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The results of a swine feeding experiment

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Iowa State College

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Cross Bred Poland China-Yorkshire, Poland China-Duhoc Jersey and
Poland China-Berkshire Hogs, Bred by Iowa Agricultural
College, Fed on Swift's Digester Tankage and Corn,
Average Weight at 8½ Months, 331 Pounds

Beef Meal, Swift's Digester Tankage, Armour's Tankage
and Standard Stock Food; Their Value When
Fed in Conjunction with Corn for the
Economical Production of Pork

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The Results of a Swine Feeding Experiment

To Determine the Value of Beef Meal, Armour's Tankage, Swift's Digestor Tankage and Standard Stock Food, When Fed in Conjunction with Corn Meal for the Economical Production of Pork

W. J. KENNEDY  F. R. MARSHALL

That the production of pork is an important factor on the average farm in Iowa is well substantiated by the fact that the farmers of Iowa annually receive more money from the production of pork than do the farmers of any other two states in the Union. Furthermore the importance of this industry is well demonstrated in the fact that out of the total number of hogs received at the Union Stock Yards, Chicago, the greatest hog market in the world, Iowa furnishes more than fifty per cent. Recognizing these facts, we can readily appreciate the value of any work furnishing reliable data giving new light in regard to the economical production of pork.

Corn, being so extensively grown in this state, quite naturally is the staple feed used. On most farms it composes the major portion of the ration, while on not a few, it is the sole ration fed. All things considered, a mixed ration usually gives better results than a ration of any one kind of feed. Previous experiments at this and other stations have furnished much valuable data regarding the advisability of using the various kinds of grain in conjunction with corn for the production of pork. Much light has also been furnished regarding the feasibility of utilizing the various kinds of forage crops for hog feeding purposes. From time to time, new products are being placed upon the market, each of which is claimed by its manufacturers to possess much merit. During the past year, perhaps no one line of these new products has attracted so wide attention as the by-products of the packing houses, such as tankage, dried blood, beef meal, etc., etc.
For many years the blood, scraps of meat, etc., from which these products are manufactured, were a total loss to the packer. For a long time their disposal added much to the running expenses of the firm. Recognizing the fact that they contained a large amount of nitrogen and mineral matter so valuable from a fertility standpoint, a new field for their disposal was opened up and they were placed upon the market in the form of fertilizers. The farmer of the middle west has never taken kindly to the use of fertilizers, thus the only market for them was in the eastern and southern states. Ever determined and on the alert to secure the patronage of the corn-belt farmers, the packing house man appeals to him in a new way by furnishing a food product, not a fertilizer, which contains anywhere from two to four times as much protein as any feed which can be produced upon the farm.

Wishing to secure some practical information relating to the value of the various by-products such as hoof meal and the various kinds of tankage prepared for sale by the packing houses, we planned and conducted a swine feeding experiment as follows:

Thirty cross-bred pigs of excellent quality averaging two hundred and five pounds each were divided into five lots of six each. Each lot contained three cross-bred Poland China-Yorkshires, two Poland China-Duroc Jerseys and one Poland China-Berkshire. These were selected from a bunch of over eighty pigs between six and seven months old which were bred on the College farm. The selection was made when they averaged about one hundred and sixty-five pounds and they were placed on preliminary feed for a period of three weeks prior to the commencement of the test.

Recognizing the importance of corn, we used it as a basis for comparison. Lot No. 1 was fed on a ration of corn meal alone, lot No. 2 on corn meal and beef meal furnished by Darling & Co., Chicago; lot No. 3 on corn meal and Swift's Digester Tankage furnished by Swift & Co., Chicago; lot No. 4 on corn meal and Armour's tankage furnished by Armour & Co., Chicago; while lot No. 5 was fed on corn meal and Standard Stock Food furnished by F. E. Sanborn & Co., Omaha, Neb.

All of the pigs made excellent gains throughout the entire period of forty-nine days. Lot No. 1 when on full
feed consumed as high as sixty pounds of corn meal per day, lot No. 2 fifty-two pounds of corn meal and ten pounds of beef meal, lot No. 3 fifty-two pounds of corn meal and ten pounds of Swift’s Digester Tankage, lot No. 4 fifty-two pounds of corn meal and ten pounds of Armour’s Tankage, lot No. 5 sixty pounds of corn meal and one-third of a pound of Standard Stock Food. At the conclusion of the experiment the hogs were consigned to Clay, Robinson & Co., Chicago, who sold each lot separately and on its merits, to Swift & Co., for $7.55, the extreme top of the market.

The feeding was done by Messrs. Oscar Royse and H. B. Ellenberger, students in agriculture who are specializing along animal husbandry lines, and will be used by them as the basis of their thesis work for graduation in the agricultural course.

As some of the feeds used are new to many people, we insert the following information as to their composition, preparation, etc.:

**Swift’s Digester Tankage.**

Digester tankage is made from meat scraps, fat trimmings and scrap bones. These are taken up as fast as taken from the animals and put into a large steel tank and cooked under a live steam pressure of 40 lbs. to the square inch, which cooks out the tallow. After the steam is turned off, it is allowed to settle, when the grease rises to the top and is drawn off. After the grease is drawn off the tankage is kept agitated and by evaporation the water is extracted until the tankage contains about 8 per cent moisture. It is then taken out of the tank, allowed to cool, is ground and stored ready for shipment. This tankage is supposed to contain about 60 per cent protein and 10 per cent of fat.

**Armour’s Tankage.**

This product, like the one just described, is made from meat scraps, scrap bones, etc. Quoting the words of the manufacturer, it is as follows: “Tankage is the product which drops to the bottom in our rendering tanks, when we are rendering out grease, tallow, etc., at our various packing houses. It has been thoroughly cooked under forty pounds pressure for several hours, which thor-
ouglily destroys any disease germs which might possibly be in the raw meat. This product is pressed and then dried in steam driers at a high temperature. It is then ground and shipped in 100 and 200 pound sacks."

**BEEF MEAL.**

This product is made from scraps of meat and bone from which the grease has been extracted and the liquors concentrated by cooking. These are then pressed, dried, and ground in preparation for the market. It is claimed to contain 40 per cent to 50 per cent of protein.

In computing the cost of gains of the various lots, the following valuations were placed on the various feeds used. These were the actual market prices of the same as quoted by the companies which sell them. In the instance of the Standard Stock Food, we quote price on half-ton lots.

<table>
<thead>
<tr>
<th>Feed</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn meal</td>
<td>$22.00 per ton</td>
</tr>
<tr>
<td>Beef meal</td>
<td>$30.00 per ton</td>
</tr>
<tr>
<td>Swift's Digester Tankage</td>
<td>$32.00 per ton</td>
</tr>
<tr>
<td>Armour's Tankage</td>
<td>$25.00 per ton</td>
</tr>
<tr>
<td>Standard Stock Food</td>
<td>$80.00 per half ton</td>
</tr>
</tbody>
</table>

The following table gives the value of the food consumed, total gains, average gain per hog, average daily gain per hog and cost of producing one hundred pounds of gain in each of the various lots of hogs.
Cross Bred Poland China-Yorkshire, Poland China-Duroc Jersey and Poland China-Berkshire Hogs, Bred by Iowa Agricultural College, Fed on Corn. Average Weight at 8½ Months, 306 Pounds.

<table>
<thead>
<tr>
<th>Kind of Feed</th>
<th>Value of Feed Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Pounds</td>
</tr>
<tr>
<td>Corn</td>
<td>2747</td>
</tr>
</tbody>
</table>

Value of feed consumed in 49 days, $30.22.
Total gain on entire lot, 596 pounds.
Average gain per hog, 99.3 pounds.
Average daily gain per hog, 3.08 pounds.
Cost of producing 100 pounds of gain, $6.10.
Cross Bred Poland China-Yorkshire, Poland China-Duroc Jersey and Poland China-Berkshire Hogs, Bred by Iowa Agricultural College, Fed on Corn and Beef Meal. Average Weight at 8½ Months, 321 Pounds.

LOT II.

**Corn and Darling’s Beef Meal.**

<table>
<thead>
<tr>
<th>Kind of Feed</th>
<th>Value of Feed Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Pounds</td>
</tr>
<tr>
<td>Corn</td>
<td>2448</td>
</tr>
<tr>
<td>Darling’s Beef Meal</td>
<td>458</td>
</tr>
</tbody>
</table>

Value of feed consumed in 49 days, $33.80.
Total gain on entire lot, 707 pounds.
Average gain per hog, 118 pounds.
Average daily gain per hog, 2.4 pounds.
Cost of producing 100 pounds of gain, $4.80.
Cross Bred Poland China-Yorkshire, Poland China-Duroc-Jersey and Poland China-Berkshire Hogs, Bred by Iowa Agricultural College, Fed on Corn and Swift's Digester Tankage. Average Weight at 8½ Months, 331 Pounds.

LOT III.

CORN AND SWIFT'S DIGESTER TANKAGE.

<table>
<thead>
<tr>
<th>Kind of Feed</th>
<th>Value of Feed Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Pounds</td>
</tr>
<tr>
<td>Corn</td>
<td>2429</td>
</tr>
<tr>
<td>Swift's Digester Tankage</td>
<td>458</td>
</tr>
</tbody>
</table>

Value of feed consumed in 49 days, $34.03.
Total gain on entire lot, 757 pounds.
Average gain per hog, 126 pounds.
Average daily gain per hog, 2.57 pounds.
Cost of producing 100 pounds of gain, $4.50.
Cross Bred Poland China-Yorkshire, Poland China-Duroc Jersey and Poland China-Berkshire Hogs, Bred by Iowa Agricultural College Fed on Corn and Armour's Tankage. Average Weight at 8½ Months 316 Pounds.

LOT IV.

CORN AND ARMOUR'S TANKAGE.

<table>
<thead>
<tr>
<th>Kind of Feed</th>
<th>Value of Feed Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Pounds</td>
</tr>
<tr>
<td>Corn........................</td>
<td>2438</td>
</tr>
<tr>
<td>Armour's Tankage.........</td>
<td>460</td>
</tr>
</tbody>
</table>

Value of feed consumed in 49 days, $32.57.
Total gain on entire lot, 668 pounds.
Average gain per hog, 111.3 pounds.
Average daily gain per hog, 9.37 pounds.
Cost of producing 100 pounds of gain, $4.90.
Cross Bred Poland China-Yorkshire, Poland China-Duroc Jersey and Poland China-Berkshire Hogs, Bred by Iowa Agricultural College and Fed on Standard Stock Food and Corn. Average Weight at 8½ Months, 312 Pounds.

LOT V.

CORN AND STANDARD STOCK FOOD.

<table>
<thead>
<tr>
<th>Kind of Feed</th>
<th>Value of Feed Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Pounds</td>
</tr>
<tr>
<td>Corn</td>
<td>2858</td>
</tr>
<tr>
<td>Standard Stock Food</td>
<td>14</td>
</tr>
</tbody>
</table>

Value of feed consumed in 49 days, $32.56.
Total gain on entire lot, 855 pounds.
Average gain per hog, 109 pounds.
Average daily gain per hog, 2.23 pounds.
Cost of producing 100 pounds of gain, $5.00.
In computing the above table, the beginning and final weights at home were used. The hogs were weighed out of the feed lots in both instances without any allowance being made for shrinkage. This seemed to us to be a fair basis on which to summarize our total gains and average daily gains per hog. Exact account was kept of all the feed consumed.

A review of the above tables will show that a ration of corn alone produced 100 pounds of gain at a cost of $3.10, while a ration of corn meal and beef meal produced 100 pounds of gain at a cost of $4.50, a difference of thirty cents in favor of the corn and beef meal ration. A ration of corn and Swift's tankage produced 100 pounds gain at a cost of $4.90, a difference of sixty cents per cwt. in favor of the corn and Swift's tankage over the corn alone. A ration of corn and Armour's tankage produced 100 pounds gain at a cost of $4.90, a difference of 20 cents per cwt. in favor of corn and Armour's tankage over corn alone. A ration of corn and Standard Stock Food produced 100 pounds gain at a cost of $5.00, a difference of ten cents per cwt. in favor of corn and Standard Stock Food over corn alone.

The following table gives the average net profit per hog in each of the various lots fed and furnishes other data from which the swine-feeder can draw conclusions regarding the relative value of the various feeds used. For the beginning weights in this table we used those taken at home, less a three per cent shrink. This was used in order that we might arrive at a fair basis for determining the beginning weight as our final weight in this instance was the selling weight of the hogs at the Union Stock Yards, Chicago. A valuation of seven cents per pound was placed on the hogs at the commencement of the feeding period. The cost of feed was determined for each lot at the market prices for all of the feed consumed. The selling price was the same, being $7.55 per cwt. for each lot. The proceeds represent the selling price on the Chicago market. The net profit per hog was arrived at by deducting the value of the hog at the beginning at seven cents per pound, the value of the feed consumed, the expense connected with marketing, such as freight, commission, yardage, etc., from the total proceeds obtained for each hog. No allowance has been made for
the labor involved in the feeding of the hogs or for the interest on the investment, two factors which must be considered. On the other hand, no credit has been given for the manure made by the hogs, a valuable source of income to the man who feeds stock.

<table>
<thead>
<tr>
<th>Lot</th>
<th>Corn Alone</th>
<th>Corn and Darling's Beef Meal</th>
<th>Corn and Swift's Digester Tankage</th>
<th>Corn and Armour's Tankage</th>
<th>Corn and Standard Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>197 lbs.</td>
<td>13.79</td>
<td>14.14</td>
<td>13.88</td>
<td>13.79</td>
</tr>
<tr>
<td>2</td>
<td>308 lbs.</td>
<td>5.63</td>
<td>5.67</td>
<td>5.43</td>
<td>5.43</td>
</tr>
<tr>
<td>3</td>
<td>317 lbs.</td>
<td>301½ lbs.</td>
<td>301½ lbs.</td>
<td>301½ lbs.</td>
<td>301½ lbs.</td>
</tr>
<tr>
<td>4</td>
<td>317 lbs.</td>
<td>301½ lbs.</td>
<td>301½ lbs.</td>
<td>301½ lbs.</td>
<td>301½ lbs.</td>
</tr>
<tr>
<td>5</td>
<td>202 lbs.</td>
<td>108 lbs.</td>
<td>90 lbs.</td>
<td>90 lbs.</td>
<td>90 lbs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average Weight at Beginning</th>
</tr>
</thead>
<tbody>
<tr>
<td>197 lbs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average Value at 67c. per Cent. Beginning</th>
</tr>
</thead>
<tbody>
<tr>
<td>$13.79</td>
</tr>
</tbody>
</table>

- Proceeds per Chicago Market: $22.12
- Selling Price on Chicago Market: $7.55 per cwt.
- Average Feed per Hog: 293 lbs.
- Average Price per Hog: $3.39
- Average Profit per Hog: $90
- Marketing Fluctuation: 2.93
- Average Product per Hog: 3.23
- Average Profit per Hog: 2.57
- Average Product per Hog: 2.64
It will be seen by the above table showing the average net profits per hog that lot No. 3, fed on corn meal and Swift’s Digester Tankage, gave the best returns, yielding $3.22, which was eighty-three cents more than lot No. 1, fed on corn alone; lot No. 2, fed on corn meal and beef meal, stood second, yielding $2.93, which was fifty-four cents more than lot No. 1, fed on corn alone; lot No. 5, fed on corn meal and Standard Stock Food, stood third, yielding $2.64, which was twenty-five cents more than lot No. 1, fed on corn alone; lot No. 4, fed on corn meal and Armour’s Tankage, stood fourth, yielding eighteen cents more than lot No. 1, fed on corn meal alone. These figures may appear to be rather insignificant, but they are reduced to the basis of feeding one hog 49 days. They mean that by the addition of Swift’s Digester Tankage to the corn meal ration, the net profits were increased over thirty-four per cent; that the addition of beef meal to the corn meal ration increased the net profits over twenty-two per cent, that the addition of Standard Stock Food to the corn ration increased the net profits ten per cent and that the addition of Armour’s tankage to the corn ration increased the net profits over seven per cent.

The following table shows the price obtained per bushel for the corn consumed by each of the various lots of hogs. This was estimated by crediting all the profits realized to the corn fed. The other feeds were all secured for the prices quoted in the feed valuation table, thus the net loss or gain should be credited to the corn.

Price per bushel returned by each of the various lots of hogs for the corn consumed:

- Lot No. 1, Corn alone, returned $0.83
- Lot No. 2, Corn and beef meal, returned $0.93
- Lot No. 3, Corn and Swift’s Tankage, returned $0.971/4
- Lot No. 4, Corn and Armour’s tankage, returned $0.88
- Lot No. 5, Corn and Standard Stock Food, returned $0.84

As will be seen by studying the above table, all of the lots returned a satisfactory margin over the market price of corn.

The following table gives the analysis of the various feeds used as reported by Dr. J. B. Weems, Station Chemist:
The above analysis shows that Darling's beef meal, Swift's tankage and Armour's tankage all contain a high percentage of protein and ash, the two components in which corn is deficient from a stock feeding standpoint, especially for young and growing animals. Thus they are excellent feeds to add to the corn ration for the proper balancing of the nutrients, while the analysis show Standard Stock Food to be high also in protein and ash, yet it is of little or no value so far as balancing the ration is concerned, due to the fact that it is fed in such small quantities.

SHRINKAGE IN SHIPPING TO CHICAGO.

<table>
<thead>
<tr>
<th>No. of Lot</th>
<th>Ration Fed</th>
<th>Pounds per Hog</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Corn</td>
<td>10½%</td>
</tr>
<tr>
<td>II</td>
<td>Corn and Beef Meal</td>
<td>13½%</td>
</tr>
<tr>
<td>III</td>
<td>Corn and Swift's Tankage</td>
<td>13 5-6</td>
</tr>
<tr>
<td>IV</td>
<td>Corn and Armour's Tankage</td>
<td>13½%</td>
</tr>
<tr>
<td>V</td>
<td>Corn and Standard Stock Food</td>
<td>10½%</td>
</tr>
</tbody>
</table>

A study of the above table will show that there is quite a variation in the shrinkage of the various lots. In this respect those fed solely on corn, or almost so, shrunk the least in shipping. In this instance it made a very noticeable difference in the relative standing of the various lots. Based on home weight Lot IV fed on Armour's
Tankage and corn stood ahead of Lot V fed on corn and Standard Stock Food, while the table showing net profits which was based on Chicago weights showed Lot V to be in the lead.

The matter contained in this bulletin is the result of but one test and may be modified by future tests. The data obtained by this experiment would indicate:

1. That in the fattening of young hogs, a ration containing more protein and ash than a corn ration gave better results than a sole corn ration.

2. That a ration consisting of five parts corn and one part Swift's tankage yielded over thirty-four per cent greater net profits than a ration of corn alone.

3. That a ration consisting of five parts corn and one part Darling's beef meal yielded over twenty-two per cent greater net profits than a ration of corn alone.

4. That a ration of corn and Standard Stock Food yielded over ten per cent greater net profit than a ration of corn alone.

5. That a ration consisting of five parts corn and one part Armour's tankage yielded over seven per cent greater net profits than a ration of corn alone.
Kennedy and Marshall: The results of a swine feeding experiment