Improving Feed and Nutrient Utilization by Optimizing Diet Energy and Nutrient Levels: Energy

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Introduction

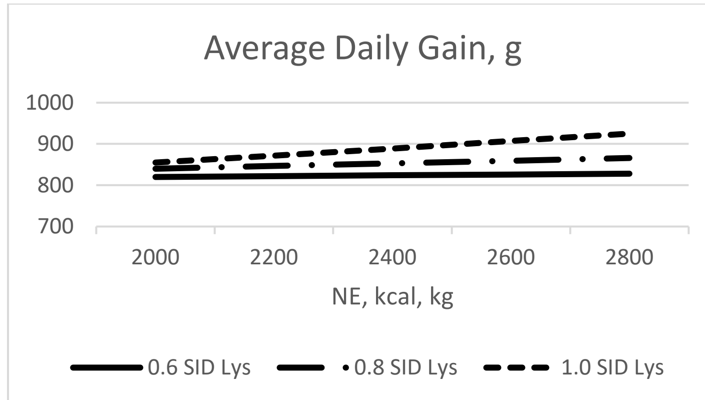
Global meat production is expected to rise by 12% from 2023 to 2032, with pork production growing from 117 to 129 million metric tons per year (OECD and FAO). Most of the environmental impact in pig farming comes from the feed system, which includes crop cultivation, feed manufacturing, and transportation. Improving pig health, management, and feed efficiency, as well as better handling of swine waste, can help meet the growing demand for pork while reducing its environmental impact (Andretta et al., 2021). Energy is the largest constituent of pig diets, therefore optimizing dietary energy is central to improving feed efficiency and reducing waste. Optimizing dietary energy can improve growth performance while reducing environmental impacts.

Energy

Changing the energy concentration in pig diets has a direct effect on how efficiently pigs use feed. A 1% change in energy should lead to a 1% change in feed efficiency, but studies show the response can range from 0.7% to 2.4% (Patience, 2012).

$$G:F = 0.00004365 \pm 0.000033 \text{ x NE (kcal/kg)} - 0.00162 \pm 0.000166 \text{ x Average BW (kg)} - 0.08023 \pm 0.1071 \text{ x SID lys (\&+\%)} + 0.000094 \pm 0.000040 \text{ x NE (kcal/kg) x SID Lys (\%)} + 0.3496 \pm 0.08771$$

This difference depends on factors like keeping the right balance between energy and lysine, and essential amino acid (Nitikanchana et al., 2015). If energy levels are raised without also increasing lysine, pig growth does not improve, but when both are increased together, pigs show the expected benefits (Nitikanchana et al., 2015; Marçal et al. 2019).



Adapted from: Nitikanchana et al., 2015.

Methods to Optimize Energy

Other factors that affect feed efficiency include how accurate the diet is formulated. In the United States, nutritionists are moving away from the use of metabolizable energy and formulating diets utilizing net energy. Ratios of phosphorus and other nutrients relative to net energy allow for optimal balancing of the diet to the pig's needs. Additionally, adding fats/oils and limiting the overfeeding of nutrients such as crude protein can improve nutrient efficiency (Navales et al., 2025).

The animal's environment also plays a significant role in optimizing energy utilization. Reducing stress, raising the pig in its optimal thermal-neutral zone, and reducing illness will allow for the animal to convert consumed energy into lean growth rather than maintenance needs (Nitikanchana et al., 2015).

Feed processing can also optimize energy release from ingredients. Processes such as the use of enzymes, reducing particle size and pelleting have all been shown to improve nutrient efficiency (Navales et al., 2025).

Main Takeaways

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- Feed efficiency improves predictability with changes in dietary energy concentration.
- Balancing the lysine:energy ratio is crucial.
- Over- and underestimation of ingredient energy values can negatively affect performance and nutrient utilization.

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This work was supported by the National Pork Board grant #22-092.