Evaluating feeding strategies with the PC

A NEW MODEL AND SOFTWARE TOOL, DEVELOPED BY INRA, INTEGRATES CURRENT KNOWLEDGE OF PIG NUTRITION TO EVALUATE THE CURRENT FEEDING STRATEGY AND TO PROPOSE OTHER STRATEGIES THAT MAY BE LESS COSTLY OR MORE ENVIRONMENTALLY FRIENDLY.

Nutritional systems, such as the net energy system or the system of standardised ileal digestible amino acids, are widely used in animal nutrition. These systems rely on the concept that a nutritional value can be attributed to a feed, which can then be compared to the nutritional requirement of the pig. Although these systems are simple to use, they have difficulties dealing with interactions (e.g. between the diet and the animal) or with the change in requirements during the productive life of the pig. For example, the lysine requirement (expressed as a percentage in the diet) of a pig depends on the growth potential and the feed intake capacity of the pig. As both the growth potential and feed intake capacity change dynamically during growth, so will the lysine requirement. Mathematical models are ideally suited to account for these nutritional interactions. INRA-Agrocampus joint research unit "Livestock Production Systems, Animal and Human Nutrition (UMR SENAH)" in Rennes, France has therefore developed InraPorc, which includes a model (the mathematical equations) for the nutrition of growing pigs and sows and a software tool to use the model.

FEED CHARACTERISATION

During the last 25 years, numerous experiments have been carried out at INRA to quantify the response of pigs to a changing nutrient supply. These results, combined with literature data, allowed the construction of the model. The software consists of three modules: a feed module, a sow module and a growing pig module. The feed module allows characterising the feed that is going to be used. The feed ingredients database of INRA is included in the software, but users can also import data from their own database of feed ingredients. Energy (or components of energy) and amino acids are the main components of the feed characterisation. For energy, faecally digestible nutrients are used as inputs, from which DE, ME and NE values are calculated. The user may also enter a known DE, ME or NE value in order to correct fecal digestibility values. For amino acids, the standardised ileal digestible amino acid content is used as an input and the availability of 12 amino acids (including histidine and arginine) is considered in model calculations.

SIMULATION OF FEEDING STRATEGY

The sow and growing pig modules are very similar in design. Both modules offer the possibility to perform a simulation based on a feeding strategy and potential animal performance. The results of a simulation can be shown as a summary report or as graphs that illustrate how the animal uses nutrients for different physiological functions. The first-limiting nutrient for protein deposition or milk production can be determined and the dynamic change in nutrient requirements can be deduced easily from the graphs. The sow module also allows to estimate requirements using the factorial approach. Nutrient balances (intake, retention and excretion) are calculated for different minerals including N, P, Cu and Zn.
Results from different simulations can be compared graphically or numerically. In addition, a sensitivity analysis can be performed in which the sensitivity of model predictions relative to key model parameters is determined. Such a sensitivity analysis can be used to quantify the impact of variation in feed intake between animals on the nutrient requirement of the herd.
Defining the potential performance of the pigs is the core of the model, which can be done with limited, on-farm information. The sow module may be parameterised using average data for the herd including feed intake during gestation and lactation, litter growth, back fat and weight loss during lactation. Based on this average information, model parameters are calculated for litters 1 through 8. Similarly, the potential performance for a growing pig can be realised using the average feed intake and growth during the growing and finishing periods.

A HELPFUL TOOL

For nutritionists, the model and software are helpful tools to evaluate the current feeding strategy on a farm and to propose other strategies if necessary. Because of the user-friendly interface and the numerous ways in which simulation results can be displayed, InraPorc can be a useful tool in teaching nutritional principles (e.g. the difference between digestible, metabolisable and net energy can be easily demonstrated). Predicting product quality, the impact of housing conditions or group responses are aspects that may be further developed by INRA. <-