

Florida has its fair share of hot and humid weather. Understanding heat stress and how Livestock Shade Structures can work for you in your cattle operation, is a valuable management tool.

Depending on where your operation is located in Florida you will experience, on average, 72 days each year of temperatures of 90° or above, with an average humidity of 86%. Cattle typically are not affected in temperatures ranging from 41° - 68°, which is the designated thermoneutral zone (TNZ) for cattle. The thermoneutral zone is the range of temperatures that an animal does not have to make any effort or physical response (i.e. shivering or panting) to maintain normal body temperature.

Why is heat stress such a concern for cattle? Hot weather **and** high humidity can reduce reproduction rates, rate of gain, milk production and feed or forage intake. In extreme cases, heat stress can increase even result in death.

A Livestock Shade Structure acts as a shield and reduces solar radiation and thereby heat loads. A Livestock Shade Structure does **not** reduce air temperature or humidity. Cattle generate internal heat through normal grazing and feeding. When we have hot weather, cattle regulate body temperature through evaporation, not perspiration like us. So, cattle will tend to breathe or pant more, try to locate surface water so they can totally immerse themselves, and/or decrease the amount feed or forage they consume to try to get cool.

Installation Costs

Materials^{1/}:

Galvanized, steel pipe for structure and bracing

Mesh, shade fabric

Lacing material, fasteners

Welding equipment, if applicable

(Mesh, shade fabric may have grommets for easier lacing to the structure)

Labor:

Welding galvanized, steel pipe structure and bracing

Lacing mesh, shade fabric to steel pipe structure

or

Contract the fabrication (welding) of the structure

or

Purchase prefabricated structure that does not require welding, just assembly

^{1/}Refer to NRCS Standards and Specifications for exact requirements.

Operation and Maintenance

Moving Livestock Shade Structures – This is necessary for two reasons: 1) Pasture grasses can die as a result of trampling and compaction from livestock and the resulting bare ground is subject to erosion issues 2) Harmful bacteria may also accumulate in the shaded areas.

Tightening mesh, shade fabric to structure – The lifespan of the fabric will increase if the fabric is prevented from slamming against the metal structure from wind gusts.

Alternatives

Alternatives to Livestock Shade Structures would be to use natural shade, such as hardwoods or pine trees. However, natural shade areas will typically become degraded resulting in the loss of trees from compaction and damage to roots and bark if the trees are not fenced. Even if the trees are fenced, the shaded areas are decreased and will eventually become bare through heavy use thus, resulting in pasture loss and increasing erosion potential. Because Livestock Shade Structures are portable, pasture areas can recover.

Considerations

Dairy

The difference between dairy cattle and beef cattle is that heat stress coincides with daily milking schedules. So, the effects of heat stress on dairy cows are immediate and result in reduced milk production on a daily basis. For most Florida dairy operations, concentrate feed is utilized, while most beef cattle operations in the state feed very little concentrate feed, relying primarily on pastures for their feed source. Due to the higher nutrient density of concentrate feed, it tends to generate more internal heat thereby making the livestock more susceptible to heat stress.

Beef

The body condition or weaning weight lost due to heat stress for beef cattle could be put back on during cooler times of the year or during nighttime cooling. Heat stress may be more of a concern when beef cattle are in closely confined areas such as feedlots and sorting or holding pens as opposed to open pastures where there is adequate air flow to assist in dissipating body heat.

Economics

The anticipated lifespan of a Livestock Shade Structure is 10 years if properly maintained, though during storm events the fabric may have to be removed in order to prevent severe damage.

Of course, heat stress is not experienced throughout the year. It is estimated that average dairy cow is exposed to heat stress about 49% of total annual hours in Florida. This percentage is figured into the dairy and beef analysis under the 'CWT Effected by Total Annual Hours of Exposure' and 'Total Weight Gain Effected by Total Annual Hours of Exposure,' respectively.

Dairy

In a University of Florida, Institute of Food and Agricultural Sciences (IFAS) study, reducing solar radiation through artificial shade from permanent structures, resulted in a 10-19% increase in milk production. The same study reported that protection from portable shades, such as Livestock Shade Structures, were less effective at reducing solar radiation than permanent

structures, but that proportional benefits would be expected. This means that if the Livestock Shade Structure provided only 80% shade as compared to a permanent structure with a metal roof, we could expect only 80% of the potential increase in milk production shown in IFAS Studies. So, if we assume only a potential of a 10% increase in milk production (the lower amount of estimated increase found in the study) and the Livestock Shade Structure provided 80% shade, you could expect an 8% increase (10% × 80%) in milk production due to portable fabric shade structures. So, 10% increase in milk production (the lower amount of estimated 10-19% increase) × 80% shade = 8% increase in milk production as a result of fabric shade structures. The table below breaks down of benefits and costs Livestock Shade Structures for dairies (See Table 1.).

Table 1. Benefit and Costs of Livestock Shade Structures for Dairies

DAIRY							
Benefits							
Number of Cows Served Under Shade Structure*	Average Milk Production Annually (lbs./cow)	Increase in Milk Production Annually with Shade	Increase in Milk Production Annually with Shade (lbs.)	CWT	CWT Effected by Total Annual Hours of Exposure	Average Price Received per CWT**	Average Annual Benefit
53	18,213	8%	77,223	772	378	\$17.40	\$6,585.00
Costs							
Average Per Unit Cost	Unit	Quantity (sq. ft.)	Total Installation Cost	Operation & Maintenance Cost	Amortization Rate***	Average Annual Cost	
\$1.60	Sq. Ft.	800	\$1,280.00	4%	0.1490	\$242.00	
Average Annual Net Benefit							\$6,343.00
Average Net Benefit per Month							\$528.00
Break-Even 1 st Month							-\$752.00
Break-Even 2 nd Month							-\$224.00
Break-Even 3 rd Month							\$304.00

*Based on typical 20' x 40' dimensions. (20' x 40' = 800 Sq. Ft.) (800 Sq. Ft. ÷ 15 Sq. Ft./Head = 53.33 Head per Shade Structure)

**10 Year State Average

**Based on 8% Interest Rate and 10 Year Lifespan

As you can see, for dairies the Average Annual Benefit is \$6,585 and the Average Annual Cost is \$242 resulting in a Net Annual Benefit of \$6,343 for one Livestock Shade Structure. So, there will be \$528 benefit every month for the next 10 years. (\$6,343 ÷ 12 months = \$528 Average Annual Net Benefit per Month). Also, you will be able to break-even on your Total Installation Costs within the third month of operation (Average Annual Net Benefit Per Month minus Total Installation Cost).

Beef

Texas Tech University reported an increase of 17 lbs. in the carcass weight of shaded heifers than those unshaded in a feedlot situation. The table below breaks down of benefits and costs Livestock Shade Structures for beef feedlots (See Table 2.).

Table 2. Benefit and Costs of Livestock Shade Structures for Beef Cattle in Feedlot

BEEF CATTLE							
Benefits							
Number of Heifers Served Under Shade Structure*		Weight Gain with Shade (lbs.)	Total Weight Gain	Total Weight Gain Effected by Total Annual Hours of Exposure	Average Price per CWT**	Average Price Received per Lb.	Total Annual Benefit
53		17	901	441	\$97.37	\$0.97	\$878.00
Costs							
Per Unit Cost	Unit	Quantity	Total Installation Cost	Operation & Maintenance Cost	Amortization Rate***	Average Annual Cost	
\$1.60	Sq. Ft.	800	\$1,280.00	4%	0.1490	\$242.00	
Average Annual Net Benefit							\$636.00
Average Net Benefit per Month							\$74.00
Break-Even Month							18.00

*Based on typical 20' x 40' dimensions. (20' x 40' = 800 Sq. Ft.) (800 Sq. Ft. ÷ 15 Sq. Ft./Head = 53.33 Head per Shade Structure)

**2 Year State Average for Heifers (FASS Prices Received)

***Based on 8% Interest Rate and 10 Year Lifespan

In a feedlot situation, Average Annual Benefit is \$878 and the Average Annual Cost is \$242 resulting in a Net Annual Benefit of \$636 for one Livestock Shade Structure. So, there will be \$528 benefit every month for the next 10 years. Break-even on your installation costs will occur in the 18th month of operation (Average Annual Net Benefit Per Month minus Total Installation Cost). As previously mentioned, the benefit of shade structures to beef cattle on pasture would expected to be less.

Management Summary

The decision to use Livestock Shade Structures depends on your management level and the type of livestock operation (e.g. dairy, cow/calf, feedlot, show steers/heifers).

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