

FEED CONVERSION RATES USED IN THE LGM-DAIRY POLICY

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Dairy farms use a wide array of feed stuffs according to the availability and affordability on the dairy farms. To enter into a LGM-Dairy contract, on-farm feedstuffs are to be converted in terms of corn and soybean meal equivalents. The feed conversion rates as specified by the RMA (Commodity Exchange Endorsement for Livestock Gross Margin for Dairy Cattle, Table 2) are based on the Nutrient Requirements of Dairy Cattle (NRC, 1989). The factors are used to convert the feed to equivalent corn (shelled, grade 2) and soybean meal (44% protein) by solving simultaneous equations for energy and protein in terms of the feed stuff in consideration. NRC 1989 table 7-1 is used to determine the energy and protein amounts. This table gives the composition of commonly used feeds in the dairy cattle diets on a 100% dry matter basis. For the protein, crude protein and for the energy, NEL (net energy at lactation) for the lactating cows in Mcal/lb are considered. Net energy at lactation (NEL) is the amount of energy of the feed that will be available to meet cow's requirements for maintenance, lactation and pregnancy.

Details on calculation of the feed conversion rates:

Equation for protein and energy NRC (1989):

For the corn grain, the crude protein % is 10% and the NEL is 0.89 Mcal/lb on a 100% dry matter basis. For the Soybean meal (44% protein), the crude protein % is 49.9 % and NEL is 0.88 Mcal/lb on a 100% dry matter basis.

Therefore, the equations for protein and energy for corn and soybean meal are:

$$**Protein: 0.10 x + 0.499 y**$$

$$**Energy: 0.89 x + 0.880 y**$$

Where x represents corn equivalents and y represents soybean meal equivalents.

Suppose wheat bran is to be converted in terms of corn and soybean meal equivalents. The crude protein % of wheat bran as per the NRC 1989 table 7-1 is 17.1 % and the NEL is 0.73 Mcal/lb on a 100% dry matter basis.

So, there will be 2 simultaneous equations with 2 sets of unknowns, which are the conversion factors for corn and soybean meal.

Equation for wheat bran can be re-written as:

$$**0.10 x + 0.499 y = 0.171**$$

$$**0.89 x + 0.880 y = 0.73**$$

Solving these two equations, $x = 0.60$ and $y = 0.22$.

Equation for protein and energy NRC (2001):

Nutrient requirements of dairy cattle (NRC 2001) is the most recent version among all the editions of the NRC. NRC 2001 provides accurate, updated and a greatly expanded set of feed composition tables. It provides a comprehensive list of feedstuffs commonly used in dairy cattle diets and their nutrient breakdown. Table 15-1 from NRC (2001) can be used for the energy and protein equations. This table enlists the nutrient composition and variability of commonly used feed stuffs for the dairy cattle on a dry basis. NRC 1989 and 2001 differ greatly in the calculation of crude protein and NEL. In the new edition of NRC, the metabolizable energy (ME) is used to calculate the net energy for lactation (NEL). In the NRC (2001), net energy at 3 times the maintenance level as well as 4 times maintenance level (high producing cows), NEL 3x and NEL 4x are enlisted in terms of Mcal/kg. We take an average of these two values to get a realistic estimate of the NEL for most dairy farms feed composition today. For the corn grain, the crude protein % is 9.4 % and the NEL 3x is 2.01 Mcal/kg and NEL 4x is 1.90 Mcal/kg on a dry basis. For the Soybean meal (44% protein), the crude protein % is 49.9 % and NEL 3x is 2.13 Mcal/kg and NEL 4x is 2.02 Mcal/kg on a dry basis. So, the equations for protein and energy for corn and soybean meal taking the average values of NEL 3x and 4x are:

$$\text{Protein: } 0.094 x + 0.499 y$$

$$\text{Energy: } 1.955 x + 2.075 y$$

Following our previous example, the Crude protein for wheat bran is 17.3% and average NEL for 3x and 4x is 1.565 Mcal/kg. Therefore,

$$0.094 x + 0.499 y = 0.173$$

$$1.955 x + 2.075 y = 1.565$$

Solving the two equations, the conversion factor for wheat bran to corn equivalents, x is 0.54 and soybean meal equivalents y is 0.24.

Following this framework any feed used on farm can be easily converted into corn or soybean meal equivalents using the LGM-Dairy feed equivalent conversion tool.