Feedlot Pen Floor Design, Management, and Production Implications

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ABSTRACT

Facilities for finishing cattle in North America include open lots with either earthen or solid pen floors, and confinement barns with either a bed pack or a deep pit. Confinement barn facilities are typically found in areas that receive a greater amount of precipitation, and actually represent a relatively small proportion of the total cattle on feed in North America. Currently, the most common feedlot facility type would be an open lot with an earthen floor. However, the use of roller compacted concrete has been identified as an economically viable product for amending feedlot pen floors to create a solid surface on which cattle are housed. The objective is to identify the pros and cons of roller compacted concrete as a pen floor surface, and discuss the management and production implication of this pen floor surface technology so that feedlot practitioners are equipped to have an informed discussion with their clients about the incorporation of this product into their production systems.

KEY WORDS

feedlot, mud, roller compacted concrete

EFFECT OF MUD ON CATTLE PERFORMANCE

It has been well established that muddy pen floor conditions increase the net energy needed for maintenance requirements[1,3], therefore negatively affecting average daily gain and feed efficiency.Mud has a multifaceted effect on cattle, as it not only increases the amount of energy required to move across the pen, but it also decreases daily dry matter intake and a muddy hair coat reduces insulation. Mud depth and corresponding affect on feedlot performance is not only a function of precipitation, but also largely impacted by cattle density and temperature[3]. Under simulated winterconditions at an industry average pen density (250 ft^2/animal), environmental conditions of 36 °F mean temperature and 2 or 6 inches of precipitation over a 120-day period resulted in 0.40 or 2.38 inches of mud, respectively. Decreasing the mean temperature to 16 °F resulted in mud depths of 2.52 or 7.52 inches for 2 or 6 inches of precipitation, respectively. Relative to 2.52 inches of mud, 7.52 inches of mud was estimated to worsen the dry matter to gain feed efficiency ratio by 37% (7.56 versus 10.38) and under current economic condition of $215/ton dry matter costs and $0.55/day yardage, increase total production costs by over $200 per head.

RCC AND ITS COMPARISION TO EARTHEN PEN FLOORS

One possible solution for mitigating the deleterious effects of mud is to amend and stabilize feedlot pen floors with roller compacted concrete (RCC). Using traditional concrete to stabilize feedlot pen floors is not an economically viable solution for large-scale operations. However, given the differential composition and decreased labor requirements of RCC when compared to traditional concrete, RCC has been identified as an economical option for amending feedlot pen floors.

Because RCC is impermeable and will not mix with manure to create a deep mud environment, the stabilized pen surface has great potential to enhance both feedlot performance and animal health outcomes. A large pen trial was conducted in Alberta in which yearling (850 lb initial weight) heifers were randomly allocated to be finished on either traditional clay-lined earthen floor pens (CLAY) or pens in which 85% of the pen surface area was amended with roller compacted concrete (RCC)[2]. Overall morbidity rates were greater in the CLAY pens versus the RCC pens (40% vs. 27%). The increase in morbidity was mostly

attributable to an increase in both foot rot (22% vs.15%) and digital dermatitis (8% vs. 4%) treatments when comparing the CLAY to the RCC pens. There was a tendency (P = 0.10) for the RCC pens to have an improved average daily gain (3.23 vs. 3.17 lbs/day) and dry matter to gain ratio (7.02 vs. 7.14) when compared to the clay pens. Lastly, when pens were cleaned, there was 40% less material that needed removed from RCC pens when compared to CLAY pens (10.86 vs 18.08 lbs), and the composition of material removed from RCC pens at time of pen cleaning had 42.4% of the ash content (22.8% vs. 39.5%) when compared to the material removed from CLAY pens.

INFRASTRUCTURE COSTS

The exorbitant infrastructure costs associated with either bed pack or deep pit confinement barns results in a barrier to entry this type of infrastructure for many producers. Current industry estimates for constructing confinement barns range from $1,300 to $2,400 per head of one-time capacity. The cheapest feedlot infrastructure is an open lot design with an earthen pen floor, for which construction estimates range from $300 to $500 per head of one-time capacity. There are many production and management advantages associated with a feedlot pen floor constructed with RCC, but a major disadvantage is the cost, which ranges from $800 to $950 per head of one-time capacity. The range in costs associated with each facility type is attributed to differences in fencing type, required excavation, and type of water system that is incorporate into any of the aforementioned facility types.

DISCUSSION

Adverse weather has a dramatic impact on feedlot animal health and performance. Any infrastructure that can mitigate exposure to mud can greatly improve feedlot outcomes. Currently in North America, the greatest proportion of cattle are fed in open lot designs with earthen pen floors. Roller compacted concrete is a pen floor technology that may be incorporated into new and existing feedlot pens at a viable price point. Large pen data that directly compare roller compacted concrete pen floors to earthen pen floors indicate favorable animal health outcomes and a tendency for enhanced average daily gain and feed efficiency. Additionally, the quantity and quality of manure harvested from the RCC pens is favourable to management of the harvested product.All of these

factors, along with the associated economics, should be taken into consideration when consulting feedlot owners on new feedlot construction projects or upgrades to existing facilities.

REFERENCES

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