

Pelleted Barley for Hogs - II¹⁾

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North Dakota is one of the leading states in production of barley. It is obvious that all the barley produced cannot be sold for human use as beer, malt, breakfast foods, infant foods, etc., and therefore, some other use must be found for the surplus.

Several years ago this station became interested in the problem of how best to use the surplus barley for feed. Previous experiments had given some comparative values of barley with other grains, but new varieties, different methods of farming, and new methods of feed preparation made a re-appraisal of the problem necessary.

Growing-fattening pigs do not utilize coarse, fibrous feeds efficiently. Grinding of grains with a fibrous hull, such as barley and oats, increases the feeding value from 18 to 25 percent over the whole grain for swine (Morrison, Feeds and Feeding, 21st Ed.). Fine grinding, up to the point of dustiness, is preferable to coarse grinding (Crampton and Bell, Jour. An. Sci. 5:200, 1946). The coarse grinding of these grains permits the pigs to "sort" out the groats from the hulls. This feeding practice results in waste. Also, coarsely ground barley and oats are less palatable which results in less intake and slower gains.

In a previous report from this station (Bimonthly Bull. XV 162; 1953), two experiments showed that pelleting of barley rations resulted in 12 to 14 percent faster gains and a saving of 8 to 17 percent in feed required per pound of gain. In these experiments barley pulverized and pelleted in complete rations proved equal or slightly superior to comparable corn rations.

Several additional experiments have been conducted to study various phases of this system of using barley as swine feeds. The results of two of these will be reported in this paper.

Experiment X

In the winter of 1951-52, forty-five pigs of Chester White and Duroc breeding were allotted into three lots of fifteen pigs each. The basis of this allotment was breed, weight, and sex. These pigs were self-fed the complete pelleted rations. Water was available at all times and bi-weekly weights and data on feed consumption were kept. The pigs were housed in similar pens with access to an outside paved runway. The protein level (calculated) of these rations was about 16 percent. Chemical analysis of the rations showed that these values were essentially correct.

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TABLE I.—Rations Formulations For Experiment X.

Lot	Corn	Barley	Oats
	lbs.	lbs.	lbs.
Ingredients	1	2	3
Corn	81	.....	.....
Barley .....	.....	90	.....
Oats .....	.....	.....	88
Meat Scraps	5	5	5
Soybean Oil Meal	13	4	6
Trace Mineral Salt ¹	0.5	0.5	0.5
Limestone	0.5	0.5	0.5
% Protein (Calculated)	15.8	16.0	16.0

¹Cobalt chloride was added to salt to provide additional 0.5 mg. cobalt per lb. of feed. Vitamins, A, D, B₁₂, riboflavin, pantothenic acid, niacin, and choline were added to meet requirements.

Table I gives the formulas of these rations. The oats used in this trial were heavy, weighing about 35 pounds per bushel. The barley was good, weighing about 47 pounds per bushel. The corn was number 2 yellow. Some of the corn was artificially dried.

TABLE II.—Summary of Performance.

	Pelleted Corn	Pelleted Barley	Pelleted Oats
Lot No.	1	2	3
Pigs per Lot	15	15	15
Initial Weight, Lb.	29.9	29.9	29.9
Final Weight, Lb.	131.6	137.4	124.5
Average Daily Gain, Lb.	1.21	1.29	1.11
Feed/Lb. Gain, Lb.	3.09	3.07	3.56
Feed/Pig/Day	3.7	3.9	3.9

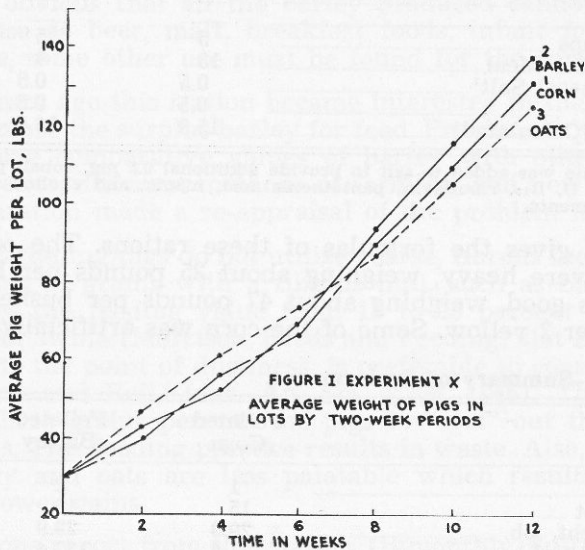
Table II presents a summary of performance of these lots of pigs. It is to be noted that final weights range from 124 to 137 pounds average per pig. This premature closing of the trial was due to an outbreak of pneumonia and enteritis during inclement weather. It was felt that the 12 weeks the pigs were on experiment indicate some interesting facts and therefore are presented. Because the trial was interrupted before the pigs reached marketable weights, statistical analysis of the data was not employed.

Discussion

The pigs averaged about 30 pounds at the initiation of the experiment. It was observed as early as the second week, the pigs on the pelleted oats were the quickest to go on full feed and because of this, gained more rapidly for the first six weeks (Figure 1). At the end of six weeks the pigs in Lot 3 (pelleted oats) had consumed on the average 3.2 pounds of feed per day as compared to 2.7 pounds for Lot 2 (barley) and 2.6 for Lot 1 (corn). This consumption of feed is reflected in the rate of gain during this period as 1.01 lb., 0.93 lb., and 0.87 lb., gain per day for the oats, barley, and

corn rations respectively. After the first six weeks the pigs in Lot 3 lost this advantage (Figure 1).

The pigs in Lot 2 (pelleted barley) made the most rapid and most efficient gains, followed closely by those fed corn. The pigs on pelleted oats made the poorest gains and required more feed



per pound of gain (Table 2) reflecting the lower energy content of this ration because they consumed, on the average of the 12 weeks, the same feed per day as the pigs on the barley ration. No lot gained as rapidly as might be expected for pigs of this breeding and age but feed efficiency was good.

Experiment XIV

Experiment XIV was conducted in the winter of 1951-52. This experiment was initiated to study 1) levels of protein necessary for use with barley rations, and 2) comparison of the efficiency of barley rations with corn rations.

Fifty Duroc pigs were allotted in the usual manner into 10 lots of five pigs each. Pigs of different ages and weights were available for this experiment and therefore allotted in two groups of twenty-five. An outbreak of the flu was evident just after weaning so that all pigs were treated to stem the flu and were allowed to recover before being placed on experiment. Methods of feeding and management were similar to that of Experiment X.

Table III gives the formula of the rations used. These rations were formulated to contain 16 percent and 12 percent total protein. However, after the rations were custom-mixed, pelleted and deliv-

ered, chemical analysis showed that the rations did not contain the level of protein desired. The corn used in the rations was higher in protein than usual (9.6 percent as compared to usual level of 8.6 to 8.8 percent) whereas the barley was much lower than normal (10.7 percent as compared to usual of 12 percent or more). Inquiry into the cause showed much of the 1951 barley crop was lower in protein than usual. This may explain much of the discrepancy in protein levels calculated and that by actual analysis.

TABLE III.—1952 Rations—Experiment XIV.

Rations	A lbs.	B lbs.	C lbs.	D lbs.
Corn	81	.....	89	.....
Barley .....	.....	90	.....	99
Meat Scraps	5	5	.....	.....
Soybean Oil Meal	13	4	10	.....
Trace Mineral Salt ¹	0.5	0.5	0.5	0.5
Limestone	0.25	0.25	0.25	0.25
Steamed Bonemeal	0.25	0.25	0.25	0.25
Vitamins ²	Yes	Yes	Yes	Yes
% Protein (Calculated and Desired)	15.8	16.0	12	12
% Protein by Analysis	16.5	15.0	13.9	10.3

¹Cobalt sulfate was added to salt to provide additional 0.5 mg. cobalt per pound of ration.

²Vitamins A, D, B₁₂, pantothenic acid, riboflavin, niacin, and choline added to meet requirements.

TABLE IV.—Experimental Design.

Experiment XIV-A					
Lots.....	1	2	3	4	5
Rations.....	C	D	A to 110 lbs. then C	B	B to 110 lbs. then D
Experiment XIV-B					
Lots.....	6	7	8	9	10
Rations.....	C	D	A to 110 lbs. then C	B	B to 110 lbs. then C

Table IV presents the experimental design used in this experiment. Lots 1 and 6 received the "low" protein (13.9) corn ration throughout. Lots 2 and 7 received the "low" protein (10.3) barley ration. Lots 3 and 8 received the "high" protein corn ration (16.5) until they reached 100 to 110 pounds and then the "low" (13.9) protein corn ration. Lots 4 and 9 received the "high" protein (15.0) barley rations throughout, whereas lots 5 and 10 received the "high" protein (15.0) barley ration until they reached 100 to 110 pounds and then "low" protein (10.3) barley ration to 200 pounds.

Table III summarizes the results of the experiment. The gains were exceptionally good. Part of this high rate of gain is explained by the fact that they were in thin condition at initiation of the experiment.

The feed efficiency is only fair for the barley rations and good for the corn rations. The extremely low protein of ration D is responsible for much of this poor efficiency. Although weight per bushel was not obtained directly for the barley, comparative weights of the corn and barley rations indicate that the barley weighed about 40 to 41 pounds per bushel.

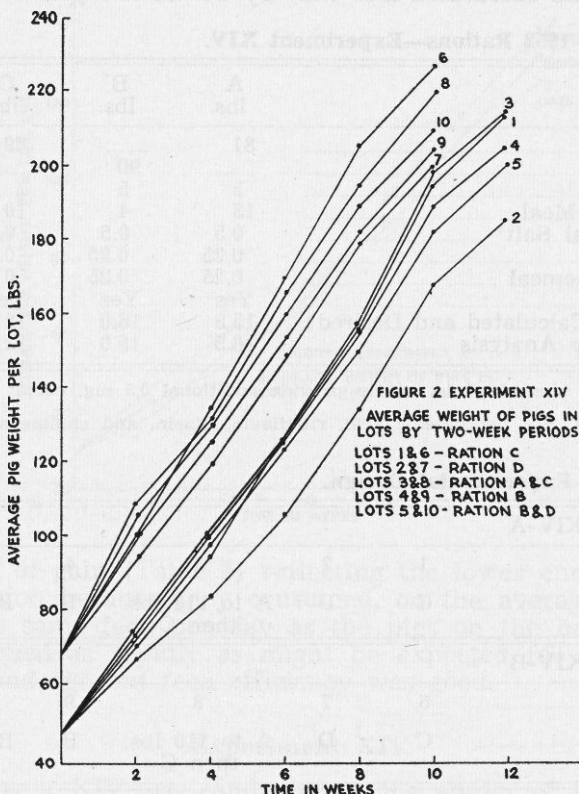


Figure 2 gives the average growth rate of these lots. Statistical analysis of the data show that there is no real difference in rate of gain between lots receiving the "high" protein barley and those on corn. This appears confusing because of the lower rate of gain in Lot 9, receiving ration D. However, one pig in that lot did not respond as well as the other four pigs in that lot and if its performance were removed from the averages, the rate of gain of that lot would be comparable to lot 10. Statistical analyses do show a highly significant difference between the performance on the "low" protein barley ration compared to the "higher" protein barley rations. This difference is to be expected because of the extremely low protein in ration D.

TABLE V.—Experiment XIV—1952. Comparisons of Pelleted Barley and Corn Rations and Levels of Protein.

Rations _____	C	D	A & C	B	B & D
% Protein _____	13.9%	10.3%	16.4 & 13.9%	15.0%	15 & 10.3%
Lots	1	2	3	4	5
Av. Initial Wt., Lb.	45.6	45.8	46.4	46.0	46.0
Av. Final Wt., Lb.	213.6	186.4	214.6	205.0	198.0
Av. Da. Gain, Lb.	2.16	1.82	2.16	2.05	1.95
Feed/Cwt. Gain, Lb.	323.2	368.8	329.3	366.7	380.9
Av. Feed/Day, Lb.	6.98	6.72	7.12	7.51	7.43
Lots	6	7	8	9	10
Av. Initial Wt., Lb.	65.4	65.2	65.8	65.2	65.2
Av. Final Wt., Lb.	227.0	199.8	210.0	205.4	219.6
Av. Da. Gain, Lb.	2.52	2.10	2.58	2.18	2.41
Feed/Cwt. Gain, Lb.	344.8	398.2	377.0	374.1	369.8
Av. Feed/Day, Lb.	8.69	8.36	7.63	8.16	8.90

Discussion

In Experiment X as in the two previously reported experiments (Bimonthly Bull. XV:162), barley, pulverized and pelleted in complete rations, was equal to corn. In Experiment XIV the gains of the hogs fed the pelleted barley rations compared favorably with those fed the corn rations. The same was not true for the feed efficiency. It took about 30 pounds more, on the average, of the barley rations per 100 pounds of gain than for the corn rations. This possibly was due to the lower protein, lighter barley used in this experiment. It does not appear that palatability of the barley rations was involved because feed intake was good for all lots except those lots on the low protein barley rations and too-low protein would generally reduce appetite.

On the other hand, cost figures give the barley-fed pigs an advantage of 50 cents to one dollar less cost per 100 pounds gain as compared to the corn rations. (The barley rations delivered cost \$14.75 and \$16.25 less for the "high" and "low" protein than the corresponding corn rations.) Part of this cost differential is due to the lower relative price of feed barley and partly due to the fact that less protein concentrate was needed to supplement the barley rations than comparable corn rations.

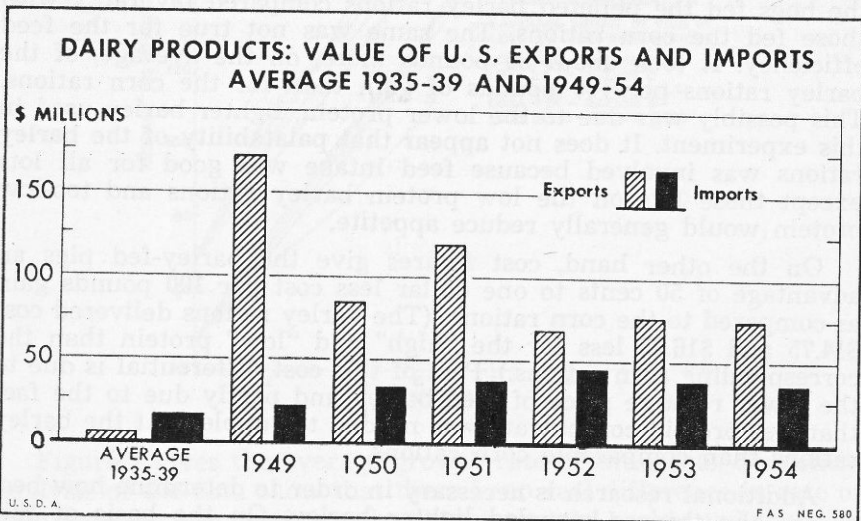
Additional research is necessary in order to determine how best to use the thinner-kerneled lighter barley. On the basis of this experiment the lower protein barley is worth about 10 per cent less than number 2 yellow corn. This is not conclusive, however, because of difference in protein levels of the rations and unexpectedly good gains of all lots make a definite conclusion impossible.

In the comparisons of levels of protein two observations are of interest. Although the rate of gain was good, the evidence is strong that 10.3 percent protein rations are too low for pigs under 100 pounds in weight. Statistical analysis show that the possibility of getting the lower gains obtained in lots 2 and 7 by chance were

only one in one hundred and therefore the ration was the cause. There was no advantage of protein levels above 14 percent for pigs of these weights. The lots started on 16 percent protein levels did no better than those on 13.9 percent protein levels. The results are less conclusive in comparisons of 15 percent protein with 15 to 10.3 percent protein combinations (lots 4 and 9 compared with 5 and 10). This experiment and other observations at this station suggest that if properly supplemented to insure good protein quality, protein levels of 13.5 percent to 14 percent are sufficient for barley rations when fed to hogs weighing 40 pounds or more.

Summary

1. Data from two experiments designed to study the value of pelleted barley rations for swine are reported.
2. In both trials the pelleted barley rations made cheaper gains in cost per pound of pork than comparable corn rations.
3. Protein levels of 13.5 to 14 percent appear to be adequate for growing-fattening pigs above 40 pounds in weight, if protein concentrates of good quality are used.
4. Barley rations containing only 10.3 percent protein are not adequate for pigs weighing less than 100 pounds, fed under dry lot conditions.



Exports of U. S. Dairy Products have dropped in dollar value for the past three years, as shown in this graph just released by the Department of Agriculture's Foreign Agricultural Service, while dairy imports (largely foreign-type cheese) have held fairly even. Actually, dairy exports from this country increased sharply in 1954, but the dollar volume was less. The whole milk equivalent of exports, at more than two billion pounds, was almost 50 per cent more in 1954 than in 1953, but in dollar value the 1954 exports were only \$81.3 million against \$82.5 million in 1953, "the increased movement of commodities at decreased value representing in some measure the efforts of the government to reduce its stocks of dairy products by moving them into world trade through reduced prices . . ." according to the USDA Foreign Agricultural Service.