396 Feed management: Northeast perspective on workshops, ARPAS certification and relationship with national feed management project and NRCS.

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Land Grant Universities in Delaware, Maryland, Pennsylvania, Virginia and West Virginia and USDA's Cooperative State Research, Education and Extension System (CSREES), working with EPA Region III, formed a partnership to advance water quality protection and restoration efforts in the Mid-Atlantic Region by providing water quality science support, training and education. In the winter of 2006, University specialists in dairy nutrition were invited to participate in the Mid-Atlantic Regional Water Program that until then was predominately comprised of engineers and agronomists. Penn State, Virginia Tech and the University of Maryland represented the dairy nutrition component. Specialists from these three Universities decided the greatest opportunity to positively affect water quality was to implement the national initiative: Development and Integration of a National Feed Management Education Program and Assessment Tools into a Comprehensive Nutrient Management Plan, which was being lead by Washington State University. The goal of the dairy nutrition group was to cater the national program to issues affecting the Mid-Atlantic Region. Collaboration with the local NRCS specialists was an essential component in getting the certification process initiated. In November 2007, the first training on how to become a certified feed management planner was held in Grantville, Pennsylvania with 105 consultants in attendance. More training followed that included both feed industry and NRCS personnel. The Mid-Atlantic group felt that for nutritionists to buy into the concept of becoming a certified feed management planner through ARPAS, off-setting the cost of the exam would be a positive incentive. As of January 2009, ARPAS lists a total of 65 certified feed management planners and 56 are in the northeast and would have attended trainings provided by the Mid-Atlantic dairy nutrition group.

Key Words: feed management, mid-Atlantic region, certification

Beef Species: Symposium: Population Data Analyses to Evaluate Trends in Animal Production Systems

397 Enhancing management decisions in modern animal agriculture using population data and appropriate analytical methodology.

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Improvements in data capture and analytics in animal protein production industries has reflected the change and opportunity observed in many manufacturing and value creation segments of the global economy. Imagination and cost are the only things that limit the amount and type of individual or unique data captured, analyzed and reported in modern animal protein production systems. As the result of mountains of data being accessible, large production systems struggle with how to best capture, analyze, evaluate, interpret and act on information that emanates from daily downloads of production related measurements. Management decisions based on scientific methodology for analysis of population information is sometimes difficult and misleading based on system bias and the appearance of significant effects simply based on the volume of data or observations involved. Furthermore, the economic impact of small differences in efficiency or production output often times outweigh science based evaluation or analysis. A decision making constraint that the food animal production industry must grapple with is the difference between controlled research results reported in peer reviewed scientific publications compared to commercial production outcomes. Additionally, conclusions with regard to treatment efficacy reported in scientific journals often do not match up with optimal economic outcomes or return on investment when evaluated in commercial production enterprises. Large commercial operations have the capability of replicating treatments across entire systems, allowing replication of treatments by barns or houses in the case of pork, broiler and layer production or pens in the case of feedlot cattle. Individual measurements are also accessible in the case of daily dairy cow output, as well as carcass metrics in pork and beef production. Linking this information to treatments, seasonal changes in environment and the impact of specific management decisions can have a dramatic impact on system profitability, long range planning and financial sustainability of animal agriculture.

Key Words: population data, management, analysis

398 An animal breeding approach to the estimation of genetic and environmental trends from field populations.

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Selection of parents from candidate individuals that outperform their contemporaries is the basis for the genetic improvement that leads to long-term trends in the performance attributes of populations. Theoretical formulae to predict the genetic trend or response to selection are well known and are functions of population parameters including heritability, intensity of selection, phenotypic variation and generation interval. Field data produced from successive generations of selected individuals do not always reflect expected gains, in part because phenotypic changes result from both genetic and environmental causes. Estimating realized trends from field data, and partitioning them into various causes, is therefore of critical interest. Prior to the 1980's, control populations were the basis for separating genetic from environmental causes of change. The development of mixed model theory, notably by Dr Henderson and colleagues, led to recognition that in certain circumstances phenotypic observations from a selected population could be decomposed into their underlying genetic and environmental components without recourse to a control population. This controversial suggestion has, over the last 2-3 decades, been accepted throughout the world as the routine approach to predict trends in populations with known parentage. It is now also frequently applied to wild populations, with molecular techniques rather than pedigree used to infer parentage. The philosophical basis that underpins the method involves a model equation that accounts for performance as the sum of various unobservable fixed and random effects. It is widely applicable to the analysis of appropriate field and experimental data.

Key Words: mixed models, BLUP

399 Data collection and determination of factors affecting efficiency and profitability of beef cattle production systems. R. Jones[1] and M. Langemeier*[2], [1]*Oklahoma State University*, *Enid*, [2]*Kansas State University*, *Manhattan*.

This paper summarizes a series of research examining the relative efficiency and profitability of various beef cattle production systems. This type of research has historically been very common in the social sciences, particularly economics, where scientists rely on population data and population research tools and techniques rather than controlled experiments. Much of the particular research referenced in this paper has been conducted using a combination of production and financial data from a sample of actual beef producers. A variety of specific techniques are available, and more than one technique may need to be utilized in the same study to provide answers to the questions at hand. For example, it is quite common to use one technique to quantify the magnitude of relative efficiency (inefficiency) exhibited within a given data set, and then use another technique to identify factors that contribute to that relative efficiency and their magnitudes. The study of important economic outcomes (efficiency, profits, costs, etc.) lends itself particularly well to this type of analysis. Given appropriate data, a wide variety of beef industry research questions can be addressed using similar techniques. We discuss specific data required to conduct various types of population analysis, and suggest potential sources and appropriate collection techniques. In addition, we provide examples of previous and ongoing research projects to illustrate the wide variety of issues that can be addressed using alternative techniques. Finally, we address potential shortcomings and other issues that need to be considered when collecting data and performing economic analyses of beef production systems.

Key Words: efficiency, economic analysis, profit

400 Applications of population data analysis in on-farm dairy trials. M. Engstrom*[1], W. Sanchez[2], W. Stone[2], and N. R. St-Pierre[3], [1]*DSM Nutritional Products, Inc.*, *Parsippany, NJ*, [2]*Diamond V Mills*, *Cedar Rapids, IA*, [3]*The Ohio State University*, *Columbus*.

With appropriate statistical designs and management controls, research trials done on-farm can generate good data, speed up technology interchange, and in some cases couldn't be done anywhere else. Useful designs include split-herd ("pen vs. pen") trials where pen comprises the experimental unit, and crossover or switchback designs where treatments are imposed on a schedule over one or more experimental groups. We've also used a "paired-herd" design, where two switchback studies are run in tandem, but with the treatments out-of-phase to neutralize environmental variation. A multi-site design utilized 35 dairies to compare milk responses to a protein source, using individual cow records to evaluate differences in milk production. Recently, we have used statistical process control techniques (SPC) to evaluate current management changes, using repeated measures on the dairy. Although a drawback to SPC might be the lack of traditional statistics to test differences, standard rules can be used to demonstrate that a process or variable has changed, or to characterize a seasonal change. Meta-analysis techniques are the most powerful tools to evaluate many similar trials for low-frequency or subtle effects. Meta-analysis can be used to segment a database to validate and compare trial methods or to investigate for publication bias. Additional design concerns for reproduction stuides include the need for adequate numbers of observations and planning for the lag time between an experimental treatment and response measurement (i.e. pregnancy confirmation).

Key Words: trial design, statistical process control, meta-analysis

401 Application of statistical process control techniques to monitor changes in animal production systems. A. De Vries*, *University of Florida*, *Gainesville*.

Statistical process control (SPC) involves using statistical techniques to measure and analyze the mean and variability in process observations. Emerging trends in animal production systems can be detected with the aid of SPC techniques. The conceptual idea is that variability in process observations comes from 2 basic sources. Common cause variability includes all sources of random variability that can be removed only by changing the process. Special cause variability results from some potentially identifiable source that can be removed if needed. Production processes that are influenced by special cause variability are said to be out of control. The goal of SPC is to detect when a process moves from in control to out of control, and possibly suggest the way it went out of control. A process that is out of control warrants further investigation, at a cost of time and effort, to identify the special cause of the shift or drift. On the other hand, processes that are in control should be left alone, unless the process is intentionally changed. Statistical techniques, primarily control charts, are needed to determine if there is enough evidence that the process has changed. The amount of evidence depends on the relative cost of type I (false positive) and type II (false negative) decision errors. Control charts have their origin in manufacturing in the 1920s but there are now abundant applications in health care and epidemiology. Various types of control charts have been applied in animal production systems, with examples in poultry, swine, dairy, and beef. Examples include monitoring of growth, disease incidence, water intake, and reproductive performance. Common challenges for applications in animal production systems are the identification of the best statistical model for the common cause variability, grouping of data, selection of type of control chart, the cost of type I and II errors, and difficulty identifying the special causes when a change is signaled. Nevertheless, carefully constructed SPC applications are powerful methods to monitor animal production systems.

Key Words: monitoring, statistics, system

Breeding and Genetics: Dairy Breeding III - Parameter Estimation

402 Estimates of heritability of feed intake in Canadian Holsteins. J. Song*, J. F. Hayes, and R. I. Cue, *McGill University, Macdonald Campus*, *Ste-Anne de Bellevue, Quebec, Canada*.

95,678,311 feed records from January 2000 to May 2007, corresponding to 16,866,117 test-day records were obtained from the Quebec Dairy Herd Improvement agency, Valacta. Each feed record contained information on animal identification, test-day date, feed type, quantity of feed intake for each feed, percentage composition of each feed for dry matter (DM), crude protein (CP), net energy for lactation (NEL), acid detergent fibre (ADF), etc. Weight of each different feed type fed to a cow on a test-day was recorded by the producer except for forage which was measured on a cow group basis according to production. Any test-day feed record with at least one feed variable outside the range of the