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Evaporation from Cattle Feedyard Pens Estimated by Bowen Ratio-Energy Balance.

Richard W. Todd¹, N. Andy Cole¹, Brent Auvermann², and R. Nolan Clark¹. (1) USDA-ARS, PO Drawer 10, Bushland, TX 79012, (2) Texas Agricultural Experiment Station, 6500 Amarillo Blvd. West, Amarillo, TX 79106

Water content of manure surfaces in feedyard pens influences the emission of ammonia and the generation of dust and odors. Stocking density, precipitation, evaporation and runoff determine the water content of pen surfaces. Our objective was to estimate seasonal evaporation at a commercial beef cattle feedyard using the Bowen ratio-energy balance method. Net radiation, manure pack heat flux and temperature, and gradients of temperature and water vapor pressure were measured during 3 days in winter 2004, 13 days in spring 2005 and 19 days in summer 2004. Evaporation was least in winter and greatest in summer. Winter evaporation averaged 1.5 mm d^{-1} , ranging from 1.1 to 2.0 mm d^{-1} . During spring, evaporation rate averaged 2.3 mm d^{-1} , ranging from 0.8 to 4.5 mm d^{-1} . Summer evaporation rate averaged 4.3 mm d^{-1} , and ranged from 2.6 to 8.4 mm d^{-1} . Estimated evaporation was 62%, 59% and 67% of calculated reference evaporation in winter, spring and summer, respectively. Evaporation was a larger fraction of reference evaporation in summer because of greater and more frequent precipitation. Cattle urine is a daily source of water to the pen surface, and its volume is a function of water intake, which is primarily determined by ambient temperature, cattle dry matter intake and salt in the ration. Urine was a significant source of water to the pen surface, adding 1.2 , 1.4 and 1.8 mm d^{-1} , representing 79%, 62%, and 42% of the mean evaporation during winter, spring and summer, respectively.

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