SPECIALTY

Ingredients price volatility and minimizing the impact on pork and chicken meat production: Feed mill perspectives

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Abstract

Multifold incidents such as supply chain interruption, climate changes, the Ukraine war, and fluctuating COVID outbreaks in different regions, are all contributed to the current volatility in feed ingredients prices. Unfortunately, the recent forecast indicates that the high feed ingredient price won't be stabilized in the near future. Due to increasing ingredients cost, feed cost has significantly increased to the tipping point where the production cost per kg of meat is closing the gap or even exceeding the market prices (Figure 1). In addition, pork and chicken meat market price hasn't been absorbing the increasing production cost, as COVID-fear and social distancing measures suppress meat consumption.

Many articles introduced different strategies to reduce the impact of the increasing feed cost, which include but are not limited to increasing the use of alternative grains (small grains) and oilseed meals (palm kernel meal, copra meal, DDGS), substituting high-cost animal protein source to a cheaper plant protein source, split sex feeding, feeder adjustment and improving farm management to reduce the feed waste in the production site. The focus of this article is to discuss three other nutritional strategies feed millers can consider to reduce the impact of increasing feed ingredients costs.

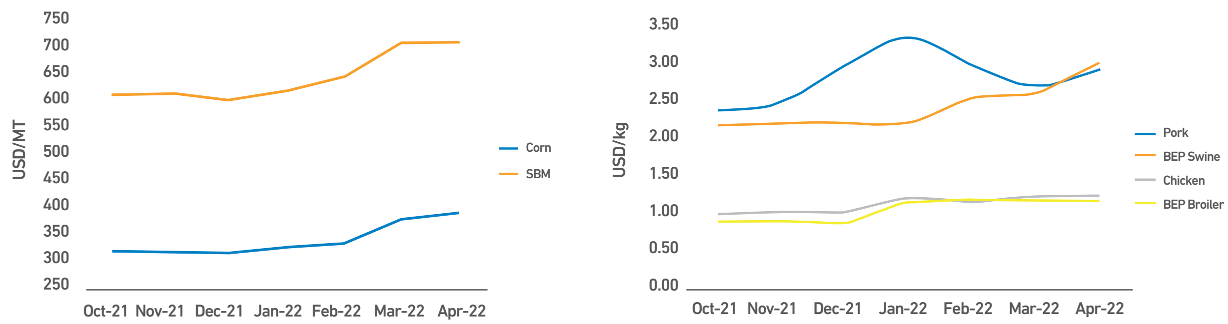


Figure 1. Changes in feed ingredients costs (Left) and pork and chicken meat prices along with break-even points (BEP) for the swine and broiler industry in Thailand (Right).

Ref: www.thaifeedmill.com.

Reduce ingredient particle size

Relationships between ingredient particle size and metabolizable energy content are well established. According to the study by Fan et al. (2017), reducing the geometrical mean particle size of wheat from 860 microns to around 640 microns can increase 80 kcal ME/kg in finisher pigs. Decreasing particle size of wheat below 600 microns had minimal effect on the extraction of ME from wheat. In contrast, decreasing particle size of corn from 860 to 330 microns almost linearly increased ME content by 100 kcal/kg in young growing pigs (Figure 2; Rojas and Stein, 2015). Considering that the grinding cost is sharply increasing when corn is ground below 600 microns and also too fine grinding below 600 microns increases the incidence of stomach ulcers, reducing the particle size of corn from 860 microns to 650 microns will increase ME content by 60 kcal/kg. In our routine simulation using current ingredients cost, the cost of 100 kcal ME in a metric ton of bro- iler feed was estimated to be USD $11. This means if we optimize the particle size of grains we could reduce the energy cost of feed by $5-7/MT of feed.

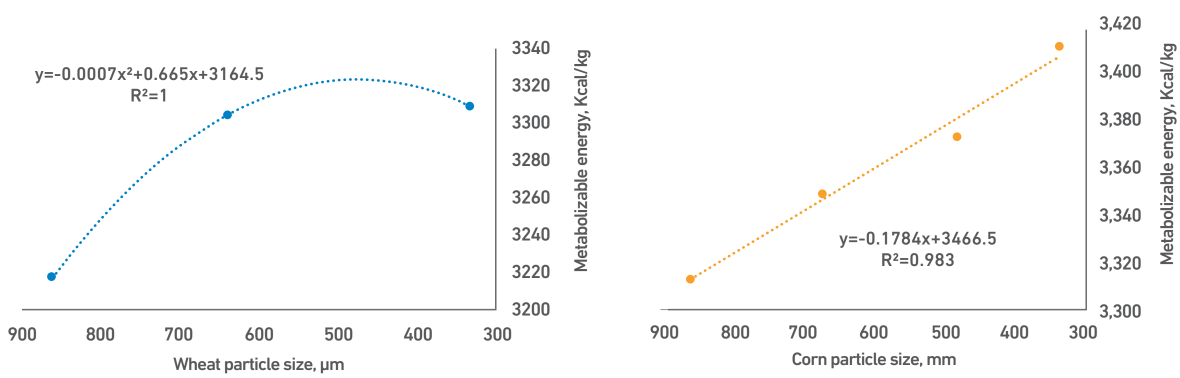
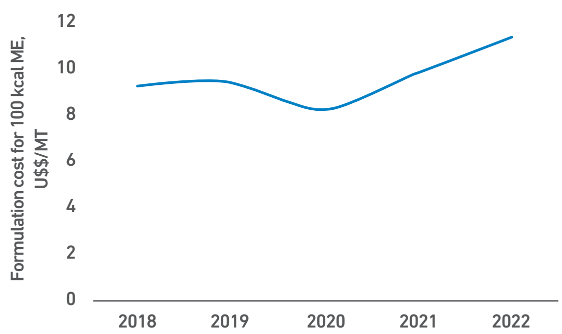


Figure 2. Decreasing particle sizes of wheat (Left, Fan et al., 2017) and corn (Right, Rojas and Stein, 2015) increases metabolizable energy contents in growing pigs.

Enzyme supplementation

In a typical monogastric animal feed formulation, around 60% and 8% of the feed cost are used to meet the energy and phosphorus requirements, respectively. Hence, increasing energy and phosphorus availability through the supplementation of exogenous xylanase and phytase are the two most effective strategies to reduce formulation costs.
The estimated formulation cost for 100 kcal ME per metric ton of feed has risen from around $9 to $11 due mainly to increased grain and feed-grade fat prices (Figure 3 left-side graph). Therefore, supplementation of exogenous xylanase with 100 kcal ME matrix application will save around $10-11/MT of feed, in most APAC countries, although the exact cost will vary depending on the country and the price of ingredients used for formulation.



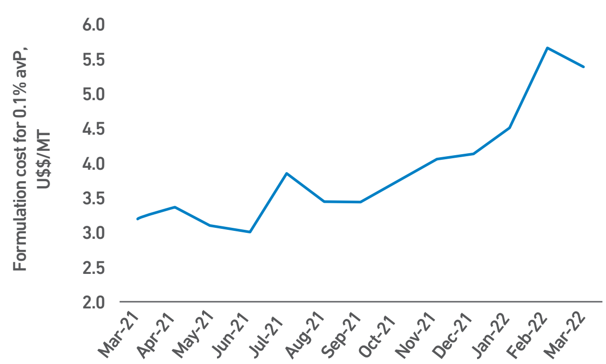


Figure 3. **Trends in formulation cost for 100 kcal ME/MT (Left) and formulation cost for 0.1% available phosphorus/MT**

Right, calculated based on formulation simulation using fluctuating ingredients price

Similarly, the estimated formulation cost for 0.1% available phosphorus (avP) per metric ton of feed has risen from $3.2 to $5.5 (Figure 3 right-side graph). Therefore, the application of a 0.15% avP matrix with exogenous phytase supplementation will reduce formulation cost by around $8/MT of feed. Therefore, combined supplementation of xylanase and phytase with the application of 100 kcal ME and 0.15% avP matrix can reduce formulation cost by around $18, which is a huge opportunity to reduce the cost of production, particularly under the current pressure placed on the animal industry.

Nutritionists generally have been applying a conservative avP and energy matrix due to variation in substrate contents in the feed ingredients and the potential loss of enzyme activity during the feed processing and storage. However, it is the right time to review and consider a more aggressive matrix application by implementing quality control measures, such as tighter quality control for ingredients and final products, which will reduce the safety margin applied in the formulation. As can be seen in the broiler commercial farm study presented in Figure 4 (Right-side graph), a conservative energy matrix applied (50 kcal) in a corn-soybean mealbased diet with supplementation of CJ xylanase resulted in a significant improvement in body weight corrected FCR (6 and 8 points improvement over PC and NC).

In this case, 100 kcal energy matrix application would have resulted in a reasonable improvement in bodyweight corrected FCR but would have reduced feed cost by around $10/MT of feed. Application of CJ phytase with 0.15% avP matrix in piglet diet also showed performance improvement at a higher phytase dose (Figure 4 left-side graph), which reduced feed cost by around $8/MT of feed.

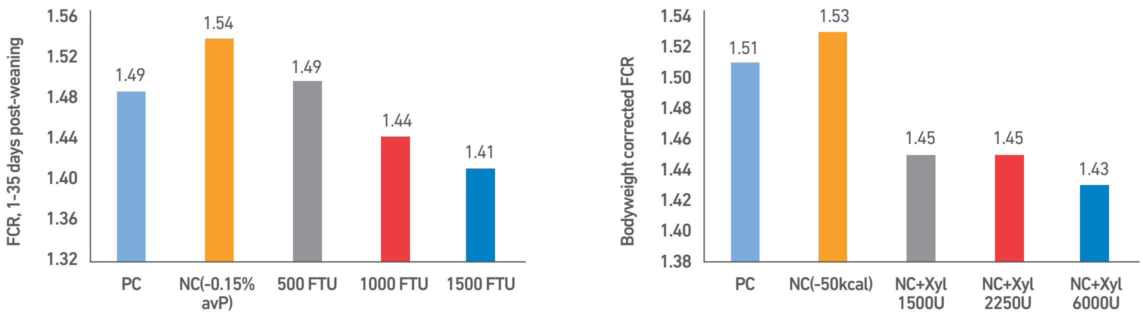


Figure 4. **Supplementation of CJ phytase in piglet diet (Left) and CJ xylanase in broiler diets (Right) validate that 0.15% avP matrix and 100 kcal ME matrix are confidently used in corn-soybean meal-based diets.**

Increasing use of synthetic amino acids

The formulation cost to meet protein (amino acid) requirements of typical monogastric animal feed is around 25% of the total feed cost, which is the second most expensive component after energy. The cost impact of protein in the animal feed is much bigger in the APAC region where feed grade protein meal production is scarce compared with the other region such as Europe and America. Therefore, the APAC animal industry generally suffers more than the other countries when the price of protein sources is increased. In such cases, replacing protein meals with crystalline amino acids can reduce feed costs, particularly in many cases inclusion of branched-chain amino acids in the formulation helps to reduce the protein meal inclusion rate in the formulation, although reducing protein too low down to the point where too much or specific synthetic amino acid inclusion increases the formulation cost.

Therefore, a frequent formulation simulation to find the dietary protein levels with the lowest feed cost will optimize the least-cost feed formulation. Reducing protein content in the diets of monogastric animals is not only reduces the formulation cost but also contributes to a healthier gut environment as excess protein fermentation in the hindgut releases toxic gases such as ammonia, indole, amine and hydrogen sulfide, which increases intestinal pH and damage epithelial cells by interrupting mitochondrial energy metabolism.

Conclusions

It is a challenging time for the APAC animal industry and pressure to develop nutritional strategies that can achieve the optimum growth performance at the lowest feed cost investment will keep increasing in the future. Management practices to reduce the physical feed waste along with reducing metabolic nutrient losses caused by environmental stress are essential on-farm strategies to overcome the challenge and thrive. In addition, mechanical and nutritional strategies such as optimizing ingredient particle size, supplementation of exogenous phytase and xylanase with proper avP and energy matrix application, and increasing the use of synthetic amino acids can help to reduce formulation costs from the feed mill perspective.