TECH NOTES
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Economic Approach to Broiler Production

By Anthony Waller, Nutrition Services Manager, Aviagen Ltd

Introduction

The profitability of broiler production, expressed in its simplest form, is the value of the end product minus the input costs to produce that product. The end product can be live birds ex farm, eviscerated whole carcasses, portioned meat products or value added chicken products. Value added products are subject to a set of economic dynamics that are outside the direct evaluation of margin over feed cost, and so will not be dealt with in this article.

The value of the end product will be directly affected by supply and demand in the meat industries. Generally, the return from portioned products is greater than from whole birds, but this is greatly dependant upon local market requirements.

Feed is the major component of input cost, accounting for up to 70% of the total production cost. For this reason, any review of input costs and profitability will include a review of feed costs as a primary component of the exercise. Due to the importance of feed in broiler production, optimising the nutrition of broilers from **both** a biological performance and economic standpoint is essential.

When faced with increases in feed ingredient prices and rising feed costs, the first instinct is often to look at ways of off-setting the financial impact of this upon the business by reducing the nutrient specification of the feed to reduce feed cost per tonne. However, before such action is taken, it is important to evaluate the full impact of such a decision upon margin over feeding cost. The desire to minimise feed cost per tonne needs to be balanced against maintaining or maximising margin.

The following table shows the financial performance of Ross 308 As-Hatched broilers grown to 42 days of age on two different nutrient densities. The lower nutrient density has 90% of the Balanced Protein levels relative to the Control (100%) which is the Ross 308 nutrient recommendations. The term Balanced Protein refers to the practical application of the Ideal Amino Acid Profile to supply broilers with the correct minimum levels of essential and non-essential amino acids. These results are from an Aviagen trial carried out in the second half of 2006.

Table 1 *- Influence of Balanced Protein on Broiler Performance (Ross 308 As-Hatched; Scotland 2006)*

	90% of Ross Broiler Nutrient Specification	100% of Ross Broiler Nutrient Specification
Farm Performance		
Liveweight (kg)	2.84	2.95
FCR	1.85	1.80
Feed Consumed (kg)	5.25	5.32
Financial Performance (€)		
Feed Price per Kg (€)	0.274	0.280
Feed Cost per Bird (€)	1.44	1.49
Feed cost per Kg Live Weight (€)	0.51	0.50
Revenue per Kg (€)	0.80	0.80
Revenue per Bird (€)	2.27	2.36
Margin per kg Live Weight (€)	0.29	0.30
Margin per Bird (€)	0.83	0.87

The table shows that feed cost per bird will be reduced as Balanced Protein is reduced, but this will be accompanied by a reduction in farm performance. The table **also** shows that if nutrient levels are reduced, margin (either per bird or per kg) will be reduced.

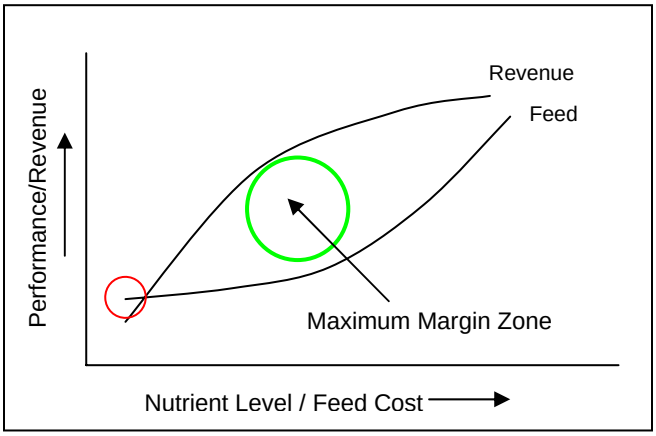
Decreasing nutrient levels decreases feed cost but can also decrease margin

Interestingly, reducing nutrient density has a negative effect on feed cost per kg live weight. Live weight and FCR are affected so significantly by reductions in nutrient density that lower density diets become less cost effective when expressed per kg live weight. This is very important to remember when formulating feeds to maximise margin.

Financial Summary

When looking to minimise feed cost, it is important to appreciate the effect on margin. **Figure 1** below shows that as nutrient level increases, feed cost (per bird) increases. However, due to improved bird performance the revenue from the birds also increases, and therefore margin over feeding cost is improved. The maximum margin is clearly not produced by minimising feed cost (indicated by the red circle), but is achieved at the point where the difference between revenue and cost is greatest (indicated by the green circle).

***Figure 1** – Relationship between nutrient level/feed cost & performance/revenue*



The producer should aim to feed the bird to ensure margin is in the maximum margin zone illustrated in the diagram above. To do this, maintaining or increasing dietary nutrient density will often be justified.

Lowest feed cost does not produce maximum margin

It is important to make a distinction between reducing feed cost per bird and reducing feed cost per kilogram of liveweight or carcass component(s). By reducing nutrient density of the feed, the feed cost per bird can very easily be reduced. However, this will reduce performance and when corrected back to equal live weight will actually result in an increased cost of production.

The level of Balanced Protein in the feed will have a major influence upon margin achieved and profitability. However, Balanced Protein is only one of the two main components of the nutritional package and energy also needs to be considered.

With regard to energy sources, it has become clear that growth of the biofuels industry has resulted in feed energy prices becoming more affected by oil prices than conventional commodities markets. With an increase in the use of cereals and feed fats for the biofuels sector, and firm oil prices, energy is likely to become expensive.

It is of key importance to appreciate that all modern broilers are responsive to amino acid and energy density and that margin over feed cost must be considered when determining an appropriate feeding strategy. The next section of this document will discuss and evaluate the optimum Balanced Protein and energy of the feed that will deliver the maximum margin over feed cost.

The Balanced Protein density of the diet is an economic decision

Aviagen have evaluated response data from a number of Balanced Protein response trials and compiled biological responses for a number of traits. From this data economic responses can be calculated for different objectives (e.g. live, eviscerated carcass and portioned products). In general, reducing Balanced Protein level reduces feed cost per tonne but also reduces performance and profitability.

Feeding to Optimise Breast Meat Yield and Profitability

When applying European production costs it is apparent that feeding adequate levels of amino acids becomes even more important when profitability is linked to the production of portioned meat products.

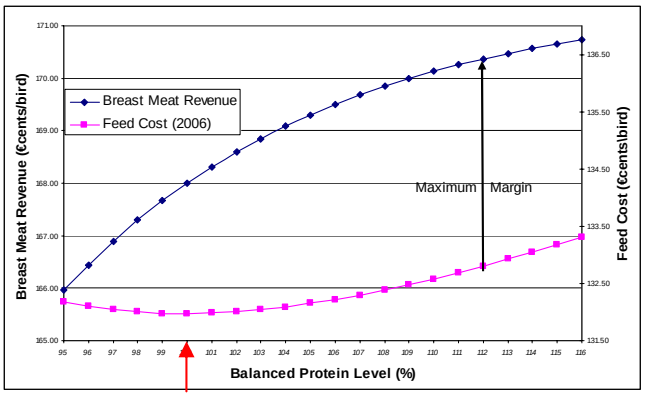
Figures 2 and 4 illustrate the impact of Balanced Protein level upon processing margin per bird. This supports the economic importance of maintaining amino acid levels at Ross recommendations, and shows that greatest processing profitability is achieved at levels of protein above these standard recommendations.

In most situations when producing birds for yield the optimum levels of amino acids and protein are above the values found in the Ross recommendations

Figures 2 and 3 also illustrate the effect of increasing feed cost upon optimal Balanced Protein level for

margin. In **Figure 2** it can be seen that as the Balanced Protein level increases (relative to the Ross recommendations) bird performance improves, the yield of breast meat per bird increases and therefore revenue from breast meat increases, as shown on the 1st y–axis. On the 2nd y-axis, the increase in feed cost (per bird) resulting from increased nutrient level is shown. The optimum or maximum margin is at the point where the difference between breast meat revenue and feed cost is greatest, in this case at 112% of Ross recommendation.

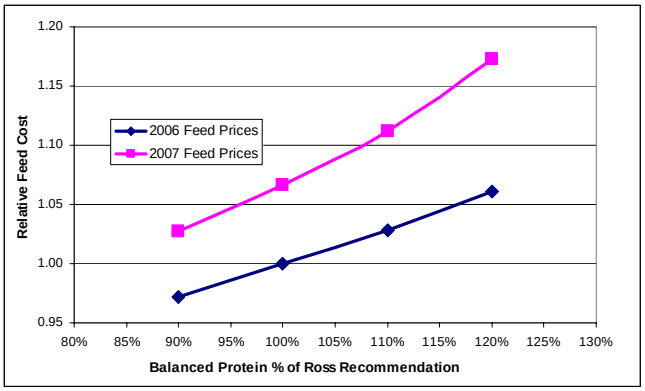
***Figure 2** – Breast meat margin relative to feed cost*



Ross Recommendation

Figure 2 shows the outcome when 2006 feed costs have been applied. In recent months, the prices of feed raw materials have increased. **Figure 3** shows the interaction between raw material prices and nutrient levels of feed on the cost of finished feed. Feed cost is expressed relative to the base feed cost of 100% Balanced Protein in 2006. The cost of wheat was set at €121\t, Soyabean meal at €207\t and feed fat at €490\t. These costs were increased for 2007 by 30%, 20% and 10% respectively,

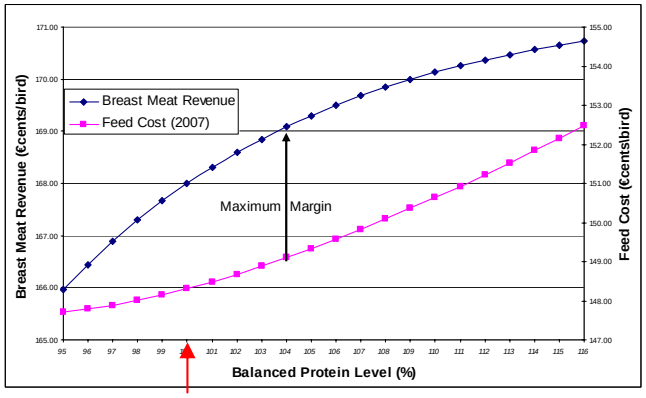
***Figure 3** – The effect of raw material cost on feed price at different raw nutrient densities*



As raw material price increases, feed prices increase across Balanced Protein densities. The increases are greater at higher levels of Balanced Protein.

As raw material prices have increased, it is necessary to revise the determination of maximum margin described previously with 2006 costs. The results of repeating the exercise with the 2007 feed costs are shown in **Figure 4** below;

***Figure 4** – Breast meat margin relative to feed cost*



Ross Recommendation

The increase in raw material prices results in higher density feeds becoming more expensive relative to 2006, and therefore the point of optimum or maximum margin is moved downwards from 112% (in 2006) to 104% (in 2007) of Ross recommendation. However, it is important to note that although the point has moved down, it is still above the Ross recommendation – therefore reaffirming the economic response of the Ross bird to Balanced Protein.

Energy

The energy content of broiler feeds is determined, like Balanced Protein, by economic considerations. In practice, the choice of energy level will also be influenced by many factors e.g. supply of feed ingredients or milling constraints. In the current environment of increasing energy cost, lowering dietary energy level (relative to Ross recommendations) may be economically beneficial.

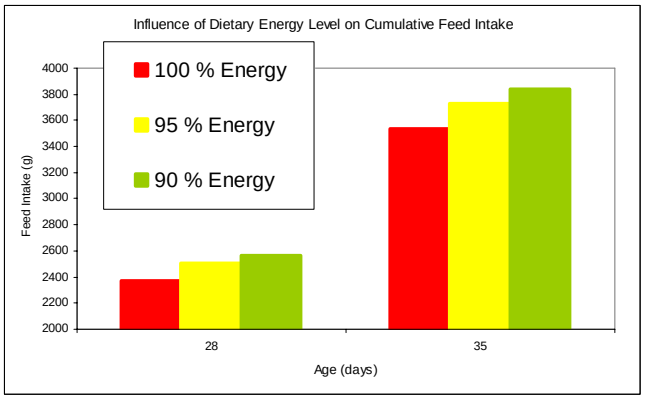
An internal Aviagen trial evaluated the impact of reducing energy content at **the Ross recommended level of Balanced Protein**. Three levels of energy were evaluated – 100%, 95% and 90% of Ross recommendations.

The results at 35 days show that a reduction in energy has a positive effect on live weight but produces deterioration in FCR:

	Lwt (Kg)	FCR
100%	2325	1.519
95%	2431	1.533
90%	2428	1.581

The 95% energy treatment produced improved live weight with a relatively small impact on FCR. However, at 90% energy there was a significant negative effect on FCR.

***Figure 5** – Influence of dietary Energy Level on cumulative feed intake*



The effect of reduced dietary energy density was to increase feed intake, illustrating that, to a point, the broiler appears to compensate for lower energy density levels by increasing feed intake and this is illustrated in **Figure 5** above. When feed Balanced Protein levels are maintained there is a net increase in amino acid intake which stimulates growth. This response to reduced energy is dependant on the broiler compensating feed intake, and the level of this response will be affected by physical feed form and environmental conditions. Clearly, when considering reducing the energy content of the feed, the physical quality of the feed must be considered.

The results from a recent Aviagen trial illustrate both the response to reduced dietary energy level and the importance of the physical quality of the feed within this response. Male Ross broilers were grown to 35 days, on energy levels that were 100% and 95% of the Ross recommendation. These energy treatments were supplied as either a good or poor physical quality feed. **Figures 6 and 7** show that the birds on the good quality pellets were able to increase feed intake when energy was reduced, resulting in improved live weights. However, the birds on the poor quality pellets were not able to increase intake, and as a result live weight was actually reduced when dietary energy was reduced.

***Figure 6 -** Effect of Energy Density and Feed Form on Feed Intake*

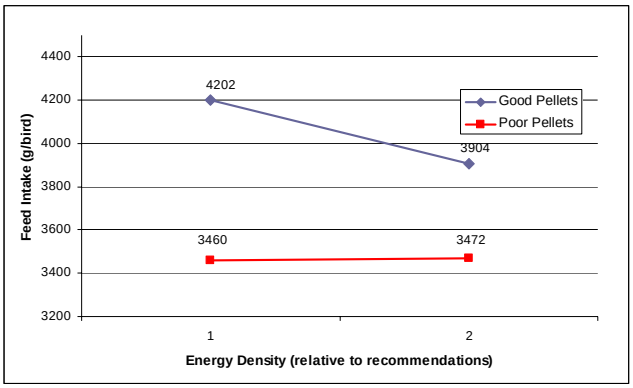
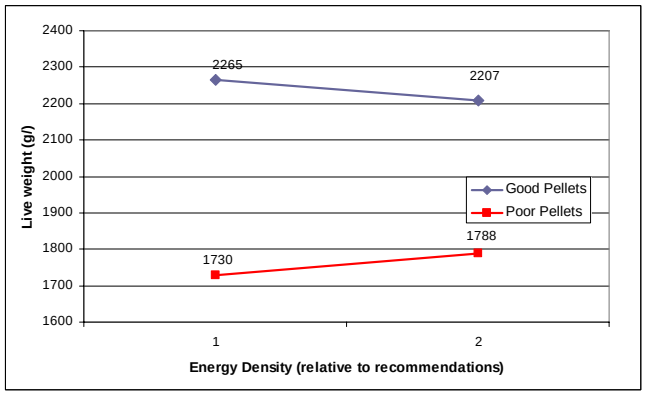


***Figure 7** - Effect of Energy Density and Feed Form on Liveweight*



<u>Summary: maximising margin rather than reducing feed cost</u>

1. When faced with rising feed cost it is tempting to reduce the feed cost per tonne by reducing the nutrient levels in the diet.
2. Lower nutrient levels will result in poorer biological performance which may therefore reduce overall margin.

In conclusion

The results from Aviagen internal trials, external field trials and economic analyses suggest that when faced with rising feed costs consideration can be given to reducing nutrient levels, but that **before** such action is taken the full impact upon the economics of the business should be evaluated.

About the Author – Anthony Waller

Anthony is Aviagen's Nutrition Services Manager for Europe and is responsible for providing customers in the region with nutritional advice and support. He gained a degree in Agriculture and Environmental Science from Newcastle University and has worked in the poultry industry for over ten years.

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