Response of Growing-Finishing Pigs to Dietary Energy Concentration

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Summary

The objective of this experiment was to develop an energy response curve for pigs in the growing and finishing phases of production. The diets varied in DE content (3.1, 3.2, 3.3, 3.4 and 3.6 Mcal DE/kg) and were fed from 25 kg to market. Feeding lower energy, lower cost diets, had no effect on ADG or on loin thickness, but did improve feed efficiency and reduced backfat thickness. These results indicate that lower energy diets may be used to increase net income. The applicability of these results amongst a diversity of commercial herds probably depends on feed intake, and the ability of pigs to increase feed intake on the lower energy diets. Nonetheless, the potential for substantially increasing net income warrants careful consideration of dietary energy levels during the growout period. In this experiment, return over feed cost varied by more than $10 per pig across the 5 dietary treatments.

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Introduction

The primary objective of pork production is to produce lean meat in a cost effective and sustainable manner. Because energy is considered to be the most important driver of growth in the diet, achieving the full genetic potential for growth in the modern pig requires a clear and definitive understanding of the energy response curve in all phases of production. Despite the importance of energy in the design of commercial feeding programs, and the impact that daily intake has on energy supply, there has been surprisingly little information developed on animal response to energy intake. The little information that is available tends to emphasize whole body growth and reveals little in terms of the partitioning of energy into protein, lipid, water and ash. Establishing responses to nutrient intake levels is particularly critical in defining feeding programs to maximize carcass quality.

Experimental Procedure

Five experimental treatments were employed : 3.1, 3.2, 3.3, 3.4 and 3.6 Mcal DE/kg. This range covers that which might be reasonably used in commercial practice, although both the lowest and highest DE values would be unusual. Diets were formulated to ensure that amino acids were not limiting the response to energy; barrows followed a separate feeding regime as compared to gilts, such that the digestible lysine:DE ratios were 2.80, 2.45 and 1.95 g/Mcal for barrows and 2.90, 2.55 and 2.05 g/Mcal for 25 to 50, 50 to 80 and 80 to 120 kg BW, respectively. Diet DE was constant within a treatment for the complete growout period. Diets were based on barley and soymeal and, depending on the energy level, incorporated varying amounts of wheat and canola oil.

Table 1. The effect of dietary energy density on body weight, ADG, ADFI and feed conversion over 3 phases of growth.

	Diet (Measured DE, Mcal/kg[1])						
Parameter	3.09	3.24	3.34	3.42	3.57	SEM	Regression
Phase 1							
Wt, kg (day 0)	31.17	31.06	31.52	31.19	31.08	0.24	ns[2]
ADG, kg/d	0.95	0.97	0.98	0.98	0.99	0.01	ns
ADFI, kg/d	1.95	1.95	1.91	1.88	1.87	0.03	ns
FCE, gain:feed	0.49	0.50	0.52	0.52	0.53	0.01	L
Phase 2							
Wt, kg (day 0)	53.15	52.97	53.38	53.39	53.48	0.32	ns
ADG, kg/d	1.04	1.08	1.10	1.06	1.06	0.02	ns
ADFI, kg/d	2.74	2.72	2.74	2.51	2.51	0.04	ns
FCE, gain:feed	0.38	0.40	0.41	0.41	0.43	0.01	L
Phase 3							
Wt, kg (day 0)	80.10	79.47	80.30	80.16	80.22	0.44	ns
Wt, kg (end)	115.07	115.51	115.26	115.02	115.58	0.41	ns
ADG, kg/d	1.04	1.08	1.10	1.07	1.06	0.02	ns
ADFI, kg/d	3.29	3.19	3.20	3.05	2.94	0.05	ns
FCE, gain:feed	0.30	0.32	0.32	0.33	0.35	0.01	L
Overall							
ADG, kg/d	1.00	1.02	1.03	1.01	1.05	0.01	ns
ADFI, kg/d	2.76	2.69	2.67	2.59	2.49	0.03	L
FCE, gain:feed	0.36	0.38	0.38	0.39	0.42	0.01	L

[1]Refers to the energy concentration which was determined experimentally at the mid-point of each phase.

[2] ns; the response to dietary energy level was not linear (P>0.05), L; a significant response to dietary energy level was observed (P < 0.05).

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Results and Discussion

Energy density of the diet had no effect on ADG during any phase, or when calculated over the entire experimental period (Table 1). Feed intake declined as the energy density of the diet increased and feed efficiency was improved. Increasing the energy density of the diet resulted in a reduced lean yield and reduced backfat thickness (Table 2); surprisingly there was no effect on carcass value or on carcass premiums.

It is important to note that by commercial standards, pigs on this experiment exhibited a high feed intake and this could explain the lack of growth response to increases in dietary energy concentration. If feed intake had been lower, the response of the pigs to dietary energy concentration may have been different. A similar experiment is presently being conducted at a commercial farm to test this hypothesis.

Conclusion

In this trial, feeding lower energy, lower cost diets had no effect on ADG or on loin thickness, but did improve feed efficiency, and reduced backfat thickness. This indicates that lower energy diets may be used to increase net income. This experiment was conducted in an environment of high feed intake, and different results may accrue under conditions of lower feed intake. At the time of this trial, the lowest energy diet increased return over feed cost by more than $10 per pig sold, as compared to the highest energy diet.

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Table 2. The effect of dietary energy density, gender and initial bodyweight on carcass value, days on test and feed cost over 3 phases of growth.

	Diet (Measured DE, Mcal/kg)						
Parameter	3.09	3.24	3.34	3.42	3.57	SEM	Reg.
Settlement Wt. (kg)	89.91	90.01	90.88	90.2	91.22	0.37	L
Index	113.81	112.91	113.45	111.70	113.24	0.48	ns
Yield	61.58	61.13	60.88	61.14	60.63	0.18	L
Fat, mm	16.83	17.79	18.33	18.62	19.39	0.34	ns
Lean, mm	61.65	60.55	62.72	60.25	61.06	1.06	ns
Price, $/pig	1.10	1.10	1.10	1.10	1.10	0.01	ns
Value, $/pig	111.36	111.63	111.67	110.20	112.75	1.16	ns
Premium, $/pig	5.56	5.33	5.53	5.06	5.00	0.18	L
Days on Test							
Phase 1	23.3	23.0	22.8	22.9	22.9	0.48	ns
Phase 2	25.9	24.8	24.6	25.0	25.0	0.49	ns
Phase 3	35.4	35.8	36.8	34.6	34.0	1.07	ns
Feed Cost, $/pig							
Phase 1	8.36	8.96	9.38	10.39	11.36	0.19	L
Phase 2	12.00	12.70	13.93	14.81	15.46	0.25	L
Phase 3	17.40	19.13	21.85	21.82	22.70	0.55	L
Total	37.76	40.76	45.16	47.03	49.52	0.61	L

[1] ns; the response to dietary energy level was not linear (P>0.05), L; a significant response to dietary energy level was observed (P < 0.05).