

OKLAHOMA
AGRICULTURAL EXPERIMENT STATION
Animal Husbandry Department
STILLWATER, OKLAHOMA

Swine Feeding Investigations

*Oklahoma Feeds and
How to Prepare Them*

By
CARL P. THOMPSON

SWINE FEEDING INVESTIGATIONS

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During the past four or five years several feeding experiments have been conducted by the animal husbandry department of this station with two main objects in view: First, to determine the comparative value of the various feeds available in Oklahoma for fattening hogs; second, to determine the best and most economical method of preparing feed for hogs. With this thought in mind, the following grains have been compared: corn, kafir, milo maize, feterita, darso, cane, barley and oats. There was also one lot where garbage was fed but this was merely incidental and not a part of our main project.

Our work in determining the best method of preparing feed for hogs has been confined to barley and kafir. There has been numerous tests by other Stations showing that there is no particular advantage in grinding corn. A considerable amount of the work done at this Station has been confined to kafir and the grain sorghums due to the fact that, especially in the western part of the state, the grain sorghums are a surer crop than corn. The following figures will give some idea of the importance of grain sorghums as a feed in Oklahoma.

The census report of 1919 and 1920 shows that the value of the grain sorghum crops grown in Oklahoma is by no means a small consideration as compared with the other grain crops. The total value of the 1919-1920 crops are as follows: corn, \$122,221,000; oats, \$59,193,000; barley, \$4,822,000 and grain sorghums, \$65,166,000. In other words, the grain sorghum crop is equivalent in value to a little more than 50 percent of the total value of that of corn. These figures are based upon years that have been very favorable for corn production from the standpoint of rainfall. Kafir, milo and feterita are the principal grain sorghums grown in the state, while darso at present is possibly one percent of the total amount of grain sorghums produced in Oklahoma.

The 1920 census shows that Oklahoma has 1,304,094 hogs, upon farms, valued at \$17,000,355. With this number of hogs upon the farms of the state of Oklahoma and the grain sorghums equal to 50 percent of the value of the corn crops would naturally tend to create an interest in the feeding value of the grain sorghums.

Digestible Nutriments in 100 Pounds of the Following Feeds

Taken from Henry & Morrison—Feeds and Feeding

Dry Matter	Cr.	Protein	Carbo- hydrates	Fat	N. Ratio
Corn	89.5	7.5	67.80	4.6	1:10.4
Kafir	88.2	9.0	63.80	2.3	1:7.9
*Darso	87.0	10.03	70.46	2.9	1:7.6
Cane	87.3	7.5	66.20	2.3	1:9.6
Oats	90.8	9.7	52.10	3.8	1:6.3
Barley	90.7	9.0	66.80	1.5	1:7.8

*Oklahoma Experiment Station, Dr. C. T. Dowell, Director.

The study of comparative yields, cost of growing and cost of harvesting the various crops used in this experiment is limited to a certain extent, but the data at hand was compiled from 275 different farms from three counties; north, central and western part of the state. This included all the available data on the cost of production of all of the crops used in this experiment.

Corn, 90 farms, \$5.57 per acre, 15.9 bushels average per acre.

Kafir, 55 farms, \$6.34 per acre, 15.9 bushels average per acre.

Oats, 130 farms, \$6.25 per acre, 30.9 bushels average per acre.

The above data was compiled in 1916 on the 1915 crops, and naturally would tend to pre-war prices as to labor. The cost of grinding must be added to the above. On the other hand, the crop shortage of the particular year was below normal as shown from the 1919 and 1920 crop report of the state.

All the factors of production were considered in the three above crops, from preparing the land to harvesting and marketing of the products. As shown in the above data, kafir might be taken as a fair representative from the grain sorghums as practically all the same factors would be considered in production. The same might apply to oats as representing the cost of production in barley.

The yield per acre in 1915 being below normal would not mean an increase in cost of production when having a larger yield per acre since the cost of harvesting which is a minor factor in cost of production would be the only one that would be increased materially. But as stated before, the cost of labor at present would mean a slight increase in the cost of production in all crops used in this experiment.

*Agricultural Economics Department, Oklahoma.

1919 Crop Census Report

Crop	Acres	Production	Average Yield Per Acre
Corn	2,472,905	53,851,093	21.4 bushels
Oats	1,573,055	45,470,191	35.0 bushels
Grain Sorghums	1,152,430	17,901,096	15.5 bushels
Barley	77,324	781,839	23.0 bushels

1920 Revised Estimate by State Board of Agriculture

Crop	Acres	Production	Average Yield Per Acre
Corn	2,820,000	78,960,000	28.0 bushels
Oats	1,650,000	54,450,000	32.9 bushels
Barley	166,000	2,784,000	24.0 bushels
Grain Sorghums	1,350,000	35,100,000	26.0 bushels

EXPERIMENT NO. 1

A Comparison of Corn, Oats, Barley, Darso and Kafir for Fattening Swine

Test began November 11, 1920; test ended January 11, 1921.

	Ground Corn and Tankage	Ground Oats and Tankage	Ground Barley and Tankage	Ground Darso and Tankage	Ground Kafir and Tankage
Lots	I	II	III	IV	V
(days)					
1. Length of feeding period	60	60	60	60	60
2. Number in lot	8	8	8	8	8
3. Initial weight	1332	1333	1236	1252	1312
4. Average initial weight	166.5	166.6	154.5	156.5	164.0
5. Total gain	781	313	784	983	1031
6. Total gain per head	97.6	29.1	98.0	122.8	128.8
7. Ave. daily gain per head	1.30	0.52	1.30	1.64	1.72
8. Final weight	2113	1646	2020	2235	2343
9. Ave. final weight per head	264.1	195.7	252.5	279.3	292.8
10. Total amount feed consumed	C-2610 T-217	O-1739 T-70	B-3240 T-160	D-3730 T-373	K-3712 T-309
11. Amt. feed consumed daily	C-5.43 T-0.45	O-3.61 T-0.13	B-6.75 T-0.32	D-7.70 T-0.77	K-7.72 T-0.63
12. Amt. of feed required to produce 100 lbs. pork	C-332 T-27	O-555 T-22	B-414 T-17	D-376 T-37	K-359 T-30
13. Cost of 100 lbs. gain	\$ 4.96	\$10.66	\$ 6.18	\$ 5.96	\$ 5.44
14. Amt. Rec. per bu. for grain	1.21	0.60	0.86	0.97	1.09
15. Profit per lot	28.80	3.20	18.16	24.96	32.48
16. Profit per head	3.60	0.40	2.27	3.12	4.06
17. Efficiency	100%	68%	91.7%	95.1%	99%

Cost of Grain.—Corn 60 cents, kafir 60 cents, darso 60 cents, barley 60 cents, oats 55 cents per bushel; tankage \$5.00 per cwt.

Experiment No. 1—A Direct Comparison of Corn, Kafir, Barley, Darso and Oats for Fattening Hogs

Forty pigs of uniform age, quality, condition and weight were divided into groups of eight each and placed in dry lots. The pigs in each of these lots were hand fed twice daily all of the mixture they would consume, the feed being moistened each time. All the lots were housed in a colony house, which had cement floors throughout, with a small outside run. The pens were kept clean and well bedded, with plenty of fresh water to drink.

The experiment extended over a period of sixty days. The pigs were weighed three successive days at the beginning and at the end of the test and the average of these three days' weights used as the initial and final weights, respectively. They were bought at 8½ cents and sold at the end of the test at the same price. All expenses involved were recorded except the labor, making the data complete so far as profit and loss is concerned.

A study of this experiment will show that the most rapid gains were made by the hogs receiving kafir, followed very closely by those receiving darso. The cost of 100 pounds of gain, however, was least in the corn fed group, based on the amount of feed required to produce 100 pounds of gain. This test shows that ground kafir has a feeding value of almost that of corn, with darso and barley slightly less than kafir. The most outstanding results of this experiment, aside from showing the value of darso and kafir as a feed, is in the poor showing made by oats, being only 68 percent as efficient as corn for fattening hogs.

EXPERIMENT NO. 2

A Comparison of Corn, Darso, Barley, Kafir and Cane for Fattening Swine

Test began January 23, 1921; test ended March 22, 1921.

	Ground Corn and Tankage	Ground Kafir and Tankage	Ground Darso and Tankage	Ground Barley and Tankage	Ground Cane and Tankage
1. Lots	I	II	III	IV	V
2. Length of feeding period (days)	60	60	60	60	60
3. Number in lot	6	6	6	6	6
4. Initial weight	611	618.5	625.5	661.5	645
5. Ave. initial weight	101.8	103.0	104.1	110.2	107.4
6. Total gain	584	515.5	414.5	598.5	565
7. Ave. daily gain per head	1.61	1.41	1.17	1.66	1.55
8. Total gain per head average	97.3	85.9	69.0	99.07	94.1
9. Average final weights	199.1	188.9	173.1	209.9	201.5
10. Final weights	1195	1134	1040	1260	1210
11. Nutritive ratio	1:6.30	1:6.07	1:6.23	1:6.03	1:6.31
12. Total Amt. feed consumed	C-1641 T-149	K-1773 T-161	D-1848 T-167	B-2053 T-187	C-2127 T-193
13. Amt. of feed consumed daily per head	C-4.55 T-0.60	K-4.75 T-0.43	D-6.15 T-0.46	B-5.70 T-0.52	C-6.08 T-0.53
14. Amt. of feed required to pro- duce 100 lbs. pork	C-297 T-11	K-343 T-37	D-445 T-25	B-322 T-57	C-376 T-38
15. Cost to produce 100 lbs. gain	\$4.41	\$ 3.74	\$5.31	\$ 4.65	\$ 6.19
16. Amt. received per bushel for grain	1.40	1.09	0.78	1.10	0.99
17. Profit per lot	19.90	15.40	6.46	19.35	8.97
18. Profit per head	3.31	2.56	1.07	3.22	1.49
19. Efficiency	100%	86%	66%	92%	78%

Cost of Grain—Corn 68 cents per bushel, kafir 58 cents, darso 58 cents, barley 55 cents, cane 75 cents; tankage \$3.50 per cwt.

Experiment No. 2— A Direct Comparison of Corn, Kafir, Barley and Cane (Orange) for Fattening Swine

Thirty pigs which were high grade Durocs, varying somewhat in size, but of uniform quality and condition, were divided into groups of six each and were placed in dry lots, same as Lot No. 1. The lots were so divided as to make them practically equal according to weight. Each of the lots were hand fed and housed under ideal conditions, giving them all they would eat twice daily with plenty of clear water kept before them and also a mixture of charcoal, sulphur and salt kept before them during the entire feeding period.

The feeding extended over a period of sixty days. The pigs were weighed as in Test No. 1. Each lot was weighed every 10 days during the feeding period. The results did not show any conclusive facts as to the rate of gain during the feeding period.

The hogs were bought at 8½ cents and sold on local market at 8 cents. All expenses were considered except labor. In this test, cane seed was used in comparison with barley, darso, kafir and corn. A study of this experiment shows that corn still leads as the most efficient feed for hogs. It will be noted, however, that darso did not show the same good results as was found in the previous test. This was no doubt due to the fact that the darso used in this test was badly moulded and not eaten readily by the hogs. A study of the next experiment shown in table three which was run to give a check on the darso shows much more favorable results.

Kafir in this test did not show as favorable results as in the preceding test; this being partly due to the quality of the kafir used. Cane, while not showing the efficiency of the other grain sorghums, nevertheless, is a satisfactory hog feed where it is available and can be secured at a reasonable price.

EXPERIMENT NO. 3

A Comparison of Corn and Darso for Fattening Swine

Test began December 1, 1921; test ended January 31, 1922.

Lots	Corn and Tankage		Darso and Tankage	
	I		II	
1. Length of feeding period (days)	60		60	
2. Number in lot	8		8	
3. Initial weight	1056		1070	
4. Ave. initial weight	132		134.6	
5. Total gain	744		698	
6. Average final weights	225		221.8	
7. Gain per head	93		87.2	
8. Final weights	1800		1775	
9. Nutritive ration	1:6.30		1:6.23	
10. Amount of feed consumed per head daily	C-5.45		D-5.25	
	T-0.85		T-0.21	
11. Total amount feed consumed	C-2616		D-2522	
	T-218		T-102	
12. Amt. feed required to produce 100 lbs. pork	C-350		D-360	
	T-31		T-15	
13. Cost 100 lbs. gain	\$ 3.87		\$ 3.14	
14. Amt. received per bu. for grain	1.58		1.56	
15. Profit per lot	45.02		48.29	
16. Profit per head	5.62		6.02	
17. Price received per bu. through grain	1.01		.98	
18. Efficiency	100%		97.5%	

Cost of Grain—Corn 47 cents, darso 42 cents.

Experiment No. 3—A Direct Comparison of Corn and Darso

The musty darso used in Test No. 2 necessitated a check to be run in order to get more conclusive facts upon the feeding value of darso.

The experiment extended over a period of sixty days. This test was conducted exactly the same as in Test No. 2, with the exception of eight pigs to the pen instead of six as were used in Test No. 2.

The pigs used were purebred Durocs and Poland Chinas. They were all in good condition and of high quality. Both lots made a good start, from the beginning, as is shown by the average daily gain. The pigs were all raised on the College farm but in figuring the cost of the experiment \$6.25 was charged, which was 75 cents higher than the top on Oklahoma City market December 1st. They were sold on local market at \$7.75 which is a margin of \$1.50 per hundred. All expenses involved were recorded except labor.

The darso in this test was of excellent quality free from mould and was readily consumed. The rate of gain was identical in the two groups and the darso proved almost as valuable, pound for pound, as corn.

EXPERIMENT NO. 4

Hogs Used

From November 1, 1918, to December 10, 1918.

The hogs used for this experiment were uneven in size and varied somewhat in age, but each lot contained an equal number of pigs of the same age and weight. All hogs had been run on alfalfa pasture during the summer with a little grain, and were all placed in dry lots one week before the experiment started and fed on ground barley and tankage. Each pen contained

eight hogs, four of which were purebred Duroc Jersey, two were purebred Poland China, and two were Duroc-Jersey-Poland-China crossed. The hogs were weighed for three consecutive days, and the average taken as the initial weight.

Time of the Experiment

The experiment began November 1, 1918, and ran for forty days. All hogs were thrifty when put on feed, and remained so until the end of the experiment.

Rations fed:

- Lot 1. Garbage from College dining hall.
- Lot 2. Ground oats 16 parts, tankage 1 part.
- Lot 3. Ground corn and ground barley mixed, equal parts; 12 parts of grain to 1 of tankage.
- Lot 4. Ground corn 12 parts, tankage 1 part.
- Lot 5. Ground barley 12 parts, tankage 1 part.

The garbage was from the College dining hall and contained no dish water. The corn, oats and barley were all of good quality. All lots were fed all they could clean up twice a day. The grain rations were fed moist, but not soaked or sloppy.

Gains Made

Lots	I	II	III	IV	V
Total initial weight per pen	1,142.7	1,167	1,122	1,114	1,158.3
Total final weight per pen	1,795	1,635	1,727	1,755	1,683
Total gain per pen	652.3	468	607	641	524
Daily gain per pen	14.85	10.63	13.8	14.57	11.91
Ave. initial weight per pig	142.8	145.8	140.28	139.25	144.8
Ave. final weight per pig	224.38	204.37	215.87	219.37	210.37
Ave. total gain per pig	85.4	58.5	75.87	80.12	65.5
Ave. daily gain per pig	1.86	1.34	1.73	1.82	1.48

Feed Consumed and Cost of Gain for Forty Days Feeding Period

	Total Feed Consumed	Total Cost of Feed per Pen	Feed per 100 lbs. Gain
Lot 1—Garbage	7,682	\$ 17.60	1,177.6
Lot II { Oats	2,950		Oats 633.41
{ Tankage	184.5		Tankage 35.17
{ Total	3,134.5	\$ 83.90	Total 668.58
Lot III { Corn	1,192		Barley 212.68
{ Barley	1,291		Corn 196.37
{ Tankage	209		Tankage 34.43
{ Total	2,692	\$107.05	Total 443.48
Lot IV { Corn	2,464		Corn 384.4
{ Tankage	206.25		Tankage 32.17
{ Total	2,670.25	\$ 92.65	Total 416.57
Lot V { Barley	2,409		Barley 459.73
{ Tankage	203		Tankage 38.74
{ Total	2,612	\$ 75.01	Total 498.47

	Cost of 100 lbs. Gain	Total Profit per Pen	Profit per Pen on Grain Only	Total Profit per Hog	Profit per Hog on Grain Only
Lot I	\$ 2.69	\$101.53	\$90.10	\$12.69	\$11.26
Lot II	17.93	3.77	7.90*	.48	.98*
Lot III	14.03	23.18	11.86	2.89	1.49
Lot IV	14.45	22.65	11.51	2.83	1.44
Lot V	14.31	21.72	10.14	2.71	1.26

*Loss

In arriving at the foregoing figures the following prices paid for feed laid down at Stillwater were used:

The garbage was purchased at the College dining hall at a cost of \$12.00 per month delivered to the barn.

Corn, \$1.85 per bushel, or \$3.30 per 100 pounds.

Oats, 80 cents per bushel, or \$2.50 per 100 pounds.

Barley, \$1.27 per bushel, or \$2.65 per 100 pounds.

Tankage, \$5.50 per 100 pounds.

Summary

In this experiment all rations were fed by hand so as to approach as near as possible the conditions used on the average Oklahoma farm. All rations were fed moist to prevent waste.

The hogs were well finished except the lot fed on oats, which showed considerable lack of finish, but when sold in with the other lots were not lacking enough in finish to prevent the load topping the Oklahoma City market.

In regard to the amount of gain from 100 pounds of feed, the following table will be of interest:

Pork produced from 100 pounds grain supplemented with tankage:
 100 pounds corn and 8.3 pounds tankage produced 26.00 lbs. pork.
 100 pounds barley and 8.3 pounds tankage produced 21.75 lbs. pork.
 100 pounds oats and 6.3 pounds tankage produced 15.8 lbs. pork.
 100 pounds barley when fed with corn and 8.3 pounds tankage produced 24.04 lbs. pork.

It will be noticed that where corn and barley were fed half-and-half that 100 pounds of barley produced 2.19 pounds more pork than where barley was fed alone.

In arriving at this conclusion, the corn used was credited with producing as much pork as the same amount of corn produced in Lot 4.

On a percent basis, figuring corn as 100 percent efficient, the above figures would indicate that barley is only 83.62 percent as efficient as corn when fed alone, and 92.41 percent as efficient as corn when fed with corn in equal parts.

Oats proved to be only 61.01 percent as efficient as corn.

The hogs topped the market at Oklahoma City, selling at \$17.40 per 100, but the figures used in figuring the results in this report was \$15.25 per 100, the price bid by the local buyer. The hogs cost laid down \$15.50 per 100 pounds.

Price Paid for Feed, and Price Received When Fed to Hogs

Feed	Price Paid	Total Price Received	Price Received for Gain Only
Garbage	\$.21 per cwt.	\$2.79 per cwt.	\$1.39 per cwt.
Corn	1.85 per bu.	2.44 per bu.	2.18 per bu.
Barley	1.27 per bu.	1.72 per bu.	1.47 per bu.
Oats80 per bu.	.91 per bu.	.71 per bu.
Barley when fed with corn	1.27 per bu.	1.27 per bu.	1.50 per bu.
Tankage	5.50 per cwt.	5.50 per cwt.	5.50 per cwt.

In figuring total price received for grain when fed to hogs, the grain was credited with all profit after deducting buying price of hogs and cost of tankage used. In figuring the price of grain when fed to hogs on basis of gains only, the grain is credited with all gain in weight minus the cost of tankage used.

Summary

1. Corn proved to be more efficient than barley or oats for fattening hogs.
2. Barley was more efficient when fed with half corn than when fed alone.
3. Oats proved decidedly inferior to corn and barley for fattening purposes.
4. Garbage, where available, is a good source of hog feed and proved very efficient.
5. With prevailing prices of barley and corn, there was but little difference in profit from feeding these two feeds.

EXPERIMENT NO. 5

From December 1, 1918, to February 9, 1919.

Methods of Preparing Barley for Hog Feeding

With the price of barley lower than corn, there were thousands of bushels of barley fed in Oklahoma the past year, and the question that naturally arose was, how should barley be prepared for feeding to give the best results. With this end in view, five lots of pigs, with five pigs to the lot were fed barley prepared or fed in different ways.

Lot 1 was fed whole barley dry.

Lot 2 was fed whole barley, free choice.

Lot 3 was fed whole barley, soaked.

Lot 4 was fed ground barley, hand-fed, moist.

Lot 5 was fed ground barley, free choice.

In each lot tankage was used to supplement the barley. In all lots that were hand-fed, tankage was fed at the rate of 1 pound of tankage to 12 parts of barley. In the free choice lots, barley was placed in one compartment of the self-feeder and tankage in the other where the hogs had access to both at all times during the experiment.

Hogs Used

The pigs used for this experiment had the run of wheat pasture with a

little barley up to the time the experiment started. They were purebred Duroc Jersey, all sired by the same boar, and were uniform in age and size.

The experiment was started December 1, 1918, and continued for seventy days.

The hogs cost \$14.50 laid down at the College hog barn, and sold for \$18.25 seventy days later at the barn.

Barley cost \$1.27 per bushel and tankage \$5.50 per 100 pounds.

Gain per Pen and per Pig

Lots	I	II	III	IV	V
Initial weight per pen	455	460	458	444	488
Final weight per pen	840	846	860	886	864
Total gain per pen	385	386	402	443	416
Daily gain per pen	5.5	5.51	5.74	6.33	5.94
Average initial weight per pig	91	92	92	89	90
Average final weight per pig	168	169	172	177	173
Average total gain per pig	77	77	80	88	83
Average daily gain per pig	1.1	1.1	1.15	1.27	1.19

From the above table it is observed that barley fed whole, dry, gave the same rate of gain whether fed in the self-feeder or by hand, but where barley was soaked, the rate of gain was increased. Ground barley gives more rapid gains than whole barley, and when fed by hand gives more rapid gains than when fed in the self-feeder. However, the rate of gains is not a true index to the value of the different rations, as will be seen by the following table:

Lots	I	II	III	IV	V
Total feed consumed per pen	Barley 1,684 Tankage 138 Total 1,822	Barley 1,684 Tankage 136 Total 1,820	Barley 1,884 Tankage 140 Total 2,024	Barley 1,792 Tankage 153 Total 1,945	Barley 1,695 Tankage 123 Total 1,818
Total cost of feed per pen	52.32	51.55	57.63	55.91	51.87
Feed per 100 lbs. gain	473	466	506	440	437
Cost of 100 lbs. gain	13.53	13.37	14.31	12.62	12.44
Profit per pen, total	35.01	36.22	33.01	41.41	40.97
On gain only	18.17	18.84	15.84	24.94	24.16
Profit per pig, total	7.00	7.24	6.60	8.28	8.19
On gain only	3.63	3.77	3.17	4.99	4.83

Comparing Lots 1, 2 and 3, it is observed that where barley was fed whole in the self-feeder, less barley was eaten than when fed by hand, and that less grain was required for 100 pounds gain. The hogs in Lot 3, getting whole barley soaked, consumed more feed and required more feed for 100 pounds gain than the whole barley fed, either hand-fed or self-feeder.

Grinding increased the amount of feed consumed and the rate of gain, but decreased the feed required for 100 pounds gain over barley fed whole. Soaking gave almost as rapid gain as the ground barley lots, but required more feed to produce 100 pounds of gain than any of the other lots.

Comparing the free-choice lots, ground barley free-choice, gave more

rapid gains, and twenty-nine pounds less feed was required to produce 100 pounds of gain than where whole barley was fed free-choice. It is interesting to note also that, where the barley was fed ground, free choice, less tankage was eaten than where the barley was fed whole, free choice.

One pound of tankage was eaten for every 13.7 pounds of ground barley but when fed whole, 1 pound of tankage was consumed for every 12.3 pounds barley. Ground barley fed by hand gave more profit per hog than when self-fed, although 100 pounds of gain was produced with less feed when self-fed than when hand-fed. The large profit was due to the larger amount of gain made by the hand-fed group.

From the standpoint of efficiency and figuring whole barley hand-fed as 100 percent efficient, we find the value of barley fed in different ways:

- Whole barley, hand-fed, 100%.
- Whole barley, self-fed, 101.5%.
- Whole barley, soaked, 93.5%.
- Ground barley, moist, hand-fed, 107.5%.
- Ground barley, self-fed, 108.23%.

The following table gives the comparative price received for barley when fed to hogs after deducting the cost of tankage eaten:

	Price Paid	Price Received	
		Total	On Gain Only
Lot 1—Whole barley, dry, hand-fed, 12 parts barley, 1 part tankage	\$1.27	\$2.27	\$1.78
Lot 2—Whole barley and tankage, free choice	1.27	2.31	2.81
Lot 3—Whole barley, soaked, 12 parts; tank- age 1 part	1.27	2.11	1.67
Lot 4—Ground barley, hand-fed, 12 parts; tankage 1 part	1.27	2.38	1.94
Lot 5—Ground barley and tankage, free choice	1.27	2.33	1.96

The hogs used for this experiment cost \$14.50 per 100 pounds laid down, and sold for \$18.25 locally. In the column headed "total selling price per bushel for barley", the total profit, after deducting buying price and cost of tankage consumed, was credited the barley. In the column headed "prices received in gain only" the barley was credited with the gains made at the selling price of the hog, minus the cost of the tankage eaten.

Summary

1. Grinding barley increases its value from 7% to 10%.
2. Soaking barley lessens the feeding value almost 7% under the whole barley, and 15% to 17% under ground barley.
3. There was a slight advantage in feeding either whole or ground barley in a self-feeder.
4. Judging from amount of tankage used in free-choice lots, the ration of 1 part of tankage to 12 or 13 parts of barley is about right.

EXPERIMENT NO. 6**Feeding Test to Determine the Value of Different Ways of Preparing Barley for Hog Feeding**

November 1, 1919, to February 10, 1920.

Five pens of hogs of equal age and breeding were used. There were five hogs to each lot. The average weight of the hogs used in this experiment was approximately 140 pounds. Barley was fed to all lots as the sole grain ration and was balanced with tankage as a protein supplement.

Lot I was hand-fed whole barley, dry, and tankage at the rate of 12 parts barley to 1 part tankage.

Lot II was fed barley and tankage in the self-feeder, free choice.

Lot III received whole barley that had been soaked for 12 hours and tankage fed by hand at the rate of 12 parts barley to 1 part tankage.

Lot IV received ground barley moistened and fed by hand, 12 parts barley to 1 part tankage.

Lot V received ground barley and tankage, free choice.

The accompanying table gives in detail the result of this experiment.

	Ave. initial weight	Ave. final weight	Ave. daily gain	Feed per 100 lbs. gain	Cost of 100 lbs. gain	Efficiency of ration
Lot 1—Whole barley, hand-fed, 12 parts barley, 1 part tankage	146.4	200	1.07	Barley 534 Tankage 48 Total 582	\$19.07	100%
Lot II—Whole barley and tankage, free choice	141.6	187	.9	Barley 666 Tankage 120 Total 786	27.07	74%
Lot III—Whole barley, soaked, 12 parts, tankage 1 part	148.4	206	1.14	Barley 504 Tankage 46 Total 550	18.23	105.8%
Lot IV—Ground barley, hand-fed, moist, 12 parts; tankage 1 part	136	211	1.5	Barley 438 Tankage 40 Total 478	\$15.85	121.7%
Lot V—Ground barley and tankage, free choice	142.4	212	1.39	Barley 473 Tankage 86 Total 559	20.88	104.1%

It will be noted in comparing this test with a similar test conducted a year ago that this checks up very closely with the previous test except in the self-feeder lots. In the previous test, the self-feeders did better than where the same feeds were fed by hand. However, in this case both lots that were fed with the self-feeder consumed more feed per 100 pounds gain than where the same feeds were fed by hand. It will also be noticed that where the hogs had access to the self-feeder that a larger proportion of tankage was consumed than in the previous test and considerable more tankage consumed than was given in the hand-fed lots. In the previous test the proportion of tankage to barley consumed in the free choice lots was approximately 1 part tankage to 12 parts barley, which was practically the same as where they were fed by hand. In this test the hogs in the free choice lots consumed 1 part of tankage to approximately 6½ pounds of barley. The probable explanation for the fact that the self-feeder lots consumed more tankage in proportion to barley is that the barley was of rather inferior quality, containing a large percent of crude fiber, whereas the barley in the preceding test was extremely good quality, containing the minimum of crude fiber.

The following is a summary of results secured in this test:

1. Ground barley whether fed by hand or in the self-feeder is much more efficient for fattening hogs than whole barley.
2. Soaking barley does not seem to improve to any considerable extent the feed qualities of barley.
3. 100 pounds of ground barley is equal in feeding value to from 110 pounds to 120 pounds of whole barley.
4. This test would indicate that the self-feeder will not always give satisfactory results where barley is used.

Further investigation will be necessary before conclusive results can be secured.

GENERAL SUMMARY

There has not been sufficient work done at this Station to warrant the drawing of positive conclusions. However, the work completed is sufficient to make the following summary of considerable importance:

1. Corn is the best carbonaceous concentrate for fattening hogs where properly supplemented.
2. Kafir when ground ranks a close second to corn in feeding value; being about 5 to 10 percent less valuable, pound for pound, than corn.
3. Milo maize and barley when ground have about the same feeding value as kafir, probably slightly less.
4. Darso and feterita are a shade less efficient for fattening hogs than kafir, but should be considered as having approximately the same feeding value.

5. Oats, while a good feed for growing hogs and brood sows, is not satisfactory as a fattening ration. 65 to 75 pounds of corn or grain sorghums is equal in feeding value to 100 pounds of oats for fattening hogs.
6. Cane seed is a satisfactory substitute for corn, barley and the grain sorghums for fattening hogs but has a feeding value of only 60 to 70 percent of that of corn and the grain sorghums.
7. Garbage, where of good quality and free from washing powders, glass, etc., can be used in the feeding of hogs with satisfactory results.
8. There is little difference in the value of corn fed in the ear or shelled as when ground.
9. All small grains, such as kafir, milo maize, feterita, darso, cane, barley and wheat should be ground to give the highest feeding value. 10 to 25 percent is added to the feeding value of these grains by grinding.
10. Soaking the small grains increases their palatability but does not increase the digestibility. In fact most tests indicate that more grain is required to produce 100 pounds of gain where the small grains are soaked than when fed dry.
11. Moistening ground grain increases the palatability and gives slightly greater gain than when fed dry.
12. The self-feeders are satisfactory in the feeding of all kinds of grain but more especially where shelled corn and ground grains are used. Where the grain sorghums, barley and other small hard grains are fed, the self-feeder does not seem to be of particular advantage.

