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Practice tip

Fact sheet – Feed efficiency adjustments to compare group close-outs in finishing pigs

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This practice tip includes a fact sheet on feed efficiency adjustments to compare group close-outs in finishing pigs.

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Conflict of interest

None reported.

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FACT Sheet: Feed efficiency adjustments to compare group close-outs in finishing pigs

Feed efficiency adjustments in finishing close-outs

Initial and final body weight (BW) are major factors affecting feed-to-gain ratio (F:G), because fat deposition is less efficient than protein deposition, and the rate of fat deposition increases relative to protein deposition as BW increases.[1] A 1% increase in dietary net energy (NE) results in a 1% improvement in feed efficiency as long as NE loading values of the ingredients in the diet are correct.[2] This assumes dietary lysine is not limiting, according to NRC requirements.[1]

Equations accounting for factors affecting F:G

Equation (1)[3] accounts for initial and final BW:

> Adjusted F:G = observed F:G + [standardized initial BW (kg) – actual initial BW (kg)] × slope estimate + [standardized final BW (kg) – actual final BW (kg)] × slope estimate

Equation (2)[4] accounts for initial and final BW and energy level of the diet:

> Adjusted F:G = observed F:G + [standardized initial BW (kg) – actual initial BW (kg)] × slope estimate + [standardized final BW (kg) – actual final BW (kg)] × slope estimate – [(standardized energy level – actual energy level) ÷ standardized energy level) × observed F:G]

The slope estimate varies with energy level of the diet and genetic line,[5,6] and slope estimates per kg BW range from 0.007 to 0.011.[5,6] Use caution when applying these slope estimates to other genetic lines that have different body composition or growth curves.

Equation (3)[7] accounts for NE, average BW, and standardized ileal digestible (SID) lysine (Lys). This equation predicts F:G and then is modified to calculate an adjusted F:G that is based on the observed F:G.

> F:G prediction = 1 ÷ [(0.000004365 × NE) – (0.00162 × average BW) – (0.08023 × SID Lys) + (0.000094 × NE × SID Lys) + 0.3496]

> Adjusted F:G = (F:G from Equation 3 using standardized values) ÷ (F:G from Equation 3 using actual values) × observed F:G

where NE is the weighted average kcal of NE per kg. Average BW (kg) is the average of initial and final BW, and SID Lys (%) is the weighted average SID Lys. The NE and SID Lys are weighted on the basis of the amount of feed in each phase during the finishing period. This equation encompasses a range of BW from 20.8 to 138.2 kg. Information regarding NE of ingredients can be found in NRC's *Nutrient Requirements of Swine*.[1]

Other factors to consider when adjusting for F:G. The impact of mortality on F:G can be calculated by using the average day in which the mortality occurred in the close-out. If mortality is assumed to occur at the mid-point of the finishing phase, for every 1% increase in mortality, F:G will be poorer by 0.5% to 0.8%.[8] Pelleting improves F:G by about 4% to 6% for pelleted diets with less than 20% fines.[4] Feed efficiency will be poorer by 0.002857 for each 1% fines in the pelleted diet.[9] Grain particle size improves F:G by 1.0% to 1.2%[10] for each 100-micron reduction from 900 to 500 microns. Gilts have approximately 1.7% better F:G than mixed gender, whereas barrows have 1.7% poorer F:G than mixed gender.[1] Ractopamine fed for 21 days prior to market decreases finisher F:G by 1.8% for 5 ppm (5 g per tonne) inclusion and 3.4% for 10 ppm (10 g per tonne) inclusion, in a summary of 12 experiments.[11] In a meta-analysis of 10 studies,[12] F:G in immunocastrated barrows was 4% lower than in surgically castrated barrows for the whole finishing phase. The meta-analyses included only data from studies with animals slaughtered between 4 and 6 weeks after the second immunization (market weight, 107 to 110 kg). The F:G advantage would be expected to be less if animals were slaughtered more than 6 weeks after the second immunization.

Examples of differences in F:G adjustment that are based on the change of a single factor from the baseline system values are shown in Table 1, using a feed efficiency adjustment calculator. For example, when comparing two close-outs with similar observed F:G, if one was fed a diet with higher energy, the adjusted F:G would be poorer than the observed F:G, reflecting the way that group would have performed if the pigs had received diets containing the same amount of dietary energy as the lower energy group.

These adjustments are useful because they account for the various known factors that affect F:G and that are normally present in production systems. A feed efficiency adjustment calculator that accounts for these factors can be found at **http://www.asi.k-state.edu/research-and-extension/swine/calculators.html**.

Fast facts

Feed efficiency of group close-outs can be compared after adjusting for known factors that can influence it.

Body weight, dietary energy and lysine, grain particle size, immunocastration, mortality, pelleting, ractopamine, and gender are major factors affecting feed efficiency, and thus adjusting for them can produce more meaningful benchmark comparisons.

Feed efficiency is typically defined as feed-to-gain ratio (F:G). Feed-to-gain is not always related to profit, but is a useful metric in benchmarking group close-outs, especially within a production system. In order to evaluate F:G across group close-outs, adjustment factors can be used to account for known sources of variation.

Table 1: Feed efficiency adjustment simulations for different factors in a barn close-out, accounting for mortality and pelleting[7]

Parameters	Baseline	Entry weight	Final weight	Dietary energy	Mortality	Pelleting	Gender
Observed F:G	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Initial weight (kg)	22	25	22	22	22	22	22
Final weight (kg)	130	130	135	130	130	130	130
Weighted SID Lys (%)	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Weighted energy (kcal) NE/kg	2527	2527	2527	2653	2527	2527	2527
Mortality (%)*	2.5	2.5	2.5	2.5	7.5	2.5	2.5
Average mortality (dpp)	60	60	60	60	60	60	60
Pelleting (Yes or No)†	No	No	No	No	No	Yes	No
If pelleted (% fines)†	0	0	0	0	0	20	0
Gender‡	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Barrows
Adjusted F:G§	NA	2.88	2.87	2.98	2.77	3.10	2.85

* Assumed impact of mortality over the baseline F:G.
† Assumed to reduce F:G by 5% when diets were in pellet form, increase F:G by 0.002857 for each 1% fines in the pelleted diet.
‡ Assumed that F:G in barrows is approximately 1.7% lower than mixed gender based on NRC[1] model.
§ Developed using Equation 3: 1 ÷ [(0.000004365 × NE) – (0.00162 × Average BW) – (0.08023 × SID Lys) + (0.000094 × NE × SID Lys) + 0.3496]. Then, adjusted F:G = (F:G from Equation 3 using standardized values) ÷ (F:G from Equation 3 using actual values) × observed F:G. The range of BW that this equation encompasses is 20.8 to 138.2 kg.
F:G = feed-to-gain ratio; SID Lys = standardized ileal digestible lysine; NE = net energy; dpp = days post placement; NA = not applicable.

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