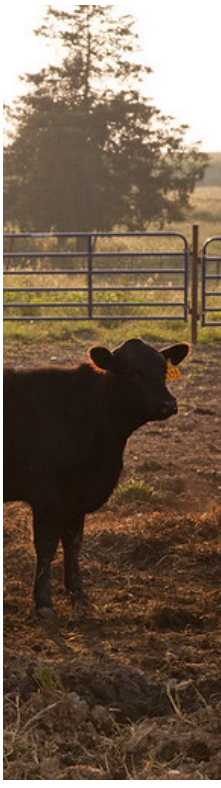
THE ENERGY IN U.S. SOYBEAN MEAL PROVIDES MORE VALUE TO ANIMALS

- Livestock require the energy available from their feed inputs to promote better efficiency of gain resulting in reduced diet costs, increased supply chain efficiency due to less grain/feed wastes during transportation and storage, and lower business operating costs
- Energy contribution in soybean meal is a key consideration when formulating diets and should be considered when assessing the total intrinsic nutritional value of the soybean meal in animal diets
- U.S. soybean meal has lower variability in energy levels resulting in a more consistent source of feed vs soybean meal of other origins

Soybean meal is typically used in poultry and swine diets as a main source of protein, where its levels of digestible amino acids (AA) provide a more complete nutritional bundle compared to alternative protein sources. What is often undervalued is the energy contribution in soybean meal, a key consideration when formulating diets because it is the most expensive component and is also critical for the growth and productivity of animals.

Energy is not a nutrient itself but is essential to maintain vital functions and metabolic pathways for displaying an animal's full genetic potential to produce meat, eggs and milk. Livestock require available energy that can be obtained from optimized diets and is utilized to promote better efficiency of gain.

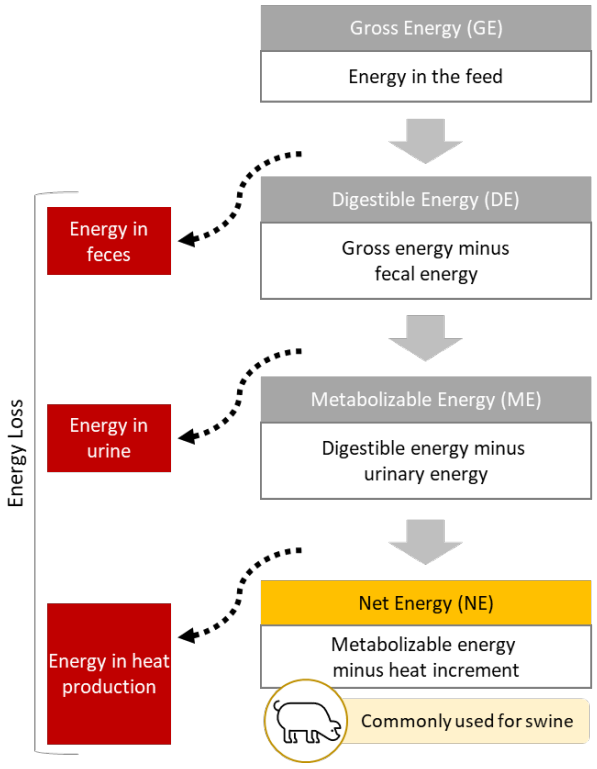


The energy partition expresses the way energy is diverted along an animal's digestive process and provides a common basis in diet formulation. Energy obtained from ingredients depends on the individual animal and the nutritional composition of the ingredient.

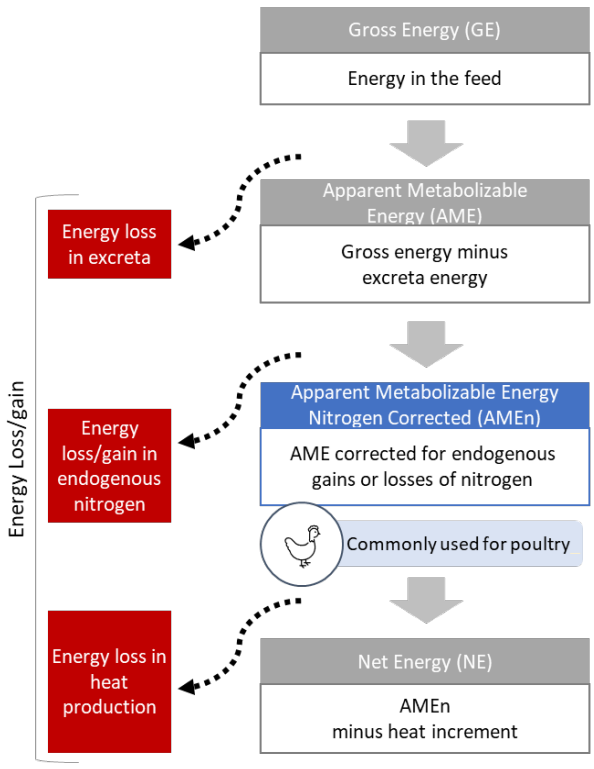
- Gross energy (GE) is the amount of energy in the feed.
- Digestible energy (DE) represents the amount of energy in the feed minus what is lost in the feces
- Apparent metabolizable energy (AME) is the DE minus the amount of energy lost in urine and fermentation gases (CH4, CO2, H2S), which are negligible in monogastric species. It can also be adjusted by the nitrogen retained in the body to derive the apparent metabolizable energy (AMEn).
- Net Energy (NE) can be defined as the useful energy for the animal and equals the ME minus the heat increment of the feed. This heat loss is related to nutrients' digestion and metabolism.

AMEn and NE are the most common energy system utilized in poultry and swine nutrition, respectively. The energy system for expressing energy requirements is illustrated in the graphic below.

Energy Partition Used to Express Requirements - Swine



Energy Partition Used to Express Requirements - Poultry

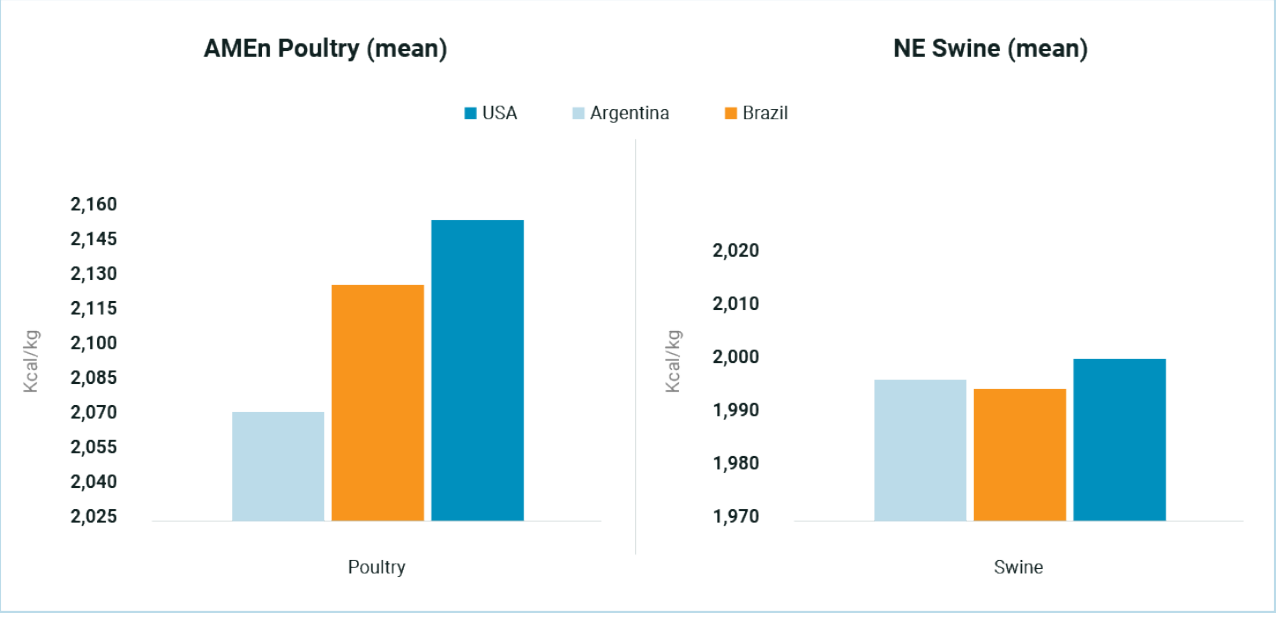


U.S. soybean meal has an advantage compared to soybean meal from other origins when considering the energy value of soybean meal. When comparing soybean meal data[1] since 2020, **U.S. soybean meal has superior levels of energy, including Net Energy (NE), which best represents what is usable for the animal to grow.**
The table and chart below summarize mean[2] values by origin.

Energy Measures, Kcal/kg (Mean Value)	ARG	BRA	USA	% Diff. (USA/ARG)	% Diff. (USA/BRA)
Gross Energy (GE)	4,139	4,130	4,157	0.43%	0.65%
Digestible Energy (DE Swine)	3,611	3,607	3,618	0.19%	0.30%
Metabolizable Energy (ME Swine)	3,299	3,295	3,305	0.18%	0.30%
Apparent Metabolizable Energy, nitrogen-corrected (AMEn Poultry)	2,068	2,130	2,154	4.16%	1.13%
Net Energy (NE Swine)	1,996	1,994	2,000	0.20%	0.30%

All values highlighted in green for "% Diff. (USA/BRA)" are statistically significant at the 1% level. For "% Diff. (USA/ARG)," GE and AMEn are statistically significant at the 1% level, all others are statistically significant at the 5% level.

The chart below depicts the difference between Argentina, Brazil and U.S. in AMEn (poultry) and NE (swine).



[1] *Data obtained from Evonik and summarized based on international trading specifications and includes observations with crude protein values between 46.0-49.0% and fiber values between 3.5-3.9%*

[2] *The AMEn and NE mean values were calculated based on equations from Ibáñez et al. (2020) and Noblet et al. (2003). Ibáñez, Miguel & Blas, C. & Cámara, Lourdes & Mateos, Gonzalo. (2020). Chemical composition, protein quality and nutritive value of commercial soybean meals produced from beans from different countries: A meta-analytical study. Animal Feed Science and Technology. 267 J. Noblet, V. Bontems, G. Tran. Estimation de la valeur énergétique des aliments pour le porc. INRA Prod. Anim., 16 (2003), pp. 197-210*

The higher energy contribution from soybean meal makes it a valuable ingredient in the diet and reduces the need for energy from other feedstuffs. **The metabolizable energy (AME) and Net Energy (NE) content of soybean meal can be as high as 97% and 78% of the corn ME and NE, respectively[3] and can provide considerable energy in standard broiler diets[4] accounting for up to 18% of total energy required by the bird. More energy contributes to reduced diet costs, increased supply chain efficiency due to less grain/feed wastes during transportation and storage, and lower business operating costs.** Ultimately, it contributes to **a more sustainable and efficient production system.**

Similarly, **lower variability in energy levels in U.S. soybean meal translates into a more consistent source of feed. This consistency improves formulation efficiency for nutritionists as it requires less adjustments to the diet and provides a more uniform nutritional bundle to animals.**

Soybean meal is often considered only as a primary source of protein and amino acids, but its energy content should also be considered when assessing the total intrinsic nutritional value of the soybean meal in animal diets. About 80% of the energy from soybean meal stems from digestible amino acids, which were shown to be higher in U.S. soybean meal, the rest is provided by highly digestible carbohydrates, such as sucrose (disaccharide). A higher usable energy content can significantly benefit animal production, in addition to providing a rich source of digestible amino acids.

AS A RESULT, THE ENERGY IN U.S. SOYBEAN MEAL PROVIDES ADDITIONAL VALUE WHEN COMPARED TO SOYBEAN MEAL FROM OTHER ORIGINS.

[3] *NRC. Nutrient requirements of swine. 11th ed. Washington: Natl. Acad. Press; 2012*

[4] *G.G. Mateos, L. Cámara, G. Fondevila, R.P. Lázaro, Critical Review of the Procedures Used for Estimation of the Energy Content of Diets and Ingredients in Poultry, Journal of Applied Poultry Research, Volume 28, Issue 3, 2019, Pages 506-525, 1056-6171*

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