

Manure Harvesting Frequency— The Key to Feedyard Dust Control in a Summer Drought

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Recent summer droughts in Texas have made dust control in feedyards in the semi-arid High Plains far more challenging than usual. High winds, high day-time temperatures and low humidity accelerated the drying rate of manure on the corral surface. Then, light winds and temperature inversions in the late evening occasionally created extreme dustiness at ground level. Such concentrations of dust may be a risk to the respiratory health of cattle and may be a nuisance for neighbors. Frequent manure harvesting can be part of a drought-management scheme to conserve water and control dust.

Background

“Scraping pens” is not a new concept to the feedyard manager, who knows that deep accumulations of manure can nibble away at profit margins when muddy bogs, rain, snow or cold weather combine to increase an animal’s maintenance requirements. However, many managers are concerned only with removing manure before winter or before the rainy season.

Industry representatives and Extension agricultural engineers in Texas have advocated “harvesting manure” instead of “scraping pens.” The difference between the two is subtle and relates more to objectives and attitude than simply to the act of removing manure from the corral surface. However, the implications are profound. Harvesting manure means scraping the corrals with a pre-planned, holistic management purpose to yield better quality manure; reduce mud, dust and odor; and improve corral drainage and appearance. The Total Quality Manure Management Manual published by the Texas Cattle

Feeders Association in June 1995 presented these holistic management principles in a compelling way.

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Applying water to the feedlot surface with a sprinkler system, mobile tanker or reel-mounted “big gun” is the dust control method many feedyard managers use. Under normal conditions, water application that keeps the moisture content of manure between 25 and 40 percent (wet basis) reduces dust significantly without creating severe odor problems.

The summer of 2000, unfortunately, was anything but normal in Texas’ cattle-feeding country. In the Amarillo area, where nearly two-thirds of the 19-inch average annual rainfall normally occurs between May and September, almost no rain fell from July to September. The annual rainfall total was 6 inches (or 35 percent) below normal by October 1, when feedyards with solid-set sprinkler systems would ordinarily be draining the systems in preparation for winter. Daytime highs in the upper 90s and low 100s were common into the first week of October. Some feedyard managers speculated that heat stress in the late afternoon increased the aggressiveness of cattle, and therefore the hoof action that generates feedyard dust. Hot autumn afternoons frequently gave way to cool, stable, calm evenings that capped the dust plumes near the ground surface and allowed them to persist for miles downwind, clearly observable to motorists and residents. In such an extreme drought, attempting to control the dust by trying to keep pace with daily evaporation (i. e., by applying supplemental water or by increasing the stocking density) was a losing proposition.

Managing Dry Manure Depth

The mechanics of feedyard dust emission are relatively simple. Although some dust results from wind scouring (similar to wind erosion from cropland, for

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example) and from truck traffic on unpaved roads, most of the dust generated in a feedyard is caused by cattle hooves trampling the dry, loose manure layer on the corral surface.

The deeper the layer of loose, dry manure, the more dust will be generated (Figs 1 and 2). Most of the dust is generated in the late afternoon and evening when cattle are most active. Lower temperatures and wind speeds at this time of day tend to keep the dust confined to a shallow layer (less than 50 feet in some cases) of air immediately above the ground (Fig. 3).

Making Supplemental Water Go Further

The benefit of frequent manure harvesting goes beyond direct dust control. Feedyards whose primary dust control measure is applying supplemental water can make their precious water go further by reducing the depth of manure to which the water is applied. That is especially true during a severe drought.

The manure layers in Figures 1 and 4 had a moisture content of 10 to 15 percent (wet basis), far below the 25 to 40 percent required for dust control. To con-

trol dust with water alone, then, the feedyard manager would have to apply enough water to increase the moisture content of the entire loose manure layer by 15 to 20 percent. As a rule, raising the moisture content of a loose manure layer by 10 percent requires 5.6 gallons per head per 1 inch of loose manure depth (based on a cattle spacing of 150 square feet per head). For example, a 2-inch layer of loose manure would require 28 gallons per head just to raise the moisture content from 10 percent to 35 percent. Simply wetting the surface of a deep manure layer may eliminate dust from wind scour, but a bovine hoof will easily penetrate the wetted surface and stir up the dry material below. Where water is already in short supply, manure harvesting reduces the amount of water needed to achieve dust control and increases the effectiveness of any water that is applied.

Manure can be harvested with tractor-drawn box scrapers or elevating paddle scrapers. The collected dry manure should be removed immediately from pens, when practical, so that cattle do not disturb or redistribute the loose material that has been collected. If the loose material must be stored in the corral for a short time, apply water, or perhaps effluent from a runoff holding pond.



Figure 1. The layer of loose manure on this corral surface is 2 to 4 inches deep.



Figure 2. The surface layer of loose manure on this recently scraped corral is less than an inch deep.



Figure 3. Increased cattle activity in the late afternoon and early evening often coincides with lower wind speeds at the earth's surface, cooler temperatures, and reduced turbulence. This confines feedyard dust to a shallow layer of air near the ground.



Figure 4. The two rows of corrals in the foreground were scraped several days before the photo was taken on a hot September evening in 2000. Corrals in the background had not been scraped in several months. The difference in dust emissions is visible and dramatic. Notice the occlusion of the lamps in the left of the photograph as a result of dust emissions in the background. (A light breeze was blowing from right to left when the photo was taken.)

Timing Manure Removal

If a feedyard routinely has dust problems, the manager should harvest manure more frequently. Most feedyards scrape their corrals once every turn of cattle (120 to 150 days), immediately after the cattle are sold to the packing plant. Some remove manure less frequently than that. If the machinery allows, manure should also be harvested at the midpoint of the feeding cycle, while the cattle are still in the corral. This will not only improve dust conditions significantly,

but also will increase the dust-control value of any supplemental water applied. If long-term weather forecasts indicate there will be a drought the next summer, beginning the manure-harvesting operations in May or June is too late. Procrastination will force the feedyard manager to play “catch-up” all summer long. Feedyard managers should prepare for dust problems early in the spring so that the average manure depth across the feedyard is at its practical minimum when summer arrives.

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