

SOME OBSERVATIONS ON THE ROLE OF BEHAVIOR IN SHEEP PRODUCTION AND FUTURE RESEARCH NEEDS

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(Accepted for publication 3 August 1983)

Hulet, C.V. and Bond, J., 1984. Some observations on the role of behavior in sheep production and future research needs. *Appl. Anim. Ethol.*, 11: 407–411.

INTRODUCTION

The influence of behavior on sheep production is not generally well understood or appreciated. There is need for behavior research to evaluate the effects of behavior in production and in experimental designs. The roles of behavior, in both intensive and range management systems, and including such factors as man–animal interactions, predation, reproduction, nutrition and transportation, are areas that deserve more research activity for optimal sheep production.

BEHAVIOR AND PRODUCTION

The science of animal behavior as a distinct discipline is important. It may be just as important that an animal behavior scientist be included in the multi-disciplinary teams needed in complex research. Animal behavioral research is needed to improve efficient utilization of sheep production in several critical areas.

Production and experimental designs

A prolific new breed of sheep has been developed by the USDA, ARS, at the U.S. Sheep Experiment Station. Polypay ewes lamb more frequently than once per year, and foundation breeding stock are available to breeders in the sheep industry through annual Sheep Station sales. Most new owners, primarily small farm flock operators, report higher production levels than have been obtained at the U.S. Sheep Experiment Station. One producer reported a 339% lamb crop raised to market age from two lambings in one year. Using the best methods developed to date, ARS and University of Idaho personnel have only been able to raise a 189% lamb crop.

What accounts for these differences favoring the small operators? We have reviewed the possibility that nutrition might be at a higher level in the farm flock. However, a careful comparison of nutritional treatment of the two groups does not appear to account for this large difference in production. All breeding stock came from essentially the same genetic base. Therefore, it is difficult to say that the farm flock operators have a more highly selected group. Is variation in stress, associated with care and management, a possible explanation for the difference in performance? Chickens, dogs, cattle and horses all appear to be disturbed by strangers. There is information from cattle research which indicates that the attitude of the caretaker towards the animals affects the level of milk production (Seabrook, 1972). An effort was made to keep all other management variables constant. The cows cared for by the "animal lover" produced at higher levels than those in the other group.

Is some of the poor production performance in large sheep flocks due to the large number of people working with the sheep, many of whom, with the high turnover rate in workers, are strangers and few of whom have the love for the sheep that an owner does? This seems to be an important variable which needs to be further tested.

A number of years ago we maintained a group of mature ewes during the winter in a closed barn. In the absence of direct sunlight, the ewes soon became brown from the barn environment. In the spring, they were combined with a larger group of white-wooled sheep. The cohesive group of brown sheep that moved as a unit clearly illustrated the strong social bond that was created among these barn-housed sheep during the winter.

There are thousands of sheep at the U.S. Sheep Experiment Station. At birth, lambs are ear-tagged using a consecutive number identification system. Thus, twin lambs bear consecutive numbers. Since half the lambs are rams and culling reduces numbers of ewes by about 50%, the likelihood of two ewes bearing consecutive numbers being found together at random would be very low. Yet, consecutive numbers at times such as shearing occur at an unusually high frequency. The simplest way to account for the relative frequency of consecutive numbered ewes appearing together is the close lifetime social bond of twin-reared lambs.

As sheep are such social creatures, what stress occurs when social groups are disrupted? When young lambs are early weaned from their dams, they characteristically exhibit a stasis of growth. Nutritionists have tried in vain to formulate diets which would eliminate this stasis or reduction in rate of growth. Could the primary cause of this stasis be social stress due to separation from the dam rather than due to the sudden change in diet? This area should be researched.

There is a need for knowledge on the effects of experimental restraints put on test animals in the following areas: (1) adaptation to intensive experimentation and to the caretaker and other people present; (2) light and ac-

tivity patterns, changes in diet, and method of feeding; (3) effects of different type of stalls and crates and other equipment and instruments; and (4) effects of various surgical techniques.

Intensive management systems

Sheep are often fed pelleted feed in confinement. Pelleted feeds pass through the gastro-intestinal tract more rapidly than non-pelleted feeds. This permits pelleted alfalfa to act like a concentrate because of the high rate of energy release in relation to body maintenance requirements. As favorable as all of this sounds, there can be serious problems from long-term feeding of pellets. The most obvious in the occurrence of "depraved appetite", or the chewing and eating of wood and pulling and eating wool. Although phosphorus supplementation may slightly reduce the problem, it does not eliminate it. The only complete cure comes from the feeding of a coarse roughage. Boredom appears to be at least a part of the problem. When the daily ration is consumed in less than 30 min, what does a sheep have to do during the remaining 23.5 h of each day? Is rumination time affected? The "behavioral needs" certainly appear to contribute to this problem, and the part behavior plays deserves to be more clearly defined.

Semi-confinement and confinement management systems are becoming increasingly common. Are certain breeds more suited and adaptable to confinement situations? What behavior factors or traits lead to good performance in confinement situations? What are the limits that can be placed on sheep in confinement systems? Overcrowding with inadequate resting, feeding and drinking space will cause problems in increased aggression. Also, the problems of ventilation and accumulation of ammonia will appear. How are researchers going to measure the effects of these stressors? More sophisticated techniques are needed for measuring the effects of confinement, which appears to bring on problems such as boredom, wool-pulling, bad feet, pica and aggression.

Research is needed to determine the effects of high levels of nutrition on life span, and on the need for, and effect of, exercise on production and reproduction efficiency. Changes in levels of nutrition will also mean changes in behavioral activities, which must be studied.

Increased reproductive performance

An important point was made by Gonyou (1983) about the "shyness" of ewe lambs in a breeding situation. In extensive range sheep operations, there is an apparent "shy breeding" problem even with 18-month-old maiden ewes. A clearer definition of all factors affecting breeding efficiency in these young maiden ewes is needed in order to maximize fertility at the early ages.

It has been clearly established by Riches and Watson (1954), Radford and Watson (1957), Watson and Radford (1960), Chesworth and Tait (1974)

and others that the introduction of rams during the transition stage between anestrus and the breeding season induces an early and relatively synchronous start to the breeding season. It has been suggested by Knight (1980) that the use of sterile rams could be maximized by exposing the ewes to the rams for only 48 h rather than 17 days as advocated by others. Further studies on the effects of the ram on mating behavior in the ewe appear warranted.

A study by Knight and Lynch (1980) suggested that when ewes in seasonal transition are subjected to the wool and wax taken from rams (in bags over the nose), they exhibit the same response as when the rams themselves are introduced to the ewes. However, this study was confounded. An experiment could easily be designed to separate the effects of stress and wool plus wax treatments.

The ram effect on estrus in ewe lambs in late summer has not been documented. An observation at the Sheep Station in Dubois suggests that ewe lambs will respond. Traditionally, we have not put Polypay ewe lambs into breeding before 1 September because our earliest recorded conceptions have occurred about 10 September. However, because of a shortage of pastures in 1981, the decision was made to combine the ewe lambs with the ram lambs in early August. About two thirds of these lambs conceived and lambed to matings occurring before September. This phenomenon needs to be studied further.

The effect of the presence of the female on testes size in rams (Ilius et al., 1976) is a very interesting and thought-provoking observation. It supports the management practice of putting ewes with rams in advance of breeding. It also raises the question as to how many females are required to adequately stimulate a large group of rams. Are females in an adjoining pen as effective as when ewes are intermingled with the rams? This whole new area of "significant interest" needs to be investigated, and could lead to improved reproductive performance during the normally anestrus period.

The factors contributing to bonding of parent and offspring are still not clearly understood. The efficient grafting of orphans to foster dams has important economic significance, and more efficient techniques need to be developed. Research is needed to evaluate the increased levels of reproductive performance such as multiple births and shorter lambing periods, high forage diets, light effects, bonding after weaning, maternal care, multiple suckling and parturition help.

Range and pasture management, truck transportation and behavior in working corrals and chutes

More basic information on factors which affect the efficiency of moving large and small groups of sheep is needed. It is frequently very difficult and frustrating to load sheep on to trucks for moving from one range to another or to market. What are the factors which lead to the ease or difficulty

of movement and loading? What factors lead to survival and comfort in transit?

There is a need for knowledge of grazing behavior related to digestibility of pasture, the effects of availability of water on feed utilization and the effects of social attachment with other species on management and productivity. A Hampshire ram was purchased, taken to a distant field and dropped off with the ewes for breeding. The next morning the ram was with the horses. The following day the ram was returned to the ewe flock. The next morning he was again back with the horses. His being raised with horses led to strong social bonds with this different species. Bond et al. (1967) reported a case of social cohesion of a steer and a wether.

Predator stress

There is an urgent need for knowledge on the effects of predation on production. There may be effects on sheep other than those being killed or wounded which adversely affect behavior and production traits. It is also important to investigate protective measures such as guard dogs, donkeys, etc.

CONCLUSION

The influence of behavior on animal production and performance is not well understood or appreciated. The limited information we have gives insight suggesting that it can have a very profound influence on performance and efficiency of production.

REFERENCES

- Bond, J., Carlson, G.E., Jackson, C., Jr. and Curry, W.A., 1967. Social cohesion of steers and sheep as a possible variable in grazing studies. *Agron. J.*, 59: 481-482.
- Chesworth, J.M. and Tait, A., 1974. A note on the effect of the presence of rams upon the amount of luteinizing hormone in the blood of ewes. *Anim. Prod.*, 19: 107-110.
- Gonyou, H.W., 1983. The role of behavior in sheep production: a review of research. *Appl. Anim. Ethol.*, 11: 341-358.
- Illius, A.W., Haynes, N.B. and Lamming, G.E., 1976. Effects of ewe proximity on peripheral plasma testosterone levels and behavior in the ram. *J. Reprod. Fertil.*, 48: 25-32.
- Knight, T.W., 1980. Onset of mating activity in Romney ewes after short periods of teasing. *N.Z. J. Agric. Res.*, 23: 277-280.
- Knight, T.W. and Lynch, P.R., 1980. Source of ram pheromones that stimulate ovulation in the ewe. *Anim. Reprod. Sci.*, 3: 133-136.
- Radford, H.M. and Watson, R.H., 1957. Influence of ram on ovarian activity and oestrus in Merino ewes in the spring and early summer. *Aust. J. Agric. Res.*, 8: 460-470.
- Riches, J.H. and Watson, R.H., 1954. The influence of the introduction of rams on the incidence of oestrus in Merino ewes. *Aust. J. Agric. Res.*, 5: 141-147.
- Seabrook, M.F., 1972. A study to determine the influence of herdsman's personality on milk yields. *J. Agric. Labour Sci.*, 1: 45-59.
- Watson, R.H. and Radford, H.M., 1960. The influence of rams on onset of oestrus in Merino ewes in the spring. *Aust. J. Agric. Res.*, 11: 65-71.