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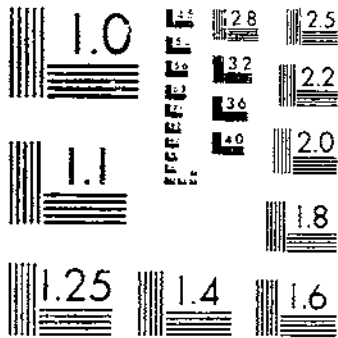
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CORRECTING THE INEFFICIENCY OF PEANUTS FOR GROWTH IN PIGS

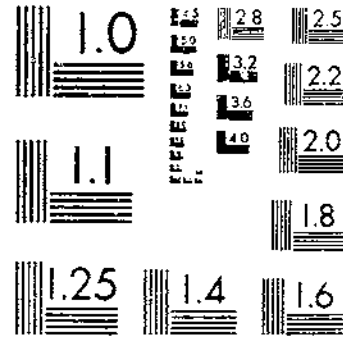
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MICROCOPY RESOLUTION TEST CHART  
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

UNITED STATES DEPARTMENT OF AGRICULTURE  
WASHINGTON, D. C.

# CORRECTING THE INEFFICIENCY OF PEANUTS FOR GROWTH IN PIGS

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## INTRODUCTION

During the last eight years the United States Department of Agriculture in cooperation with a number of the State agricultural experiment stations has been making a comprehensive study of the soft-pork problem. Numerous feeds and other factors suspected of causing pork to be soft or oily have been studied in much detail and under varying conditions. One of the first feeds to receive consideration in these investigations was peanuts. These were made the subject of early investigation because of the widely prevailing belief at that time that they were the outstanding softening feed in the United States.

Studies were planned and carried out (1) to determine the effects of peanuts grazed and self-fed, with and without mineral mixtures, upon the firmness of the carcass; and (2) to learn the requirements for hardening peanut-fed pigs. From the many experiments was obtained a volume of feeding results, in addition to the data from carcass and fat studies, which supplied much additional information as to the value of peanuts for fattening under the different conditions.<sup>1</sup>

Peanuts bore the reputation of being a highly satisfactory hog feed, particularly for fattening purposes. Many experiment stations recommended the plans of feeding mentioned in the preceding paragraph, and it was customary on farms in the peanut-producing sections of the country to follow these methods. Results reported in Department Bulletins 1407<sup>2</sup> and 1492<sup>3</sup> showed that peanuts fed to pigs with initial weights of approximately 100 pounds and 115 pounds, respectively, while producing a moderately rapid rate of gain, were reason-

<sup>1</sup> HANKINS, O. G., and ELLIS, N. R. SOME RESULTS OF SOFT-PORK INVESTIGATIONS. U. S. Dept. Agr. Bul. 1407, 68 p., illus. 1926.

<sup>2</sup> HANKINS, O. G., and ELLIS, N. R. *Op. cit.*, p. 27, 28.

<sup>3</sup> HANKINS, O. G., ELLIS, N. R., and ZELLER, J. H. SOME RESULTS OF SOFT-PORK INVESTIGATIONS, II. U. S. Dept. Agr. Bul. 1492, p. 16. 1928.

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ably efficient with respect to the quantity required per unit of gain. Approximately 490 pigs were involved in the experiments to which reference is made.

Table 1 shows the average composition of shelled and unshelled peanuts.

TABLE 1.—Average composition of shelled and unshelled peanuts<sup>1</sup>

Kind of peanuts	Water	Ash	Protein	Fiber	Nitrogen-free extract	Fat
Shelled (as consumed by hogs).....	Per cent 5.5	Per cent 2.3	Per cent 30.2	Per cent 2.8	Per cent 11.6	Per cent 47.6
Unshelled.....	6.0	2.8	24.7	18.0	15.4	33.1

<sup>1</sup> Figures from the cattle food laboratory Bureau of Chemistry, United States Department of Agriculture.

It is with shelled peanuts that this bulletin deals especially since hogs do not eat the shells even when unshelled peanuts are fed.

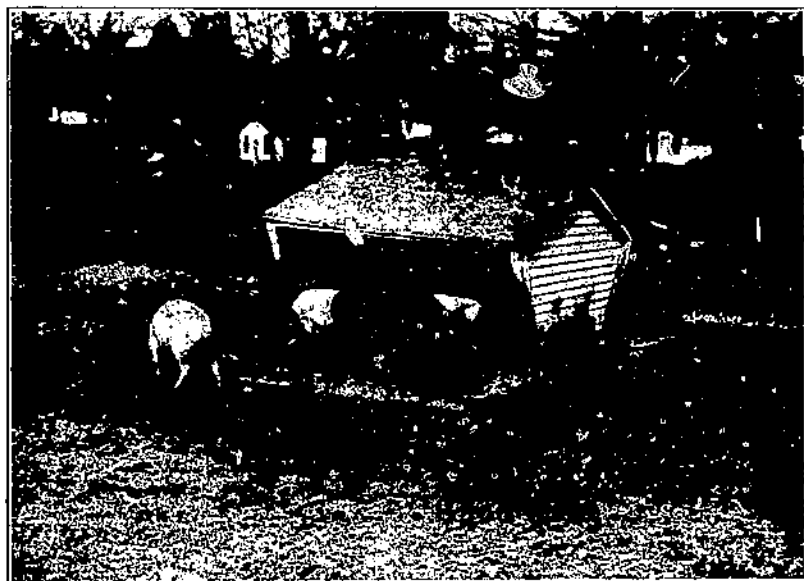


FIGURE 1.—Growing pigs self-fed with unshelled peanuts and supplements. The material on the platform and ground near by is principally empty shells

(Fig. 1.) The high percentages of fat and protein are especially noteworthy. The digestible nutrients of shelled peanuts are as follows:<sup>4</sup>

Digestible protein.....	Per cent 27.4
Digestible carbohydrates.....	10.0
Digestible fat.....	42.9

From these figures it is calculated that the nutritive ratio of shelled peanuts is 1:3.9. This suggests the possibility that peanuts without a protein supplement may also be suitable as a feed for growing pigs. It is a rather common practice, in fact, in sections where peanuts grow well, to feed them to growing pigs as well as to fattening hogs, without a protein supplement.

<sup>4</sup> HENRY, W. A., and MORRISON, F. B. FEEDS AND FEEDING. Ed. 18, unbridged, 770 p., illus. Madison, Wis. 1923.

## PURPOSE OF THE INVESTIGATION

The primary object was to study the hardening requirements of pigs having an initial weight of between 30 and 60 pounds when fed corn, tankage, and minerals as a hardening ration following the peanut ration. The feeding results from the peanut rations at first were a secondary consideration, but the importance of a comparative study of the feeding value of peanuts and minerals with and without an animal-protein supplement soon became apparent.

Very few pigs in the peanut-growing sections of the country are fed protein supplemental feeds with peanuts. The question arose as to whether the hog producer in the peanut-growing section was actually getting the best results from his method of feeding peanuts, or whether the addition of a protein supplement to the peanut ration for growing pigs would enable the feeder to make a more efficient use of peanuts. In order to determine this the series of three experiments reported in this bulletin was conducted.

## RESULTS OF THE FIRST EXPERIMENT, 1924-25

In November, 1924, an experiment was begun at the United States Animal Husbandry Experiment Farm, Beltsville, Md., in which low-grade shelled peanuts, mineral mixture, and, later, tankage, were fed to purebred fall pigs having an average initial weight of 39.3 pounds. Table 2 shows the composition of the peanuts and tankage which were fed in this experiment.

TABLE 2.—Composition of feeds used in first experiment<sup>1</sup>

Feed	Water	Ash	Protein	Fiber	Nitrogen-free extract	Fat
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Peanuts, low grade, shelled.....	4.00	5.73	26.23	2.49	24.33	36.30
Tankage.....	9.08	21.77	61.56	1.26	1.22	5.11

<sup>1</sup> Analyses by the cattle food laboratory, Bureau of Chemistry, United States Department of Agriculture.

The mineral mixture was composed of the following:

	Pounds		Pounds
Charcoal.....	75	Glauber salt.....	6
Common salt.....	6	Copperas.....	1
Ground limestone.....	6	Raw phosphate rock.....	3
Flowers of sulphur.....	3		

At the beginning of this experiment the peanuts and the mineral mixture were self-fed, free choice, to all the pigs. This feeding continued for eight weeks. The results for this period are summarized in the following tabulation:<sup>2</sup>

Number of pigs used.....	25
Number of days fed.....	56
Average initial weight.....	39.3 pounds
Average final weight.....	58.8
Average gain.....	19.5
Average daily gain.....	.35
Average quantity of peanuts consumed daily per pig.....	1.51
Average quantity of peanuts consumed per 100 pounds gain.....	436.2

<sup>2</sup> Exact figures on consumption of minerals not available.

The charcoal available for use in the mineral mixture in the self-feeder had been finely pulverized, and strong winds caused unavoidable wastage. The further fact that charcoal comprised the bulk of the mixture necessarily makes the consumption figures for it unreliable. For that reason they are not given for this experiment nor in the results of the two following experiments.

The very low average daily gain is especially striking. Likewise the poor feed utilization, as shown by the amount of peanuts consumed per 100 pounds gain, commands attention.

The poor showing made by these pigs was impressive. Considering this and the further fact that it is not theoretically sound for a feed to be satisfactory for both fattening and growth it was decided to modify the feeding of some of the pigs. The 25 pigs were divided, as equally as possible, with respect to weight, gain, age, thrift, and other factors, into two lots of 12 and 13 animals. One lot was self-fed tankage in addition to the peanuts and mineral mixture while the other group was continued on the peanuts-mineral-mixture ration without change. These two lots were fed for a 4-week period. Table 3 gives a summary of the results.

TABLE 3.—Results of feeding peanuts and mineral mixture, self-fed, free choice, with and without tankage, in dry lot

Item	Ration	
	Peanuts, mineral mixture, and tankage (lot 1)	Peanuts and mineral mixture (lot 2)
Pigs used.....number.....	13	12
Days fed.....do.....	28	28
Average initial weight.....pounds.....	58.2	56.2
Average final weight.....do.....	87.2	76.
Average gain.....do.....	29	16.8
Average daily gain.....do.....	1.03	.6
Average daily feed consumption:		
Shelled peanuts.....do.....	2.02	2.54
Tankage.....do.....	.43	
Total feed (exclusive of minerals).....do.....	2.45	2.54
Feed consumed per 100 pounds gain:		
Shelled peanuts.....do.....	196	427.6
Tankage.....do.....	41.2	
Total feed (exclusive of minerals).....do.....	237.2	427.6

The rate of gain in both lots was higher than that made by the 25 pigs during the first 8-week period. The tankage-fed lot, however, gained at a much more rapid rate during the 4-week period than the other lot and approximately trebled the daily gain made during the 8-week period. On the other hand the 12 pigs in the peanuts-mineral-mixture lot gained approximately 70 per cent faster than during the preceding 8-week period. This 70 per cent increase can be attributed, in part, to the larger size of the pigs when the 4-week period began and to the improved ability to utilize a fattening ration. The

marked advantage of feeding tankage with peanuts and mineral mixture to pigs of this size, however, is the very striking point brought out by these rates of gain.

Although there was little difference in the average daily consumption of feed in the two lots the feed utilization calls for attention. When tankage was fed there was a striking decrease in the amount of peanuts consumed per pound of gain in weight. In fact the feed requirement was remarkably low. Approximately 80 per cent more feed, not including minerals, was consumed per 100 pounds gain by the lot which received no tankage than by the other lot.

By calculation the consumption of nutrients per 100 pounds gain was determined. Table 4 shows the results of this calculation.

TABLE 4.—*Calculated amounts of nutrients consumed per 100 pounds gain in first experiment*

Nutrients	Lot 1			Lot 2: Peanuts
	Peanuts	Tankage	Total	
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Protein.....	51.45	25.36	76.81	112.22
Carbohydrates.....	52.57	1.02	53.59	114.06
Fat.....	71.15	2.11	73.26	155.18

A comparison of the total amount of each nutrient consumed per unit of gain by lot 1 and lot 2 is very interesting. In all three cases the amount in lot 1 is much less than in lot 2. Approximately one-third of the protein and small proportions of the other nutrients consumed by lot 1 were furnished by the tankage. It required 60.77 pounds of peanut protein consumed by lot 2 to replace 25.36 pounds of tankage protein consumed in the case of lot 1. In fact the protein, carbohydrates, and fat as shown for the tankage replaced 60.77, 62.09, and 84.03 pounds of peanut protein, carbohydrates, and fat, respectively, consumed by lot 2.

#### RESULTS OF THE SECOND EXPERIMENT, 1925-26

A second experiment in this series was conducted at the same farm from December 23, 1925, to February 17, 1926. Two lots of 20 purebred pigs each were fed. One lot was self-fed unshelled peanuts, tankage, and mineral mixture; the other lot received unshelled peanuts and mineral mixture. (Fig. 1.) The pigs were of fall 1925 farrow and ranged from approximately 30 to 60 pounds in weight when the test began.

Two different purchases of peanuts were used in this experiment. Table 5 shows the weighted average composition of the nuts (shelled basis) as consumed by the pigs in each lot. An analysis of the tankage which was fed is not available. The average composition of tankage, as reported by Henry and Morrison in *Feeds and Feeding*, also is shown in Table 5. This is given as representing satisfactorily the composition of the tankage fed.



TABLE 5.—Composition of feeds used in second experiment

Feed	Water	Ash	Protein	Fiber	Nitro- gen- free extract	Fat
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Peanuts (shelled basis) fed in lot 1 <sup>1</sup> .....	4.03	2.46	28.15	4.97	14.49	45.90
Peanuts (shelled basis) fed in lot 2 <sup>1</sup> .....	4.05	2.45	28.10	4.92	14.05	45.83
Tankage <sup>2</sup> .....	7.9	15.3	60.4	5.3	3.7	7.4

<sup>1</sup>Analyses by the cattle food laboratory, Bureau of Chemistry, U. S. Department of Agriculture.

<sup>2</sup>HENRY, W. A., and MORRISON, F. B. Op. cit.

The same mixture of minerals was used as in the first test.

The 40 pigs were on feed in the two lots for eight weeks. The results are summarized in Table 6.

TABLE 6.—Results of feeding unshelled peanuts and mineral mixture, self-fed, free choice, with and without tankage, in dry lot

Item	Ration		
	Peanuts, mineral mixture, and tankage (lot 1)	Peanuts and mineral mixture (lot 2)	
Pigs used.....	number.....	20	20
Days fed.....	do.....	50	50
Average initial weight.....	pounds.....	43.4	43.7
Average final weight.....	do.....	83.3	80.9
Average gain.....	do.....	39.9	37.2
Average daily gain.....	do.....	.71	.31
Average daily feed consumption:			
Unshelled peanuts.....	do.....	2.12	1.96
Peanuts (shelled basis).....	do.....	(1.54)	(1.42)
Tankage.....	do.....	.33	
Total feed (exclusive of minerals).....	do.....	2.45	1.96
Total feed (exclusive of minerals with peanuts on shelled basis).....	do.....	(1.87)	(1.42)
Feed consumed per 100 pounds gain:			
Unshelled peanuts.....	do.....	293.12	638.48
Peanuts (shelled basis).....	do.....	(216.44)	(462.26)
Tankage.....	do.....	46.96	
Total feed (exclusive of minerals).....	do.....	344.11	638.48
Total feed (exclusive of minerals with peanuts on shelled basis).....	do.....	(262.43)	(462.26)

As in the first experiment the tankage-fed lot made much more rapid gains. In this case, in fact, the rate of gain of lot 1 was approximately 2.3 times that of lot 2. A daily gain of 0.71 of a pound is practically normal for pigs of the size of these, whereas 0.31 of a pound, of course, is unsatisfactory.

It is of interest and probable significance that the pigs in lot 1 not only consumed an average of one-third of a pound of tankage per day but also somewhat more peanuts than lot 2. The feed utilization in the two lots was similar to that in the first experiment. Again, when tankage was fed there was a marked decrease in the quantity of peanuts consumed per unit of gain.

Although the amount of feed eaten per 100 pounds gain in weight in neither lot was as low as in the corresponding lot of the preceding

test, yet the showing made by lot 1 was very good and can not be considered lightly. On a shelled-nut basis approximately 76 per cent more total feed, exclusive of minerals, was consumed by lot 2 than by lot 1, per unit of gain. This compares with 80 per cent in the first test.

The consumption of nutrients per 100 pounds gain was determined by calculation, as shown in Table 7.

TABLE 7.—*Calculated amounts of nutrients consumed per 100 pounds gain in weight, in second experiment*

Nutrients	Lot 1			Lot 2: Peanuts
	Peanuts	Tankage	Total	
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Protein.....	60.03	27.78	88.71	123.90
Carbohydrates.....	42.12	4.14	46.26	90.46
Fat.....	93.35	3.40	102.75	211.85

In the case of each nutrient the total amount consumed per unit of gain by lot 1 was much less than by lot 2. This corresponds to the results of the first experiment. Again, approximately one-third of the protein and small proportions of the other nutrients consumed by lot 1 were furnished by the tankage. As compared with the ration of lot 2, the 27.78 pounds of tankage protein consumed per 100 pounds gain by lot 1 had replacement value equal to 68.97 pounds of peanut protein. Further calculation shows that the small amounts of carbohydrates and fat of the tankage, with the protein mentioned, had a value equal to the total value of 48.34 pounds, 112.50 pounds, and 68.97 pounds of the peanut carbohydrates, fat, and protein, respectively, consumed per 100 pounds gain by lot 2.

#### RESULTS OF THE THIRD EXPERIMENT, 1926-27

The third and last experiment in this series was conducted at the Beltsville farm from December 14, 1926, to February 9, 1927. Two lots of 20 purebred pigs each were used in the experiment. One pig in lot 2 died of pneumonia seven days after the experiment began. Lot 1, of 20 pigs, was self-fed unshelled peanuts, tankage, and mineral mixture; lot 2, of 19 pigs, had free access to unshelled peanuts and mineral mixture. Pigs of 1926 fall farrow were used, and they ranged in weight from 33 to 56 pounds, with an average weight of 45 pounds at the beginning of the experiment.

Table 8 shows the composition of the feeds used in the third experiment.

TABLE 8.—*Composition of feeds used in third experiment*<sup>1</sup>

Feed	Water	Ash	Protein	Fiber	Nitro- gen- free extract	Fat
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Peanuts (shelled basis).....	6.83	2.44	23.38	2.29	14.76	44.30
Tankage.....	8.30	20.88	60.00	1.90	2.11	6.81

<sup>1</sup> Analyses by the cattle food laboratory, Bureau of Chemistry, United States Department of Agriculture.

The mineral mixture used in this experiment was composed of the following:

	Pounds
Steamed bone meal.....	50
Ground limestone.....	25
16 per cent superphosphate.....	25
Cottonseed salt.....	5

The feeding results for the 8-week period of this test are summarized in Table 9.

TABLE 9.—Results of feeding unshelled peanuts and mineral mixture, self-fed, free choice, with and without tankage, in dry lot

Item	Ration	
	Peanuts, mineral mixture, and tankage (lot 1)	Peanuts and mineral mixture (lot 2)
Pigs used.....	20	10
Days fed.....	50	56
Average initial weight.....	45.5	45.3
Average final weight.....	102.8	69.5
Average gain.....	57.3	24.2
Average daily gain.....	1.02	.43
Average daily feed consumption:		
Unshelled peanuts.....	2.64	2.31
Peanuts (shelled basis).....	(1.87)	(1.62)
Tankage.....	.41	.....
Total feed (exclusive of minerals).....	3.07	2.31
Total feed (exclusive of minerals) with peanuts on shelled basis.....	(2.28)	(1.62)
Feed consumed per 100 pounds gain:		
Unshelled peanuts.....	259.60	537.48
Peanuts (shelled basis).....	(182.56)	(375.04)
Tankage.....	39.88	.....
Total feed (exclusive of minerals).....	290.48	537.48
Total feed (exclusive of minerals) with peanuts on shelled basis.....	(222.38)	(375.04)

As in the two preceding experiments the tankage-fed lot gained more rapidly than the other lot. The rate of gain in lot 1 was approximately 2.4 times that in lot 2, while in the preceding tests the corresponding figures were 1.7 and 2.3. The average daily gain of 1.02 pounds in lot 1 is a very good gain for pigs of the age and weight of those used. On the other hand, the average gain of 0.43 of a pound made daily in lot 2 is considerably below normal.

The lot 1 pigs consumed more peanuts daily as an average than those in lot 2, regardless of the fact that the former also ate nearly one-half pound of tankage each. This same general result was also obtained in the second experiment, and it indicates that the tankage stimulated the appetites of the pigs.

From the standpoint of feed utilization, the three experiments are similar. The tankage-fed lots consumed a much smaller quantity of peanuts and even less total feed per unit of gain than the lots which were fed no tankage. Calculated to the shelled-nut basis, 182.5 pounds of peanuts, fed with tankage, were required to produce 100 pounds of gain in the third test. This may be compared with 196 pounds and 216.44 pounds of shelled peanuts in the first and second experiments, respectively. The amount of 375.04 pounds of peanuts (shelled basis) consumed per 100 pounds gain in lot 2 of the last experiment also was lower than in the corresponding lots of the other tests. These amounts were 427.5 pounds and 462.26 pounds in the first and second test, respectively. In the last test approximately 69 per cent more total feed (exclusive of minerals) was consumed by lot 2 than by lot 1 per unit of gain. This figure may be compared with 80 per cent in the first test and 76 per cent in the second test.

The consumption of nutrients per 100 pounds gain in the third test was calculated and is shown in Table 10.

TABLE 10.—*Calculated amounts of nutrients consumed per 100 pounds gain in third experiment*

Nutrients	Lot 1			Lot 2: Peanuts
	Peanuts	Tankage	Total	
Protein.....	<i>Pounds</i> 53.62	<i>Pounds</i> 23.93	<i>Pounds</i> 77.55	<i>Pounds</i> 110.19
Carbohydrates.....	31.12	1.60	23.72	63.94
Fat.....	89.85	2.72	83.57	166.14

In this experiment, as in the others, the total amount of each nutrient consumed per unit of gain by lot 1 was considerably less than that consumed by lot 2. As before, about one-third of the protein and small proportions of the other nutrients consumed by lot 1 were supplied in the tankage. The 23.93 pounds of tankage protein consumed for each 100 pounds gain in lot 1 had replacement value equal to 56.57 pounds of peanut protein consumed by lot 2. Further calculation develops the fact that the relatively small quantities of tankage nutrients shown in Table 10 had a value equivalent to the total value of 56.57 pounds, 32.82 pounds, and 85.29 pounds of the peanut protein, carbohydrates, and fat, respectively, consumed per 100 pounds gain by lot 2.

#### GENERAL RESULTS

The results of this series of experiments lend themselves well to consideration as a whole. Table 11 shows the average feeding results obtained in the three tests.

TABLE 11.—Weighted average results of feeding peanuts and mineral mixture, self-fed, free choice, with and without tankage, in three experiments

Item	Ration	
	Peanuts, mineral mixture, and tankage (lot 1)	Peanuts and mineral mixture (lot 2)
Pigs used.....number.....	53	51
Days fed.....do.....	49.1	49.4
Average initial weight.....pounds.....	47.8	47.9
Average final weight.....do.....	91.6	67.6
Average gain.....do.....	43.8	10.7
Average daily gain.....do.....	.89	.40
Average daily feed consumption:		
Unshelled peanuts <sup>1</sup> .....do.....	2.46	2.33
Peanuts (shelled basis).....do.....	(1.75)	(1.65)
Tankage.....do.....	.38	
Total feed (exclusive of minerals).....do.....	2.84	2.33
Total feed (exclusive of minerals) with peanuts on shelled basis.....do.....	(2.13)	(1.65)
Feed consumed per 100 pounds gain:		
Unshelled peanuts.....do.....	276.16	384.75
Peanuts (shelled basis).....do.....	(196.34)	(415.35)
Tankage.....do.....	42.20	
Total feed (exclusive of minerals).....do.....	318.36	384.75
Total feed (exclusive of minerals) with peanuts on shelled basis.....do.....	(238.54)	(415.35)

<sup>1</sup> Shelled peanuts were fed in first experiment. Estimate of amount consumed, in terms of unshelled nuts was based upon 70 per cent shelling yield.

The feeding of tankage with peanuts and minerals more than doubled the rate of gain. While the rate of gain made by the tankage-fed pigs was very good, considering their age and size, that made by the other group was unsatisfactory.

It is of interest that the tankage-fed group not only consumed 0.38 of a pound of tankage per pig daily, as an average, but also ate 0.1 of a pound more of peanuts (shelled basis) than the other group. In other words the average pig in the former group consumed 0.48 of a pound more feed (exclusive of minerals) per day than the average pig in the latter group. The apparent deduction to be made is that the tankage, in addition to other effects, stimulated the appetites of the pigs.

The difference between the two groups of pigs with respect to feed utilization is very striking. A total of 415.35 pounds of peanuts (shelled basis) was required to produce 100 pounds gain when no tankage was fed. In the other group of pigs, however, a consumption of 42.2 pounds of tankage per 100 pounds gain was accompanied by the consumption of 196.34 pounds of peanuts, or 219.01 pounds less than in the no-tankage group. In other words 1 pound of tankage eaten by the pigs resulted in the saving of approximately 5.2 pounds of shelled peanuts. With unshelled peanuts at 3 cents a pound, which makes the cost of shelled peanuts 4.3 cents a pound on a basis of 70 per cent shelling yield, tankage was worth 22.4 cents a pound.

There was a feed cost of \$17.86 per 100 pounds gain when no tankage was fed, as compared to a cost of \$9.92 when tankage was fed as a supplement to peanuts, with unshelled peanuts at 3 cents and tankage at 3.5 cents a pound. Exact figures on consumption of minerals

are not available, and therefore the cost of minerals is not included in the above. With mineral mixture at 3 cents a pound, however, it is estimated that the cost of minerals consumed by either group of pigs did not exceed 35 cents per 100 pounds gain.

The data on nutrient consumption by the two groups of pigs are interesting and significant. Table 12 shows the average calculated consumption of nutrients per 100 pounds gain by the two groups of pigs.

TABLE 12.—*Weighted average consumption (calculated) of nutrients per 100 pounds gain in three experiments*

Nutrients	Lot 1			Lot 2: Peanuts
	Peanuts	Tankage	Total	
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Protein.....	55.78	25.49	81.27	117.35
Carbohydrates.....	38.36	2.38	40.74	83.11
Fat.....	85.64	2.88	88.49	179.61

Considering the protein, it is calculated that the 25.49 pounds of tankage protein consumed by lots 1 had a value equal to 61.57 pounds of the peanut protein consumed by lot 2. This is a ratio of 1 : 2.4 for the quantity of tankage protein in relation to that of peanuts. It will be noted that the quantities of carbohydrates and fat supplied by the tankage in lot 1 were relatively small. It is not likely that they had an important part in producing the superior results shown by this lot. As a whole, however, the nutrients as shown for tankage equaled the total value of 61.57, 44.75, and 93.97 pounds of peanut protein, carbohydrates, and fat, respectively, consumed by the group which received no tankage.

### SUMMARY AND CONCLUSIONS

Although in fattening hogs peanuts promote moderately rapid gains with low feed consumption per unit of gain, the experiments here reported indicate the value of a protein supplement when peanuts are fed to growing pigs. The composition of peanuts suggests that the feed without protein supplement should be suitable for growing pigs, yet the first phase of the first experiment in this series indicated strongly that even with mineral supplements peanuts are not efficient for pigs in the early stages of growth.

The three experiments reported in this bulletin indicated that tankage corrects the inefficiency of a ration of peanuts and minerals for growing pigs and results in rapid gains and highly economical feed utilization. Purebred pigs of 1924, 1925, and 1926 fall farrow were started each year soon after the pigs were weaned.

As an average the pigs receiving only peanuts and minerals made a daily gain of 0.4 of a pound as compared with 0.89 of a pound for the pigs receiving tankage as a supplement.

Tankage seemed to stimulate the appetites of the pigs. The average pig in the tankage-fed lots ate 0.38 of a pound of tankage a day in addition to consuming 0.1 of a pound more of peanuts (shelled basis) than the average pig in the other lots.

In feed utilization the tankage-fed lots showed strikingly superior results. The lots receiving no tankage consumed from 69 to 80 per cent more feed, excluding minerals, for each unit of gain. One hundred pounds of gain in the tankage lots required an average of 276 pounds of peanuts (unshelled) and 42 pounds of tankage, while in the lots receiving no protein supplement 585 pounds of peanuts (unshelled) was needed. Each pound of tankage saved more than 5 pounds of shelled peanuts.

With unshelled peanuts at 3 cents a pound and tankage at 3.5 cents, the addition of tankage to the ration produced 100 pounds of gain at a saving of \$7.94.

The cost of minerals is not considered in the above. With mineral mixture at 3 cents a pound, however, it is estimated that the cost of minerals consumed by either group of pigs did not exceed 35 cents per 100 pounds gain.

The amount of each nutrient consumed per unit of gain was much less for the tankage-fed pigs. The 25.49 pounds of tankage protein consumed per 100 pounds gain, as an average for the three tests, had a value equal to 61.57 pounds of the peanut protein consumed by the pigs which were fed no tankage. This, combined with the further fact that the tankage furnished only small quantities of carbohydrates and fat, suggests that the protein of the tankage was relatively efficient and contributed largely to the superior results obtained in the tankage fed lots. The total value of 25.49, 2.38, and 2.85 pounds of tankage protein, carbohydrates, and fat, respectively, consumed per 100 pounds gain, was equal to that of 61.57, 44.75, and 93.97 pounds of peanut protein, carbohydrates, and fat consumed by the no-tankage lots.

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