Release of a Net Energy and SID Amino Acid Content Calculator
Developed by University of Guelph and Ajinomoto Heartland Inc

The publication of the Nutrient Requirements of Swine (NRC, 2012) resulted in the first complete public swine Net Energy system in North America. The previous version (NRC, 1998) introduced table NE values. However, for each ingredient, values were determined independently. In addition, there was no system in modifying the values as nutrient content of that ingredient varied. This has led to some inconsistencies when comparing ingredients, or trying to value ingredients in a formulation system. The new NRC system is based on work from Noblet (1994) and uses his equations to establish book values as well as the ability to update energy values based on changes in nutrient content of the ingredients.

There are two advantages to this system. First, all ingredients are integrated under a single system, allowing them to be compared against each other. Second, by having equations to adjust energy values, nutritionists now have a tool to change values based on changing nutrient content of that feedstuff instead of using a single table value.

This calculator allows for the calculation of Net Energy and SID amino acid content of the 12 most used feed ingredients in North America

Why is Net Energy Important?

Net Energy (NE) best describes the available energy content of feedstuffs and represents a large improvement over Metabolizable Energy (ME). The difference between ME and NE is the efficiency of using energy from the various energy yielding nutrients. According to Noblet (1994), fat is utilized at a 90% efficiency, starch is utilized at an 82% efficiency, while both protein and fiber are utilized at a 59% efficiency. Thus, relative to starch, a ME system undervalues fat energy and overvalues protein and fiber energy. As a result, major changes in ingredients in the formula may lead to either unpredictable performance (mainly in terms of feed efficiency) or changes in carcass lean content.

This can even occur in corn-SBM diets. When utilizing a ME system, corn and SBM have essentially the same caloric value, while SBM has about 80% the caloric value of corn in a NE system. Under the ME system, when high levels of amino acids (and corn) are used to replace SBM, fat levels will remain constant when formulating to the same ME level. Under the NE system, within which high levels of amino acids (and corn) are used to replace SBM, fat levels will be reduced when formulating to the same NE level. As a result of using a ME system, the pig will experience a higher-than-expected energy level in the feed than formulated. This will lead to potentially higher fat deposition which may hurt feed efficiency and cause a lower carcass lean value.

Amino acids

Accurate formulation of digestible amino acids is important as well. Similar to energy, amino acid content of feedstuffs can vary. It is important to have a process to update amino acid loadings in ingredients to be formulated. There are many methods to do this. The first is to analyze amino acids on a regular basis or at times when amino acid content is likely to change (new crop harvest). The second is
To analyze protein content of feedstuffs (easier and faster to do) and use that to predict amino acid contents. While the latter is not ideal, it does allow you to follow trends for easy-to-measure changes in ingredients. Digestibility coefficients are much more difficult to predict, especially for processed ingredients where data has shown variation. At this time, it is best to use a fixed value for digestibility coefficients using best estimates. More real-time estimation of digestibility coefficients is needed.

Using the calculator

This calculator can be downloaded from www.lysine.com and was developed by C.F. M. de Lange from University of Guelph and K. J. Touchette from Ajinomoto Heartland, Inc. The 12 most common ingredients used in North America are included in the calculator. In the calculator, you can calculate contents of Net Energy, digestible amino acids, and digestible phosphorus.

All energy equations are derived from NRC (2012). Since these equations use digestible energy (DE) in the calculations, either the NRC (2012) book value or a user defined DE value can be entered. In addition, crude protein, ether extract, acid digestible fiber, and starch content of the ingredient are needed for NE calculation.

For amino acids, there are multiple ways to determine digestible amino acid contents. For total amino acids, there are three options. The first is to use the NRC (2012) book values. The second is to calculate amino acids from crude protein (NRC, 1998 equations are used). The third is to enter amino acid results from lab analyses. For digestibility coefficients, either the default NRC (2012) values, user defined values can be entered. From these, the digestible amino acid contents are calculated.

For phosphorus, the NRC (2012) book or user defined values can be used to obtain digestible phosphorus.

When all ingredients have been updated, the nutrient detail will be displayed in the report page. In Column A, drop-down boxes can be used to order the nutrients to be the same as the formulation system. This will make nutrient update entry into the formulation matrix easier.

Current ingredients in the calculator
Corn
Corn DDGS
Soybean Meal
Bakery Meal
Barley
Canola meal
Corn Germ Meal
High Fat Rice Bran
Meat and Bone Meal
Sorghum
Wheat
Wheat Middlings