# Nutrition modeling helps reduce

**Research**

with
**TIM LUNDEEN**

NUTRITIONAL modeling systems developed in the Texas A&M University department of animal science have helped participating Texas feedlot operators keep feed costs in check and produce beef more profitably.

Now, these models have the potential to be applied to help reduce greenhouse gas emissions, according to researchers.

Dr. Luis Tedeschi, Texas A&M AgriLife Research nutritionist and associate professor in the department of animal science, has extensively studied decision support systems, specifically nutritional modeling. As a doctoral student at Cornell University, Tedeschi worked with Dr. Danny Fox to develop the Cornell Net Carbohydrate & Protein System model for evaluating herd nutrition and nutrient excretion.

At Texas A&M, Tedeschi built upon that work in developing the Cattle Value Discovery System (CVDS), which helps feedyards sort animals into homogenous groups so a higher percentage reach a desired level of grade on the day the pen is marketed.

"Usually, when feedlots receive animals, they group them in pens by weight," he said. "We changed the paradigm to grouping them according to CVDS-predicted days to reach the target U.S. Department of Agriculture quality grade — usually USDA low Choice."

Also, nutritionists typically have formulated cattle rations that contain excess nutrients to ensure that the growth rate is maximized, which often increased nutrient excretion and contributed to adverse effects on water and air quality, Tedeschi said.

The Large Ruminant Nutrition System (LRNS) is a computer model that estimates beef and dairy cattle nutrient requirements and supply under specific conditions of animal type, climate, management and the physiochemical composition of available feeds. This model uses the same computational engine of the Cornell Net Carbohydrate & Protein system, Tedeschi said.

The CVDS modeling system is used by Performance Cattle Co. and Micro Beef Technologies, among others. When used in combination with LRNS, CVDS creates a complete ration for each animal and predicts a day to reach the target USDA grade. A radio-frequency identification ear tag system monitors which lots of animals receive a certain kind and amount of feed ration.

"It's a very complete model for nutrition," Tedeschi said. "In addition to improving performance and profitability while reducing environmental impact, these models help producers and consultants understand nutrient requirements and feed utilization in beef, sheep and goats."

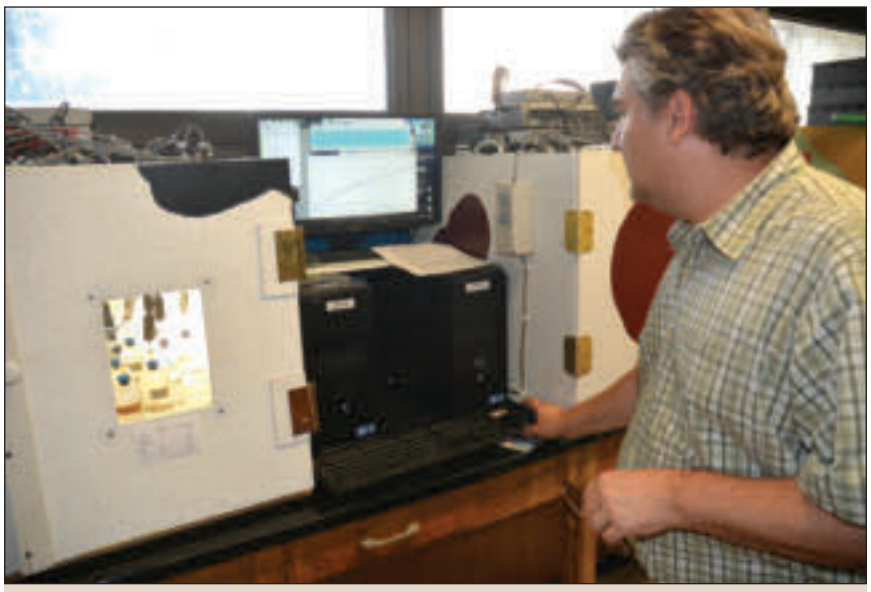

Photo: **Blair Fannin/Texas A&M AgriLife Research.**

**NUTRITION MODELS:** In support of cattle nutrition models, Dr. Luis Tedeschi at Texas A&M University has developed *in vitro* gas production systems to assess digestion characteristics and biological values of feeds based on their pattern of accumulated gas during incubation with rumen fluid under anaerobic conditions.

The modeling system can also be applied in predicting expected progeny differences for breeding herd replacements.

At Texas A&M, in support of the LRNS and CVDS models, Tedeschi has developed *in vitro* gas production systems to assess digestion characteristics and biological values of feeds based on their pattern of accumulated gas during incubation with rumen fluid under anaerobic conditions. This process is a re-engineered version of one developed by Cornell researchers Dr. Alice Pell and Peter Schofield, who designed a computerized closed system using flasks connected to pressure sensors, Tedeschi

# cattle emissions

said.

"The data collected from these samples is imported into a spreadsheet, which automatically calculates fractional degradation rates of fiber and non-fiber carbohydrates to estimate total digestible nutrients and metabolized energy of feeds," he said. "This information is utilized by nutritionists using LRNS to formulate and balance rations."

The *in vitro* technology also helps evaluate how much methane is generated in a formulated feed ration, which can be used to reduce greenhouse gas emissions.

"In a sense, what is really nice is that these same ideas started with nutrition models," Tedeschi said. "We are trying to improve how we feed animals and get a better understanding of physiological makeup and into informatics. The most benefit is to Texas and the beef companies."

Tedeschi said contemporary competition for the use of resources, environmental and economic challenges in animal agriculture has raised the bar for all major players in the animal industry.

"Decision support systems are more important than ever because they give users the ability to quickly evaluate multiple scenarios of production and choose options that are more acceptable, sustainable and resilient," he said.

Tedeschi said the latest modeling project, the Ruminant Nutrition System (RNS), is a more comprehensive decision support system model that integrates cattle, sheep and goats into one platform.

"The main objective of the RNS is to provide a framework for incorporating and implementing new scientific knowledge and sub-models to more accurately predict nutrient requirements and biological values of feedstuffs for ruminants in a perpetually challenging world," he said.

Work on the RNS model continues and can be used in multiple applications among the livestock feeding sector, Tedeschi noted.

### Beef manure odor

A recent study conducted by researchers with the U.S. Department of Agriculture's Agricultural Research Service (ARS) indicated that just three compounds in beef manure are responsible for generating more than two-thirds of detectable odors.

These findings, by ARS agricultural engineers Bryan Woodbury and John Gilley, could help with developing techniques to control objectionable odors from manure that's used to amend crop fields.

Woodbury and Gilley conducted a comprehensive study to identify compounds responsible for beef manure odor and to evaluate how land application practices, diet, soil moisture and application procedures affect odor emissions. The team used manure collected from feedlot pens in which cattle consumed diets containing 0%, 10% or 30% wet distillers grain with solubles.

The scientists also evaluated two application methods — no-till surface manure application or disk tillage that incorporated manure into the soil — and collected air samples before and after water was added to the soil to assess the effect of moisture levels on emissions.

Beef cattle manure was applied at levels that provided 135 lb. of nitrogen per acre, which met the one-year nitrogen requirement for corn. After collecting and analyzing the air samples, the researchers determined that two volatile fatty acids — isovaleric acid and butyric acid — and the aromatic compound 4-methylphenol were responsible for more than two-thirds of detectable beef manure odors. Most of these odors were released within 24 hours after manure was applied to the soil.

Incorporating the manure into the soil and irrigating afterwards reduced most of the odor compounds that were measured. However, the manure needed to be incorporated almost immediately after being applied to obtain the most effective odor mitigation, ARS said.

The importance of tilling manure into soil was highlighted by emission measurements the researchers obtained for 4-methylphenol. The greatest emissions of this compound occurred from dry soils on no-till plots and were sometimes as much as 10 times greater than similar emissions from tilled soils.

Woodbury works for the ARS Nutrition & Environmental Management Research Unit in Clay Center, Neb., and Gilley works for the ARS Agroecosystem Management Research Unit in Lincoln, Neb. They published their research in the *Journal of Environmental Quality*. ■

# VeriPrime, Eureka Genomics enter working agreement

**VERIPRIME Beef Cooperative and Eureka Genomics, a leader in next-generation genotyping, have entered into an agreement to further develop cattle herd health risk management technology.**

**The two companies will leverage Eureka Genomics' proprietary next-generation genotyping technology to identify and develop assays that could potentially enhance cattle health risk management.**

**Over the next several months, VeriPrime and Eureka Genomics will work together with member feedyards and their veterinarians to initiate clinical field trials for the purpose of identifying and validating the best practical methods to implement the new technology.**

**"The increased value of cattle and the cost of therapy makes the development of cattle health risk management vital, and this agreement with Eureka Genomics allows us to move forward further and faster," VeriPrime chief executive officer Scott Crain said.**

**Eureka Genomics chief operating officer Didier Perez added, "By entering this agreement with VeriPrime, Eureka Genomics has the unique opportunity to leverage our technology to help fuel further innovation in veterinary medicine."**

**VeriPrime is a member-owned federation of cooperatives representing more than 70% of U.S. fed cattle.** ■