Initial Report . . .

# Compensatory Growth in Growing-Finishing Swine

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**Compensatory growth can be defined as an increased growth rate in one time-period as a result of a slight growth restriction in an earlier time-period. This phenomenon has been recognized in farm animals for generations, yet purposeful induction of the compensatory growth phenomenon for economic purposes is a recent development. The research discussed in this report was conducted in response to the significant results obtained with turkeys by R. L. Johnson.**

Circumstances under which compensatory growth can occur include the period after weaning from very large litters, after elimination of internal parasites and after slight dietary restriction of energy or protein. A type of negative compensatory growth can occur when antibiotics are removed from rations for growing pigs housed in an "unclean" environment. Cattle feeders have traditionally sought calves with "large frames" and didn't object if the calves were slightly thin, because these calves would respond to proper management by making rapid and efficient (compensatory) gains. A similar situation exists in the lamb feeding industry.

The initial investigations of compensatory growth at the North Dakota Agricultural Experiment Station involved turkeys (see Johnson and Sell, 1973, and Johnson, 1974). Since both turkeys and swine are non-ruminants, compensatory growth should be attainable in swine as well as in turkeys. The experiments reported here were designed to determine if compensatory growth was feasible in swine and the conditions under which compensatory growth would be economically desirable.

## Procedure

The research by Johnson and Johnson and Sell involved a 30 per cent restriction of dietary protein after turkey poults were trained to eat and drink. Additionally, the restriction was imposed during approximately one-third of the growing period or the period in which 20-25 per cent of the total weight gain is normally obtained.

The first swine experiment involved very young pigs (average weight of approximately 35 pounds). The control group was to receive a 16 per cent crude protein ration to market weight. The treatment groups would receive a 14 per cent ration for 4 or 8 weeks and then the 16 per cent ration to market weight. Both rations (14 per cent and 16 per cent) were pelleted barley-soybean meal mixtures containing supplemental minerals and vitamins. A 16 per cent ration had previously been demonstrated to be economical and produce more rapid weight gains than lower protein rations (J. N. Johnson, 1974).

The first experiment demonstrated the most desirable time for protein restriction to obtain compensatory growth, while the second experiment was designed to yield information relative to the most desirable extent of the restriction in dietary protein.

The control group again received a 16 per cent ration from the start of the experiment to approximately 200 pounds. The treatment groups received 12 per cent or 14 per cent rations for 4 weeks, and then 16 per cent rations to the final weight. The pigs used in this experiment had an average initial weight of approximately 42 pounds.

## Results and Discussion

The data obtained in the first experiment (Table 1) revealed that compensatory gain can be obtained in swine by lowering the level of crude protein in the feed from 16 per cent to 14 per cent for a 4-week period. Most importantly, compensatory gain is economically advantageous because of the savings obtained in reducing the feed cost per pig when calculated on the basis of equalized weight gain. Feed costs estimated were those prevailing for comparable commercial rations at the mid-point of the experiment (October, 1974).

The data from the first experiment also demonstrate that over-restriction of dietary protein can be detrimental to optimum performance. Thus, while the correct extent of restriction resulted in a saving of $2.52 per pig, over-restriction

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**Table 1. Results of First Swine Compensatory Growth Experiment (111 days).**

| Item | Initial 4 wks / Second 4 wks / To market | Treatment 16% / 16% / 16% | 14% / 16% / 16% | 14% / 14% / 16% |
|---|---|---|---|---|
| No. of pigs | | 12 | 12 | 11 |
| Avg. initial wt. | | 35.1 | 35.0 | 35.5 |
| Avg. final wt. | | 220.7 | 218.3 | 205.1 |
| Avg. daily gain | | 1.67 | 1.65 | 1.54 |
| Avg. daily feed | | 5.76 | 5.49 | 5.61 |
| Avg. feed/gain | | 3.44 | 3.32 | 3.64 |
| Feed per pig 16%[1] | | 639 | 519.6 | 420.4 |
| 14% | | — | 89.6 | 202.5 |
| Total | | 639 | 609.2 | 622.9 |
| Feed cost per pig[2] | | $51.13 | $47.84 | $47.80 |
| Feed cost per pig to 220 lbs. | | 51.13 | 48.61[3] | 52.79[3] |

[1]*Actual feed to end of experiment NOT to equal final weight*

[2]*Estimated feed costs per ton: 16% - $160; 14% - $140*

[3]*Estimated*

would cost the producer $1.66 at the feed prices assumed.

Extremely good quality feed barley was available for the first experiment, and the data from the second experiment (Table 2) suggest that the grain available for the latter experiment was of lower quality. Regardless, compensatory growth was again demonstrated, although it might be more correct to name the phenomenon "compensatory efficiency" because of the improvement in feed per pound of gain. Feed costs were reduced by $4.00 per pig by feeding the 14 per cent protein for the initial 28 days of the experiment.

**Table 2. Results of The Second Swine Compensatory Growth Experiment (106 days).**

| Item | First 4 wks / to 200 lbs. | Treatment 16% / 16% | 14% / 16% | 12% / 16% |
|---|---|---|---|---|
| No. of pigs | | 18 | 18 | 17 |
| Avg. initial wt. | | 42.2 | 42.2 | 42.0 |
| Avg. final wt. | | 204.1 | 196.0 | 200.4 |
| Avg. daily gain | | 1.53 | 1.45 | 1.50 |
| Avg. daily feed | | 5.77 | 5.13 | 5.97[1] |
| Avg. feed/gain | | 3.78 | 3.53 | 3.99[1] |
| Feed per pig to 204 lbs. 16% | | 611.3 | 478.8 | 532.9 |
| 14% | | — | 93.8 | — |
| 12% | | — | — | 112.7 |
| Total | | 611.3 | 572.6 | 644.6[1] |
| Feed cost/pig[2] | | $48.90 | $44.87 | $49.39[1] |

[1]*Includes considerable wasted feed*

[2]*Estimated feed costs per ton: 16% - $160; 14% - $140; 12% - $120*

Feed wastage became a problem in the third group (12 per cent for 4 weeks, 16 per cent to market) because it was impossible to properly adjust the feeder to prevent wastage. This wastage could have been prevented with proper equipment, but must be included in the data presented. Had this loss been prevented, it is highly probable that restriction to 12 per cent for 4 weeks would have been economically advantageous.

Certain similarities were present in the experiments. For example, each pig fed a 14 per cent ration for 4 weeks consumed approximately 90 pounds of the ration during that period. As noted previously, efficiency was improved markedly. In the current emotional climate of consumerism and highly publicized non-professional "experts," it certainly is not a disadvantage to employ procedures that save feed grains. These savings amounted to $2.56 and $4.03 in the first and second experiments, respectively. This amount is of no small consequence to the producer!

## Summary

Two experiments utilizing 88 pigs were conducted to determine if compensatory gains could be produced in growing-finishing swine and to identify the conditions for maximizing the economics associated with this procedure.

Compensatory weight gain was obtained in each experiment, but the increased efficiency obtained (reduced feed required per pound of gain) makes the practice of special significance to swine producers. Total feed saved per pig ranged from 30 to 40 pounds, while net savings per pig varied from $2.52 to $4.03 in the first and second experiments respectively.

This effect (compensatory gain/compensatory efficiency) can be readily produced by feeding well-balanced rations containing 14 per cent crude protein for a period of four weeks to pigs having an average initial weight of approximately 40 pounds. Restriction for more than four weeks will result in an undesirable condition of slight stunting and reduced efficiency.

## References

1. Johnson, J. N. 1974. **Protein Levels for Swine. Third NDSU Livestock Research Day.**

2. Johnson, R. L. 1974. **Compensatory Growth Studies with Market Turkeys. Proc. Minnesota Nutrition Conference,** p. 41-50.

3. Johnson, R. L. and J. L. Sell. 1973. **Growth Rate and Feed Utilization in Turkeys as Related to Early Nutrition. Poultry Sci.** 62:54 (abstract).