SMALL RUMINANT: SUSTAINABLE SMALL RUMINANT PRODUCTION STRATEGIES TO MEET GLOBAL DEMANDS

0735 Pasture development and sustainable grazing management.

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Because grazed forage is the cheapest source of nutrients for small ruminants, grazing systems should be planned around maximizing use of grazed forages and minimizing that of hay and purchased feedstuffs. From 4 wk before parturition until weaning, the doe or ewe will consume 60% of the nutrients required in a year; therefore, it is important to provide as much nutrition as possible during this time from grazed forages. This may be accomplished by adjusting the lambing/kidding season and/or utilizing appropriate forage species that provide grazing during this period. Soil type (series), fertility, and rainfall (amount and distribution) are major determinants of forage production. A soil survey and soil test determine limitations in selection of forage species. Local/state level expertise is very important for planning a forage production system. Planting new forage species is expensive, although no-till drills reduce the cost. However, it can be cost-effective to establish forages that provide grazing during critical periods, such as cool-season forages for kidding/Lambing or warm-season forages for summer grazing. Overseeding forages, especially cool-season legumes and grasses, can be quite cost-effective. Forage plant structure (bunch vs. sod forming) and tannin-containing plants can facilitate control of internal parasites. Control of internal parasites is often a more important factor in pasture management than maximizing forage production. Inclusion and/or maintenance of woody species in the goats' grazing system is beneficial. Woody species may be leguminous, provide high quality forage, tolerate drought, and enable animals to graze away from the soil, reducing parasite challenge. Nonetheless, the inclusion of woody species in grazing systems is limited by lack of information. Rotational grazing is important for the control of internal parasites, uniform utilization of available forages, weed control, and pasture persistence. Timely provision of supplements such as minerals and/or protein can increase intake and digestibility of available forage, mitigating need for additional supplementation. Fencing costs can be a major constraint of small ruminant pasture management, but electric fencing may be a cost-effective solution. Shade is necessary in humid areas, and a windbreak is necessary during cold weather to reduce stress in grazing animals. A well-planned water distribution system will facilitate a rotational grazing program. Predator control is essential for an effective small ruminant grazing program. An appropriate forage management plan will reduce internal parasite problems and costs of production, thereby improving profitability of the small ruminant enterprise.

Key Words: pasture management, grazing system, internal parasite

0736 Internal parasite anthelmintic resistance and control.

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Gastrointestinal nematodes are major pathogens of small ruminants, and control has relied almost exclusively on the frequent use of anthelmintics. Nematodes, especially *Haemonchus contortus*, have developed resistance to all approved anthelmintics. *H. Contortus* is a problem in warm/wet environments like the southeastern United States (year-round) and is now a seasonal (summer) problem in the rest of United States. For the past 50+-plus years, recommended control strategies maximized benefits of treatment and ignored resistance issues. Resistance is the ability of nematodes to survive treatments that are generally effective at the recommended dose. Treatment eliminates those whose genotype renders them susceptible and those that are resistant survive and pass on their "resistant" genes. Resistant nematodes accumulate and finally treatment failure occurs. For anthelmintics to remain effective, refugia must be preserved. Refugia is the proportion of the population that is not selected by drug treatment and provides a pool of susceptible genes to dilute resistant genes in that population. Targeted selective treatment is a concept based on the unequal distribution of nematodes in the animal population. A small proportion of animals in a population harbor most of the nematodes and are responsible for most of the egg output and thus pasture contamination. Targeting only those animals for treatment will provide refugia in the untreated animals. Monitoring with FAMACHA and/or fecal egg counts are proven concepts to identify those animals needing treatment. Once identified, smart use of anthelmintics and incorporating alternative control measures into an integrated control program are essential for sustainability.

Key Words: small ruminant nematodes, anthelmintic resistance, control

0737 Genetic selection for enhanced production efficiency.

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The objective of this presentation is to cover issues related to using genetic selection to enhance production efficiency of small ruminants. Efficiency of production is a function of outputs and inputs. Meat and fiber production are the most economically important outputs. Outputs may be expressed as a function of number of breeding animals, amount of feed utilized, amount of land area, amount of time or labor required, or some other input factor. Genetic means of improving production efficiency should start with selection of the proper breed(s) for the production environment. Sheep and goat production can be thought of as a means of harvesting and con-

verting forage or grains to meat and fiber. Small ruminants can be productive in a variety of environmental conditions. The efficient breed(s) is one that fits the environment. Clarifying selection objectives is an important first step in developing a selection program. Selection for traits that have high heritability and can be measured early in life can yield results in a short period of time. Improvement in traits that can only be measured later in life and/or have a lower heritability take longer to yield results. An effective selection program must be adopted by enough breeders to have an impact on the larger population. The segmented nature of the meat and fiber industries does not lend itself to efficient communication of economic incentives for improvements in production. Breeders and producers may not realize the importance of traits that are crucial at the processing stage. Improvement in information flow via economic incentives will provide breeders with the information needed to set breeding goals. Improved knowledge of relative importance of traits, in all segments of the industry, will lead to design of more effective selection programs. Designing an effective selection program requires knowledge of genetic and phenotypic relationships among traits and relative economic values of output traits. Selection programs must also account for substantial changes in relative values of input traits.

Key Words: sheep, goats, genetics

0738 Efficiency of small ruminant reproductive management. M. Knights*, *West Virginia University, Morgantown.*

Productivity of the female small ruminant is below its true potential in part due to suboptimal reproductive performance. Lifetime reproductive performance of the ewe is influenced by age at first lambing, frequency of lambing and prolificacy. Replacement females comprise 20 to 30% of the breeding flock but their pregnancy rates, embryonic survival and prolificacy are lower than that of their adult flock mates, which reduces overall reproductive efficiency. Strong correlations exist between weight at first breeding and variables contributing to lambing rate. A positive correlation also has been reported between fertility and genetic potential for growth of the ewe lamb. These findings indicate that fertility of replacements can be improved through nutritional management and selection without delaying the age at first breeding. Additionally, pre-treatment with progestogen and gonadotropins enhances fertility and should be integrated in management of replacements. Seasonality of reproduction restricts lambing to once per year in temperate latitudes. Frequency of lambing can be accelerated by increasing the proportion of females bred out -of-season through light management, selection and breeding, and the use of the male effect in combination with pre-treatment with progestogens. These approaches are less effective in fall-born ewe lambs and lactating ewes, but genetic selection may improve fertility in these categories. Development of efficient, low-cost weaning systems, and approaches that increase the fertility of the lactating ewe during seasonal anestrous are needed to increase lifetime reproductive performance. Maintaining an appropriate ratio of parous to non-parous breeding females, synchronization of estrus, and pregnancy diagnosis will increase the proportion of ewes lambing and assist in controlling the timing of births to facilitate accelerated lambing programs. Wide variation in ovulation rate and prolificacy exists between and within breeds and across parity, and, lower prolificacy is observed in ewe lambs and ewes bred out-of-season. Optimum prolificacy can be achieved through a combination of selection and breeding, nutritional management and by maintaining an appropriate parity distribution in the breeding flock. Pharmacological treatments, including use of gonadotrophic hormones and immunization against protein and steroid hormones can increase prolificacy, but the response is limited by increasing prenatal losses as ovulation rate is increased. Cost effectiveness of such treatments needs to be evaluated further. In conclusion, our current understanding of reproduction provides an opportunity to make incremental changes to age at first lambing, pregnancy rate, frequency of lambing and prolificacy and thereby increase lifetime reproductive performance of the ewe.

Key Words: reproductive efficiency, small ruminants

0739 Managerial steps to alleviate the effects of heat stress, water deprivation, and low pasture quality in small ruminants. P. Y. Aad*[1] and S. Abi Saab[2], [1]*Notre Dame University, Zouk Mosbeh, Lebanon,* [2]*Lebanese University, Faculty of Agricultural Sciences, Dekwaneh, Lebanon.*

Global environmental challenges as depicted by increased ambient temperature by 0.7°C, decreased rainfall, and unpredictable weather patterns are associated with global warming. Such changes are translated by an increase in heat stress amplitude and duration, less water, and more solar radiation, resulting in slower pasture growth, higher soil erosion, and overgrazing. Therefore, small ruminants will be exposed to more days outside thermal neutral zone, less available water, and poorer pasture quality. Unfortunately, in most parts of the world threatened by global warming, small ruminants are managed extensively and walk long distances for pastures and water access. Heat stress in sheep and goat is associated with both lower feed intake and performance. Intensive small ruminant production could benefit from highly digestible and denser energy diets as supplemented by fats or isoflavonoids, and temperate water with modulated salt content. Moreover, in extensively managed animals, proper pasture rotation to prevent overgrazing, and the use of mixed pasture such as legume and grass could provide proper feeding under heat stress conditions. Furthermore, traveled distance modulation, timing of sheering, shade, ventilation and sprinkles provide good management to alleviate solar radiation intensity and heat stress and additionally improve follicular and semen quality

and prevent early embryonic loss. Breeding strategies and the usage of locally adapted breeds should be promoted alongside planned breeding for animals with lower environmental impact. Small ruminants, when properly managed, have the potential to be good energy converters and could provide a viable solution for food security in a globally warming world.

Key Words: heat stress, gobal warming, small ruminant management

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0740 Global demand for small ruminant products.

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A dynamic world market continues to evolve for the products of small ruminants. Small ruminants, for this paper, are restricted to sheep and goats. While we may focus on lamb and sheep meat, other products including goat meat, wool, mohair, and cashmere remain important. Several factors are at work in today's global market for small ruminant products. As usual, they are the classic factors that affect the demand for any product: the product's own price, consumer incomes, the prices of competing goods, and changing tastes and preferences. Fueled by growth of the Chinese economy and incomes, Chinese sheep meat imports have surged in recent years. In 2012, China overtook France as the world's largest importer of sheep meat by volume. China imports primarily lower value cuts so that the average value of the Chinese sheep meat imports is lower than that of Northern European and U.S. markets. Nevertheless, the average value of Chinese sheep meat imports is growing. A better picture of the changing market requires a look at supply as well as demand factors impacting the market. Global sheep flock numbers remain just below the 2007 peak of about 1.1 billion head, although some growth in flocks did begin to occur again in 2011. China has the world's largest flock at 139 million head. Global sheep meat production has grown by 20% over the last decade, however, due to increases in productivity. The major meat exporting countries of Australia and New Zealand are in the top 10 ranking by flock size. Production in those countries has been hampered by drought, volatile prices, and the profitable economics of competing enterprises like dairy and milk production. U.S. sheep meat production has declined by 35% over the last decade. Although decreased global wool production has led to higher prices in recent years, those prices have been tempered by the effects of the worldwide recession on demand. The demand for relatively high priced fibers has struggled during the recession and economic recovery. Overall, the global market for small ruminant market continues to evolve. Trade flows between countries are changing as incomes rise and production patterns shift.

Key Words: sheepmeat, wool, China