Air Quality Conservation Practices, Cont.

Land Application

- Incorporate manure on fields within 48 hours
- Inject slurry into soil
- Use low pressure, pivot drag hoses, or sub-surface drip irrigation application systems

Nitrous Oxide, Methane, and Odorous Gases

Nitrous oxide and methane are both highly efficient at absorbing infrared radiation.

Nitrous Oxide (N_2O)

- N_2O contributes to ozone reduction
- Released at any stage of livestock production
- Emissions increased in anaerobic (oxygen-depleted), high-temp. & moist environments
- Lowest emission levels from swine; highest from poultry

Methane (CH_4)

- Produced by ruminant animals and microbial degradation of organic matter
- Amount produced affected by manure management
- Emissions are increased in anaerobic environments, high temperature, and/ or moist conditions

Odorous Gases

Amine compounds

- Several amines are known to affect levels of air pollution because of their odorous and toxic characteristics
- Amines react with other natural compounds to form carcinogens
- Can cause irritation to the skin, respiratory tract, and mucous membranes

Hydrogen sulfide (H_2S)

- Colorless, heavier-than-air, water soluble, and has a rotten egg smell
- Usually formed under anaerobic conditions in manure
- High levels can pose health risks

Feeding Options and Concerns

Nitrogen excretion is divided between urine and feces. Urine rapidly hydrolyzes and forms ammonia (NH_3). About 25% of the nitrogen in animal waste is lost as NH_3. Nitrogen in the feces is mostly in an organic form and is slowly released by microbes, making it more available for plant use. Dietary changes, especially during critical air quality periods, may reduce (NH_3) emissions from the urine.

Research has shown that the following diet changes are effective in reducing NH_3 emissions.

- Remove excess protein from livestock diets, which can also save on feed cost
- Reduce crude protein in swine and poultry diets
- Use feed supplements such as tannin-rich legumes (which shift nitrogen from urine to feces)
- Add gypsum-zeolite to poultry diets, which can prevent the conversion to NH_3 and retain nitrogen in the manure for field application

In one study, a slight reduction in crude protein and the addition of gypsum-zeolite supplement in turkey diets reduced the emissions of NH_3 by 39%, CO_2 by 5%, CH_4 by 17% and N_2O by 48%.

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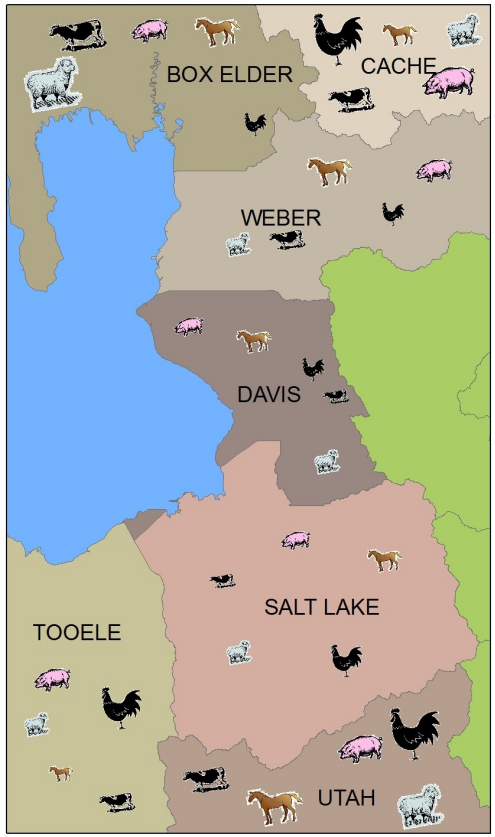
UDAQ-NAEMS Outreach Project



Utah Department of Agriculture and Food

UtahStateUniversity COOPERATIVE EXTENSION

Utah Farm Bureau

Utah Air Emissions Outreach Project

The Utah Air Quality Team was established to determine how the National Air Emissions Monitoring Study (NAEMS) protocols would work in the arid western states. Most of the work on NAEMS was being done in the more humid East and Midwest.

Air quality monitoring trailer

The Utah Division of Air Quality (UDAQ) received a grant from congress to test the EPA NAEMS protocols in arid western conditions. In cooperation with the Utah Department of Agriculture and Food (UDA&F), UDAQ contracted with Dr. Randy Martin of Utah State University and others for the protocol test project.

The UDAQ-NAEMS outreach project uses the results of the USU study to relate the results to the animal feeding industry in Utah. Results of the USU study are presented to the public to assist with the placement of investments in feeding enterprises considering their potential risk to air quality. The results can be found on the USU Extension Service Producer's Website.

To view the full outreach project report visit the Air Quality Outreach page on the **USU Producer's Website**:

UtahStateUniversity COOPERATIVE EXTENSION

http://agwastemanagement.usu.edu/Air_Emissions

Animal Feeding Operations and Air Quality

Animal feeding operations can affect air quality through direct emissions of gases and aerosols such as ammonia, nitrous oxide, methane, hydrogen sulfide, amine compounds, particulate matter, volatile organic compounds, microorganisms, and odor. Gas-phase ammonia is the predominant pollutant gas emitted from animal feeding operations. It is produced when urea (present in urine) is broken down by the enzyme urease (present in feces and soil).

What is Ammonia?

Ammonia (NH_3) is colorless, lighter than air, highly water-soluble, and has a sharp, pungent odor. NH_3 is classified as a particulate precursor, i.e. in the vapor phase it will react with other compounds to form fine particulate matter ($PM_{2.5}$).

Dr. Randy Martin demonstrating air quality monitoring equipment. (From left: Randy Parker, Commissioner Leonard Blackham and Dr. Howard Thomas)

Why Be Concerned About Ammonia?

Particulate matter is an air quality concern because both PM_{10} (big) and $PM_{2.5}$ (small) particles can damage lung tissue and cause respiratory and cardiovascular problems. $PM_{2.5}$ is more harmful than PM_{10} because it travels deeper into the lungs and is made up of compounds that are more toxic.

Air Quality Conservation Practices

The following conservation practices can significantly reduce air pollution emissions from animal feeding operations:

Layer Hens
- Change from high-rise layer housing to a manure-belt system
- Lower in-house temperature
- Frequently remove manure and change litter
- Plant vegetative environmental buffers (VEB) outside ventilation fans and install biofilters on exhausts
- Decrease pH of litter by adding alum
- Use sodium bisulfate to reduce ammonia emissions from manure
- Add urease inhibitor to manure and litter in layer houses

Swine
- Use pull-plug housing rather than deep-pit houses
- Install biofilters on ventilation exhausts

Dairy
- Install floors that divert urine away from feces to reduce ammonia emissions
- Select bedding (e.g. sand or pine shavings) that separates feces and urine

Lagoons
- Cover the lagoon
- Control water temperature and pH (lower pH has lower emission rates)
- Plant wind breaks and vegetative environmental buffers (VEB)
- Separate liquids and solids

Composting Practices
- Incorporate alum
- Compost aerobically (oxygen rich)
- Increase carbon to nitrogen ratio (C:N)