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Managing Barber's Pole Worm and other Gastrointestinal Parasites in a Solar Grazing System

Introduction

Rapid development of solar farms across the United States has provided an opportunity to use sheep grazing as a means of vegetation management around solar panels. Providing this service to solar energy companies offers a multitude of benefits from reduced mowing requirements to potential carbon sequestration in grazing systems. As sheep numbers increase in solar grazing systems, parasite management will be critical to long-term sustainability of this public-facing service business. However, parasite management may need to be adapted to meet challenges faced by large-scale sheep production on solar farms.

Solar Grazing Management

Solar farms across the US vary in size, but managing vegetation is particularly labor and cost-intensive on larger sites. Sheep have proven to be a beneficial biological "tool" in this situation, as flocks can be mob-grazed to reduce vegetative matter in mass. On larger solar farms, hundreds, if not thousands, of sheep are utilized and tend to be more extensively managed. Briefly, "extensive" management differs from "intensive" management as animals are not individually observed, fed, or treated at regular intervals. Extensively management flocks are commonly found in large western operations grazing on native rangelands. However, solar grazing presents challenges

Image by New Slate Land Management

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that would not typically be observed in this traditional production scheme. To date, the development of solar farms has largely taken place in environments with warm and wet summer environments, which are conducive to the survival of Barber Pole Worm (*Haemonchus contortus*). In these regions parasite management is the number one health concern for small ruminant producers particularly due to the widespread buildup of anthelmintic resistance.

Furthermore, many of the sheep grazing large solar sites consist of animals that have been sourced from multiple flocks. Ignoring parasitism in these animals can foster a situation where a few animals with dewormer-resistant parasites can quickly lead to a widespread infection of these very problematic worms amongst the larger group. Mitigating the effect of parasitism can be accomplished using a series of management techniques developed over years of research in this field. Good quarantine and treatment practices are critical any time new animals are introduced. Similarly, if flocks are moved from site to site or spend time at a "home" farm/ranch during certain periods of the year, there is potential for parasites to be spread or picked up by the animals and transported to the new location that may have even a short term prior been considered "worm-free". A strong understanding of the conditions that promote parasites and potential high-risk grazing situations will be important to all operators who manage sheep in these scenarios.

Challenges in a Solar Grazing System

Other management practices traditionally used for parasite control may not be practical in solar grazing systems. It is not realistic to attempt establishment of tannin-containing forages such as *Sericea lespedeza* or Birdsfoot trefoil and supplemental feeding may be challenging. Protein tubes may be provided in some scenarios. In other cases, limit feeders may be used to provide protein supplementation to ewes and/or lambs while grazing. This requires additional infrastructure to move and refill which may be possible in some solar farms and not in others.
Routine handling for FAMACHA© scoring, Five Point Checks©, and other inspections may be limited and dependent on labor resources, handling equipment, and site size. When treatment is required, combination dewormer treatment should be used. In addition to the combination treatment, copper oxide wire particles may be used to further improve treatment efficacy. Despite limited handling opportunities, it is still recommended to use deworming products and copper oxide wire particles in a targeted selective treatment program where individuals are only treated if deemed necessary by FAMACHA© score and/or Five Point Check© . Maintaining this refugia parasite population is essential to maintain anthelmintic efficacy over the 30+ year lifespan of a solar farm. New solar farms that have not been previously grazed may have

Comparison of sheep grazed (right) vs. non-grazed (left) on vegetation management. Image by Andrew Weaver limited parasite pressure. However, improper de-wormer use will only intensify management challenges as parasite pressure grows on solar farms over time.

Furthermore, solar sites will not come equipped with permanent sheep handling facilities, as would be found on many farms and ranches in the US. While frequency of handling flocks on solar farms may be reduced compared to intensive situations, that does not negate the necessity of handling. Effective disease prevention and flock monitoring are essential components of good flock management and care of sheep. Investment in a good portable corral system, whether homemade or purchased, where animals can be easily worked is vital and will likely pay for itself in due time, even if the upfront cost is significant.

Hybrid (mow and graze) vegetation management models in solar grazing systems also provide opportunity to extend the rest period allowing greater time for infective larvae death and reduced exposure during grazing. By alternating grazing and mowing events, the rest period between grazes may be doubled or more. Based on Barger et al. (1972), at 20 degrees C (68 degrees F), it takes approximately 60 days for 80 percent larval death and 90 days for 90 percent larval death. Balancing grazing and mowing events within the bounds of vegetation height restrictions, graziers may be able to minimize parasite exposure.

Additionally, avoiding overgrazing may further reduce larval exposure as 90 percent of larvae reside within four inches of the ground (Santos et al., 2012; Amaradasa et al., 2010). To do this, temporary fencing systems may be needed in large sites to subdivide paddocks, preventing overgrazing and extending the rest period. Sheep should not have access to the same area for more than 5 to 7 days. In smaller solar arrays, large flocks may be given access to the entire site for a short period of time and then moved to a different array.

What Can be Done Long-Term?

There are several management practices that can be used to improve parasite control while grazing solar farms. First, if parasites are expected to be a major challenge in your production system, incorporating parasite-resistant genetics into your flock is critical. Consider starting with breeds that are notably more parasite resistant, such as the Katahdin, St. Croix, and other breeds of Caribbean descent. However, parasite resistance can also vary within all breeds of sheep and this trait has been shown to be moderately heritable (Vanimisetti et al., 2004), meaning that

Image by Andrew Weaver

selection for sheep more resistant to parasite infection can minimize clinical symptoms and death loss from parasitism over time.

The most accurate tool for identifying sheep more resistant to parasitism is the fecal egg count (FEC) estimated breeding value (EBV). Estimated breeding values predict genetic merit for specific traits. They allow producers to select individuals based on their genetics, independent of environmental influences. The FEC EBV predicts an individual's ability to change FEC. The FEC EBV is expressed as a percent change with more parasite resistant individuals having lower (more negative) FEC EBVs (see figure 1). This tool can be easily utilized in large commercial flocks by purchasing stud rams with low FEC EBVs. In generation 1, 50 percent of the offspring's genetics will be a result of these low FEC EBV stud rams. In generation 2, 75 percent of the offspring's genetics will be a result of low FEC EBV stud rams and in generation 3, 87.5 percent of the offspring's genetics will be a result of low FEC EBV genetics. By generation 4, over 90 percent of the genetics in a flock can represent low FEC, parasite resistant, genetics by simply purchasing low FEC stud rams for each of those generations. This can be done in a multi-sire breeding system without any selection of ewes.

Additional evidence now supports the hypothesis that selection for low FEC EBV also improves immune fitness, colostrum quality, and resistance to other pathogens besides parasites (Weaver et al., 2023, Bentley et al., 2023, 2024). In an extensive management system such as solar grazing that does not allow for daily handling of sheep, breeding sheep for better health provides significant potential to mitigate clinical disease and death loss.

Integrated Parasite Management for Solar Grazing

Long-term, a multi-faceted, integrated plan will offer the best opportunities to minimize parasite burden and ensure sheep health and survival. The plan must be practical and applicable to the context of the solar grazing system and will vary based on location, climate, production system and labor resources. With many solar sites contracted for 30+ years, it is essential that sound parasite management practices are implemented now to minimize development of dewormer resistant nematodes over time and allow for effective treatment when necessary. Ultimately, selection of sheep resistant to parasite infection using the FEC EBV may have the greatest long-term benefit to parasite management on solar farms.

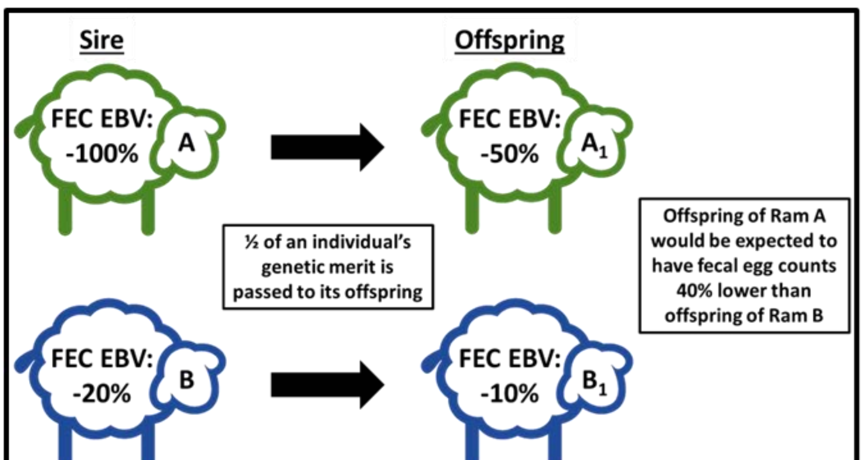

Figure 1

The most accurate tool for identifying sheep more resistant to parasitism is the fecal egg count (FEC) estimated breeding value (EBV).

Image by New Slate Land Management

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