Investigation of Net Feed Efficiency in Dairy Cattle

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Selection of animals based on the feed conversion ratio (FCR) and gross energy efficiency, as the commonly used measures for energy efficiency, may increase the maintenance requirements of animal. Energy intake has different partial efficiencies for maintenance, lactation and growth but FCR and gross energy efficiency do not differentiate them. Residual feed intake (RFI) is a corrected measure of live weight and production for feed utilization and often referred as net feed or energy efficiency. This concept can be termed as "the difference between the actual feed intake and that predicted on the basis of mean requirements for body weight maintenance and levels of production" (Koch et al. 1963). Methods for evaluating individual RFI have been developed for meat producing animals, such as in beef cattle, swine and poultry during their growth stage. However, there is currently no method available for evaluating individual RFI in female breeding stock such as dairy cattle.

This study focuses on developing statistical models for evaluation individual RFI in different stages of lactation using random regression models based on pre-adjusted phenotype records, including milk yield, milk composition, body weight, growth and body condition score for primiparous and multiparous cows. The individual genetic and phenotypic RFI in different stages of lactation for primiparous and multiparous cows and the correlation among them and with conformation traits will be calculated. Although the research project uses the dairy cow as a model, the methods can be broadly applied to the female breeding stocks of other livestock species. These results will be of significant benefits to the animal industries at the national and international levels by improving feed utilization for milk and meat production. The models allow dairy industries (in particular) to select animals that are genetically improved in energy efficiency to increase profitability.