

Air Quality: Reducing Feedlot Emissions

2008

Federal Initiatives Accomplishments



Purpose/Objectives

To develop science-based emission factors and cost-effective abatement technologies, researchers are studying dust, particulate matter, ammonia, hydrogen sulfide, odor, and volatile compounds from cattle feedlots and dairies in Texas and Kansas. The project developed emissions characterizations, identified emission factors with appropriate abatement measures, and provided technology transfer that will improve the sustainability of cattle and dairy operations as vital economic sectors of rural communities in the South Great Plains.

Accomplishments/Impacts

- Fifty-three percent of Texas feedyards have adopted some form of dust control measures identified in this project, either solid set sprinklers, traveling gun sprinklers, or frequent manure harvesting.
- About 80 Texas feedyards have received Environmental Quality Incentives Program (EQIP) cost sharing for dust-control measures applying science-based technologies.
- Project results from particulate matter (PM) monitoring in dairies has led the California Air Resources Board to reduce its adopted emission factor.
- Determined that PM concentrations peaked in the evenings, when conditions consisted of low moisture, high cattle activity, and the presence of the inversion layer in the atmosphere.
- Developed a protocol for PM emission factors in cattle feedyards and dairies: average 18 pounds per day per 1,000 head, with a range of 9–24 pounds per day per 1,000 head.
- Determined that 20% of surface-manure moisture content and 1-inch surface manure depth may be critical thresholds for PM₁₀ control.
- Identified promising surface treatment strategies, including frequent scraping to remove loose surface manure, wheat straw, and sawdust mulches, and the use of emulsions.
- Determined that ammonia emissions average 53% of nitrogen fed, but supplementing cattle diets with 3% added fat decreased laboratory ammonia by more than 30%; phase feeding decreased nitrogen volatilization losses by 16% vs. steers fed a constant 11.5% crude protein diet.
- Determined that the surface abatement measure using Zeolite reduced ammonia emissions by 25%–50% and a combination of Zeolite and urease inhibitor reduced emissions by 70%. Corn oil also reduced emissions by 85%.
- Determined that hydrogen sulfide concentration and emission data from three Texas feedyards was very low—significantly below the Texas Commission on Environmental Quality's average for residential, business, or commercial property.
- Determined that only two volatile odor compounds (p-cresol and phenol) exceeded threshold values at four miles downwind from a cattle feedyard. Although odor was detected at up to nine miles downwind, the intensity was not above odor panel threshold values.
- Determined that the genetically modified yeast enzyme Horseradish peroxidase resulted in a 70%–90% reduction in vitro of the principal odorant p-cresole.

Lead Agency:

Texas AgriLife Research

Partners:

Texas AgriLife Extension Service;
West Texas A&M University;
Kansas State University;
U.S. Department of Agriculture—
Agricultural Research Service

Federal Funding:

U.S. Department of Agriculture—
Cooperative State Research, Education,
and Extension Service (CSREES)

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