SUSTAINING LIVESTOCK PRODUCTION

Demand for animal products is rising, but available land, fresh water, and energy resources are declining. In addition to resource challenges, the livestock industry must also address consumer concerns about food safety, nutrition, animal welfare, and the environment. The pressure is on for the livestock industry to be more socially, economically, and environmentally sustainable.

Traditionally, efforts to improve sustainability have focused on the efficiency of specific aspects of livestock production. This approach is not sufficient. Advances in efficiency in one area can have unintended negative impacts in another. In some cases, advances do not actually reduce resource use or impacts; they simply allow more resources to be used more easily.

THE MULTISTATE APPROACH

To address the complex challenges facing livestock production and balance environmental, economic, and social sustainability, a team of researchers from 15+ land-grant universities are looking at the broader, system-wide impacts of new technological innovations, practices, and policies. Benefits of working together include:

- **Shared** funds, resources, and knowledge
- **Transdisciplinary** research
- **Diverse** research settings
- **Holistic** look at all facets of sustainability
- **Integrated** data and findings
- **Consensus** on conclusions and recommendations
- **Widespread interdisciplinary training** for students, the next generation of scientists

BUILDING DATABASES

Researchers improved crop and manure sample collection and analysis, leading to better data that are being used to revise dairy regulations in California. Researchers also added data and other tools to databases and produced a "data dictionary" to define terms, helping scientists, educators, farmers, policymakers, and private industry share, find, and use accurate data easily.

PROTECTING THE AIR & WATER

Applying manure to farmland provides nutrients for crops, but excess can run off fields, pollute water, and impact air quality. Researchers identified critical factors in the fate of nutrients from manure applied to cropland and quantified manure runoff risks. At roundtables in Nebraska, scientists discussed manure use and soil health with farmers, 87% of which gained valuable knowledge that could lead to changes in practices on more than 48,000 farms. In Iowa, over 5,000 livestock producers learned how to change manure application rates to maximize crop nutrient use.

REDUCING ODOR & GAS EMISSIONS

As they decompose, animal manure and other organic wastes give off odors that can cause conflicts with neighbors and gases (like methane, a powerful greenhouse gas) that impair air quality. Researchers and international collaborators identified cost-effective techniques to reduce emissions, including special nanoparticle-based wall coatings, black light treatments for swine and poultry barns, and targeted strategies for beef cattle feed yards and open-lot dairy farms.

LOOKING AT THE WHOLE SYSTEM

Scientists are looking at the relationships between demand for meat and dairy and social, economic, and environmental systems. Researchers also designed a model to evaluate the effectiveness of livestock practices and tools at specific sites, which is essential to understanding overall impacts. Other models revealed that the state of the environment, government, and economy are among the main factors affecting food security for millions of people.

CREATING RENEWABLE ENERGY

To reduce greenhouse gas emissions, manure and other organic farm waste can be mixed together and recycled into biogas—a renewable energy resource. In Michigan, researchers developed online tools to model the potential impacts of biogas on the economy, energy production, and greenhouse gas emissions. In Arkansas, studies identified the optimal conditions needed to break down poultry litter—a mix of bedding material, manure, and feathers—into reusable material. This is a major step toward on-farm recycling of poultry litter into valuable renewable energy.

MANAGING LIVESTOCK DISEASES

Early detection and accurate diagnosis help livestock producers prevent costly, dangerous disease outbreaks and maintain a safe, steady food supply. Collaborating researchers identified biological markers that indicate the presence of certain infectious diseases, offering a fast, non-invasive way to detect and diagnose diseases. Iowa scientists made progress in early detection of tuberculosis in cattle through the gasses emitted from their manure.

PROJECT FUNDING & PARTICIPATION