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Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

CORN, COW-PEAS AND WHEAT-BRAN FOR FATTENING PIGS.

J. F. DUGGAR, Agriculturist.

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CORN, COWPEAS, AND WHEAT BRAN FOR FATTENING PIGS.

By J. F. Duggar.

PORK PRODUCTION IN ALABAMA.

The low price of cotton in the last few years makes more imperative than ever before the necessity of producing on the farm the food required by laborers and teams engaged in the cultivation of our great staple crop. Home production of corn, hay and pork has increased in recent years. Yet there is still room for improvement, especially in the production of pork. With the hope of aiding in this important industry, the Agricultural Department of this station has begun a series of experiments in feeding pigs.

Why a state with such agricultural resources as Alabama should fail to produce all of the pork consumed within her borders has not been satisfactorily explained, although several causes have been mentioned in partial explanation. The risk of loss from hog cholera and the fact that corn is generally higher in price here than it is in the Northwest are usually mentioned as the chief hindrances to the upbuilding of the swine industry in the South.

As regards disease, the counties in which hogs are kept under fence are probably not more frequently and disastrously visited by cholera than are states where the hog is one of the main sources of farm revenue. While most veterinarians regard treatment as practically useless, all agree that precautions can be taken to check the rapid spread of the disease.

The higher price of corn here than in the Northwest by no means proves that the cost of raising hogs is so much greater here as to justify the neglect of the swine industry and the importation of a large proportion of the pork consumed in this State. There is no law, save that of custom, that the hog shall live on corn alone. There are partial substitutes abundantly and cheaply produced in the South. Among them are almost continuous pasturage, cowpeas grown as a renovating crop, peanuts, sweet potatoes and several other crops which may be harvested by hogs.

There is even reason to believe that in addition to the growing of meat for use on the farm and to supply local butchers, the production of pork for the packing companies can be made a profitable industry in some parts of the State. This, however, is possible only with an increased interest in methods of feeding, and with a wider appreciation of the value of the improved breeds.

The following extracts from a letter received in answer to inquiries by the writer bear on the possibilities of commercial pork production in Alabama:

Birmingham, Ala., Jan. 19, 1897.

J. F. Duggar,
Professor of Agriculture,
Agricultural and Mechanical College,
Auburn, Ala.

Dear Sir;—

* * * "At the present time we are buying all of our packing hogs in Tennessee, shipping same to this point on the railroad, and have always done so on account of the inferior hogs raised in this State. The breeds of hogs we usually get from Tennessee are Berkshire and a cross between the Berkshire and Poland China. * * * The best hogs for packing purposes weigh from 175 to 250 lbs., and are barrows and the sows that have never been with pig. The above are live weights. * * * In regard to prices, they vary

at all times, and no rule can be set down as to when hogs will be cheap or high, but for the last year they have been cheaper than for the past twenty years. * * * * The price on good corn fed hogs, f. o. b., Birmingham, is 3 cents gross weight. * * *

"There is no reason why this industry should not grow to immense proportions in this section of the Union, and instead of buying pork from the West, we should be able to supply our own wants and ship to the Eastern markets. * * The past year has been a very bad year for those that have raised hogs; when hogs are bringing 5 cents gross, as they very often do, the profit must be very good."

Yours truly,
Birmingham Packing Company,
Per C. H. U.

OBJECTS OF THE EXPERIMENT

The experiment described in this bulletin, which was one of three tests conducted in the fall and winter of 1896-97, relates to only a small portion of the general subject of pork production. In this experiment our cheaper class of foodstuffs, viz., those harvested by the hogs themselves, are not considered. For this reason, and for other reasons mentioned later, the cost of growing a pound of pork, as recorded here, is not published as being the minimum, nor even as being as low as the average swine breeder, working under ordinary conditions, can show.

The object of the experiment was to learn the relative values of corn, cowpeas, and wheat bran as food for growing pigs. In the following pages comparisons will be made between these foodstuffs:

(1) As regards the amount of increase in weight made by pigs fed on the different rations.

(2) As regards the cost of the pork produced, and

(3) As regards the effects of the several materials on the quality of pork, on the size of the internal organs and general health of the pigs, and on the quality of manure produced.

THE PIGS USED IN THIS EXPERIMENT.

Twelve pigs, divided into four lots of three pigs each, were used in this experiment. They were all sired by the same Essex boar and were out of two Essex sows, reputed to be thoroughbred, and very closely related. With two exceptions the pigs were quite uniform in size, age and appearance.

The conditions of the experiment were in some respects unfavorable to the attainment of best results. The pens were so arranged that it was necessary to catch the pigs and carry them to the scales for their weekly weighings. Such disturbances always interfere with rapid fattening. The only shelter was a single layer of 12-inch boards without battens, affording but little protection from rain. The unvaried diet, necessary in such tests as these, tended to make the gain less than it would have been if the food had been occasionally changed as a means of improving the appetite.

When the first period of the experiment was begun, August 23, 1896, one litter of pigs was a little less, the other a little more, than five months old, and all were quite small for that age, the lot averaging only 46.8 pounds in weight. Prior to the experiment they had received very little grain, having lived chiefly on what was afforded by scant pastures and woodland, supplemented by green sorghum during the month just preceding the experiment.

Details of feeding and weighing were carried out under the immediate charge of Mr. T. U. Culver.

August, 26, 1896, the twelve pigs were di-

vided into four lots, making the lots as nearly equal as possible in weight and appearance, and distributing the sexes as evenly as possible. That the lots were quite evenly matched, is shown by the fact that the heaviest and lightest lots differed by only 6.2 lbs.

To learn whether the several lots were evenly matched in feeding and fattening qualities as well as in weight, all lots were fed on the same kind and amount of food for twenty-one days. During this time, which we shall call Period I, each pen received daily 6 lbs. (2 lbs. per head) of shelled corn. The pigs, taken from pasture and put on an exclusive corn diet, fattened rapidly and made quite an economical gain. For every pound of gain in live weight Lot I required 3.57 lbs. of corn ;Lot II, 2.92 lbs ; Lot III, 3.32 lbs ;and Lot IV, (average for two pigs), 3.14 lbs. of corn.

Although the results are not strictly uniform for the several lots, they indicate that the different lots were fairly well matched.

THE RATIONS FED.

After three weeks of exclusive corn diet each lot of three pigs was given a different ration, beginning Sept. 16. The first week on the new rations was not regarded as a part of the experiment proper, but as a preparatory period during which the pigs might get accustomed to their new diet, and during which time the corn fed in the preceding period might be entirely eliminated from the body.

Hence Period II began Sept. 23, one week after the rations had been changed. During Period II, lot 1 was fed entirely on corn, lot II exclusively on cowpeas, lot III on equal weights of corn and cowpeas, and lot IV on equal weights of corn and wheat bran.

These rations were continued for seventeen weeks (from Sept. 16, 1896, to Jan. 13, 1897), before the experiment was closed. Indeed, the same feeding was continued after the

close of the feeding experiment until every pig was slaughtered, the last one going to the butcher Feb. 23, 1897, after eating cowpeas alone for more than five months, without change.

Prior to Nov. 4 the corn, cowpeas and mixed rations were fed without grinding. After that date corn and peas for all pens were very coarsely ground. All rations were fed twice daily in the dry condition. This was done not because dry feed was regarded as best, but for convenience in weighing back any food left uneaten in the troughs. The plan was to give each pen all that could be eaten, but the pigs could doubtless have been induced to eat more, and hence to fatten more economically if the changes in amount of food offered had been more frequently made.

With the exception of a few weeks, all pens received daily with their food about half a teacup full of a mixture made up of sulphur, hardwood ashes, charcoal, and one part of sulphate of iron (copperas) to about thirty parts of the other constituents. The sulphate of iron was added to the usual ash mixture on the recommendation of Dr. C. A. Cary, Station Veterinarian, as a remedy for the large worms which abounded in the intestines of the pigs.

AMOUNT OF FOOD PER POUND OF INCREASE IN LIVE WEIGHT.

The following table shows the gains made during the sixteen weeks of Period II, the total amount of food eaten in the same time, and the number of pounds of food required to produce one pound of increase in live weight.

Summary for 16 weeks showing food eaten, gain, and pounds food per pound of increase in live weight.

	Food eaten	Total gain.	Food for each lb. of gain.
	Lbs.	*Lbs.*	*Lbs.*
Lot I. Corn	844.2	173.3	4.87
Lot II. Cowpeas	954.2	198.0	4.81
Lot III. ½ corn, ½ cowpeas	908.7	209.5	4.33
Lot IV. ½ corn, ½ wheatbran	1044.4	203.0	5.21

The lot receiving equal parts of corn and cowpeas made slightly the largest gain, and required least food to produce a pound of increase in weight.

Judging by the quantity of food eaten, the ration consisting of corn and wheat bran was most palatable. This last ration, however, was least effective, pound for pound. The figures just given show that a mixture of equal parts of corn and cowpeas was more effective, pound for pound, than an equal weight of either corn or cowpeas.

This, at first, looks contradictory; yet it is not so when we recall that the animal needs rather a balanced ration than one excessively rich in nitrogenous material, like cowpeas, or than a ration especially rich in starchy or carbonaceous material, like corn. In the mixture each material has probably been made more effective by the presence of the other. In the superiority of a mixture of foods of such opposite qualities over either food alone there is some slight similarity to the well known fact that a mixture of three fertilizers, as acid phosphate, cotton seed meal and kainit, often prove superior to an equal weight of either one applied alone.

A striking example of the increased efficiency resulting from balancing a ration by mixing two unlike foodstuffs rather than feeding either alone is found in the results of certain American feedings experiments, which show that at usual prices in dairy districts there is greater economy and greater efficiency of food materials in feeding corn and skim milk than in feeding exclusively on either.

DIGESTIBLE MATTER IN THE SEVERAL RATIONS.

Not only was a pound of gain made with least weight of food when a mixture of cowpeas and corn was supplied, but also with the least weight of digestible matter.

The greater efficiency of a pound of digestible matter in the mixed or balanced rations is shown in the following table.

Digestible matter consumed in 16 weeks, pounds digestible matter per pound of gain, and nutritive ratio.

	Food eaten.	Digestible.	Digestible matter	Gain in live weight	Pounds digestible matter per lb. of gain.	Nutritive ratio.
	Lbs.	*Per cent.*	*Lbs.*	*Lbs.*	*Lbs.*	
I.	844.2 corn	79	667.	173.3	3.85	1 to 9.7
II.	954.2 cowpeas...	77*	735.	198.0	3.71	1 to 2.6
III.	454.3 corn.....	79	708.	209.5	3.38	1 to 6.2
	454.3 cowpeas ..	77*				
IV.	522.2 corn.....	79	704.	203.0	3.46	1 to 6.8
	522.2 wh. bran..	56				

* Calculated, using digestion percentages (coefficients) obtained when Canada peas, a closely related food stuff, was fed to swine Tenn. Bul. Vol. IX, No. 3, p. 130 and Expt. Sta. Record, Vol. VI, No. 1 p. 8.

The above table shows that a pound of digestible matter was most effective in the ration of mixed cowpeas and corn, nearly as valuable in a mixture of wheat bran and corn, decidedly less effective in an exclusive cowpea ration, and least valuable in a pound of corn.

As the result of numerous feeding experiments, made chiefly in Germany, a feeding standard has been formulated. According to Wolff's standard the proper nutritive ratio for fattening pigs—(and this is simply the ratio of digestible nitrogen in food to the sum of the digestible starch, sugar, fat, etc., the fat being first multiplied by 2.5 on account of its high fuel value)—is 1 to 5 or 6. In our experiments the digestible matter was most effective in those rations that approached nearest to the German standard: cowpeas, with the very narrow nutritive ratio of 1 to 2.6 and corn with the very wide nutritive ratio of 1 to 9.7, both proved less effective than balanced rations in which the nutritive ratio was 1 to 6.2 and 1 to 6.8.

PRICE OF PORK.

In order to get at the financial returns resulting from the use of different foods, it is necessary to state the price obtained or obtainable for the pork. All the pigs in this experiment

were actually sold to a local meat dealer at 3 cents per pound gross. This was slightly less than would have been obtained by selling the carcasses at 5 cents net, a price which was then being paid for dressed pork and a price at which several other carcasses were sold last winter. Five cents per pound net is equal to 3 3-4 cents per pound gross, with pigs which dress 75 per cent of their live weight. In return for the reduced price, the Experiment Station reserved the right to cut from each carcass a section of meat to be photographed.

FINANCIAL RESULTS.

Assuming the prices prevailing in Auburn in the early part of the winter, we have 40 cents as the price of a bushel of corn and 50 cents as the cost of a bushel of cow peas. Wheat bran delivered at the Experiment Station barn cost $15 per ton.

At these prices the cost of one pound of gross increase was 3.35 cents when both corn and cowpeas were fed, 3.48 cents when only corn was given, 3.61 cents when cowpeas were fed alone and also 3.61 cents with a mixture of corn and wheat bran. At the above prices for food stuffs, a combination of corn and cowpeas, equal parts of each, afforded the cheapest gain, and this too in spite of the fact that cowpeas were priced higher, both per pound and per bushel than any other material.

During the three weeks of period II when all pigs, fresh from the pasture, received only corn, the gains were much more rapid than in the later stages of feeding. For the brief period, even with live pigs at only 3 cents per pound, the gain made was sufficient to pay the following prices per bushel of corn fed to the different lots: 46, 54, 50 1-2 and 53 1-2 cents. From this it follows that with corn at 40 cents, even with 3-cent pork, there was a profit during the first period of exclusive corn feeding, the margin of profit

varying with the different lots from 6 to 14 cents on each bushel of corn consumed.

During this short period the average of all lots was 17.3 pounds of gain in live weight for every bushel of corn consumed. When exclusive corn feeding was continued, the rate of gain fell far below this figure, the average for the corn-fed pen during the sixteen weeks covered by period II being 11.5 pounds of increase in live weight per bushel of corn.

A better method of comparing the financial results from the several foods is obtained by calculating what prices animals pay for their food. On this basis, we find that with pork at 3 3-4 cents gross, the food consumed was worth for feeding purposes the prices given below:

Financial returns made for food consumed.

Corn, (lot 1.) per 100 lbs. of food, 77 cents; per bushel, (56 lbs.) 43 cents.

Cowpeas (lot II.) per 100 lbs. of food, 78 cents; per bushel, (60 pounds) 47 cents.

Mixture of one-half corn, one-half cowpeas (lot III.) per 100 pounds of food, 86.5 cents.

Mixture of one-half corn, one-half wheatbran (lot IV.) per 100 lbs. of food, 72 cents.

The mixture of equal parts of corn and cowpeas produced pork to the value of 86.5 cents per 100 lbs of food, or about 8 per cent advance over the value of the same foods fed separately. Assuming that this increased efficiency was shared in equally by both constiuents of the mixture, we have a return of 46.4 cents per bushel of corn and 51 cents per bushel of cowpeas when fed in combination.

If we assume a price of only 3 cents per pound gross for pigs, the quotation in Birmingham in January 1896, the prices obtained for the food consumed are correspondingly lowered. On this basis the returns per hundred pounds of food eaten are 62 cents for corn, 62 for cowpeas, 69 cents for

a mixture of corn and cowpeas, and 58 cents for a mixture of corn and wheat bran. Only in a year of low prices for foodstuffs would such results be profitable, unless certain indirect benefits of feeding cowpeas, instead of selling them, be considered. An important indirect benefit of feeding, not taken account of in the above figures, is the value of the manure produced, a subject which will be discussed elsewhere in this bulletin.

In the case of cowpeas an important advantage of feeding instead of selling them is that thereby the heavy cost of picking may be saved, the pigs doing the harvesting. In this locality the custom is to pay half the cowpeas for the picking of the same, which is equivalent to saying that when cowpeas command 50 cents per bushel in the market, they are worth on the vines for purposes of sale only 25 cents per bushel.

On this basis of 25 cents per bushel for cowpeas, the lot fed on cowpeas alone makes a pound of pork at a cost of only 1.8 cents, and the lot fed on a mixture of corn and cowpeas makes its gain at a cost of 2.45 cents per pound.

Twenty-five cents per bushel of unpicked cowpeas will not pay for their culture, whether they are picked for half and sold, or pastured off with hogs. However, they are grown chiefly for the fertilizing value of their stems, leaves, and roots, and for this main purpose, with the production of seed as an incidental feature, the cultivation of cowpeas cannot be too strongly commended.

PROPORTION OF FAT AND LEAN MEAT AND SIZE OF INTERNAL ORGANS.

Experiments in several states have shown that it is possible to increase the proportion of lean meat, thereby improving the quality of the pork, by feeding materials rich in nitrogen. To effect this change it is necessary to begin the nitrogenous ration while the pigs are young and to continue it for a long

time. In our experiments the ration of each lot was continued without change until each animal was butchered, which in some instances was several weeks after the end of period II. The minimum length of unchanged feeding was 120 days, the maximum (with one of the cornfed lot) 169 * days. On account of financial considerations, the pigs were not slaughtered all at the same time, but on such dates as the local market required them. Hence it was impossible to lay side by side portions of the different carcasses and thus judge directly of the proportions of fat and lean in each animal. Instead, photographs were made of sections of meat taken from representative animals in each lot, and by means of these, comparisons of the character of meat had to be made. This was not an entirely satisfactory method, because cloudy weather sometimes caused delay in taking photographs, and facilities for preserving the specimens in good order by means of refrigeration were wanting.

The cuts of meat selected for photographing were cross sections through the loins. The photographic work was kindly done by Prof. P. H. Mell.

The illustrations in the back of this bulletin speak for themselves. While individual variations somewhat obscure results, it appears that the largest proportion of fat accompanies the all-corn diet.

This evidence of an increased proportion of lean meat as the result of feeding nitrogenous or narrow rations is reinforced by the figures showing weights and percentages of fat found on the stomach and intestines of the pigs of the different lots. With exclusive corn feeding we find the largest percentage of intestinal fat, an average of 2.3 per cent. of the live weight. The lot fed on cowpeas alone showed only about half as much, 1.1 per cent., and intermediate percentages were afforded by the two lots fed on part corn along with some more nitrogenous food stuff. A small percentage of fat on

* Including period I, period II, one week between these periods and several weeks after the conclusion of period II.

the stomach and intestines argues a large proportion of lean meat in the carcass. These facts, as well as the weight and percentages of dressed carcass, liver, lungs, kidneys, spleen, and heart are set forth in detail in table VII in the appendix to this bulletin.

That table shows that the proportion of dressed to live weight was not appreciably influenced by the several food stuffs employed. It also indicates that with the nitrogenous rations there was an increase in the absolute weight of liver, kidneys, heart and spleen and that this increase was marked in the case of the spleen, not only in its absolute weight, but also in its percentage weight.

The general trend of the few experiments bearing on this matter is that by feeding to growing pigs a ration well supplied with protein, (the usual form of the nitrogenous matter of food stuffs,) there is an increase not only in the proportion of lean meat, but also an increase in the weight of many of the internal organs and in the strength of the bones. All these result of judicious feeding tend toward greater vigor, hardiness and increased power of resisting disease.

THE MANURE PRODUCED FROM DIFFERENT RATIONS.

All our common foodstuffs have two values, first as food for the animal body and second as manure, or food for plants. The fertilizing value of the nitrogen, phosphoric acid, and potash that exist in foods is not destroyed by the process of digestion. On the contrary the manure even of milk cows and of growing animals contains considerable more than half of the fertilizing ingredients of the food; fattening animals frequently excrete in solid and liquid excrement fully 90 per cent. of the fertilizing materials originally contained in the food.

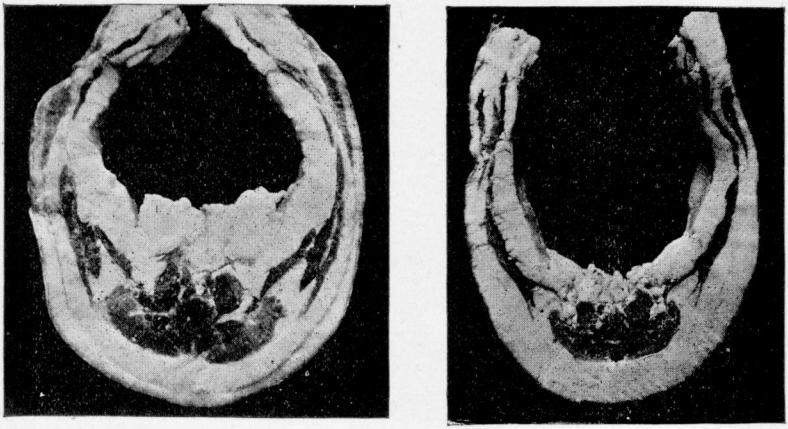
To compare the quality of manure produced by the different rations, both the solid and liquid excrements was collected from one pig fed on each ration. The pigs were placed in small stalls with tight floors and pine sawdust was used in

sufficient quantity to absorb all droppings. The droppings of 48 hours were collected, the pigs used having first been brought to a constant daily ration of 3 pounds of grain per head.

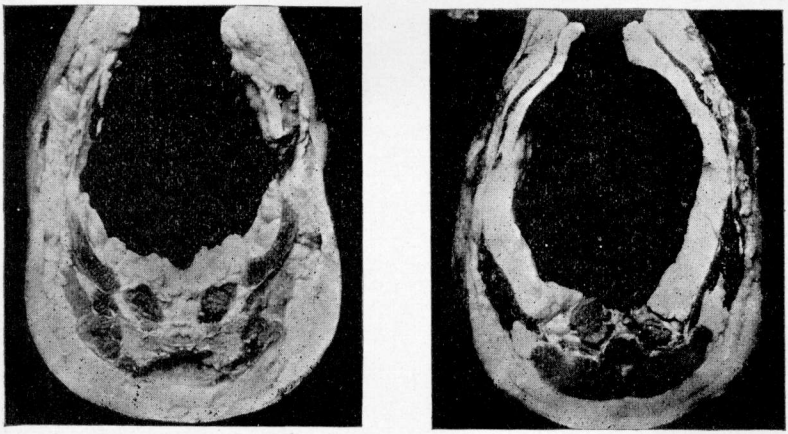
The samples of mixed dung, urine and sawdust and of the sawdust alone were analyzed in duplicate by Dr. J. T. Anderson, of the Chemical Department of the Station. The results detailed in Table I of the appendix to this bulletin are calculated from Dr. Anderson's analyses, first making allowance for the small amount of fertilizing, material contained in the sawdust.

From that table we may see that the pig fed on corn alone made the smallest quantity of manure, the amount of feed being the same as for the other pigs. This is probably due to the fact that animals on a carbonaceous diet consume less water than do those on a nitrogenous ration. The water allowed these pigs was not weighed, but governed wholly by the thirst of the pigs. This greater bulk of manure, due to greater delution with water, in two cases makes the manure from nitrogenous rations poorer pound per pound than that from a corn diet. Yet the total value of the manure produced is considerably greater when the ration consists of cowpeas or of part cowpeas or wheat bran than when only corn is fed.

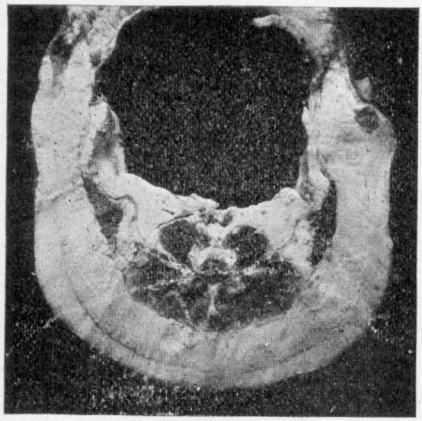
The weight of nitrogen excreted in 48 hours,- and it is nitrogen which is the ingredient that gives to animal manures their chief value,—is nearly 70 per cent. greater in the manure from cowpeas than in that from corn; it is fully 40 per cent. greater in manure from a ration of half cowpeas and half corn than in that from an exclusive corn ration.

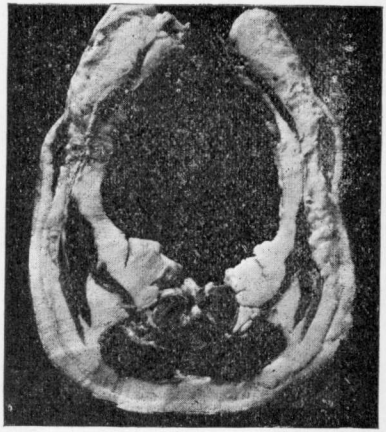


LOT I.—Nos. 1 and 2; fed on corn.

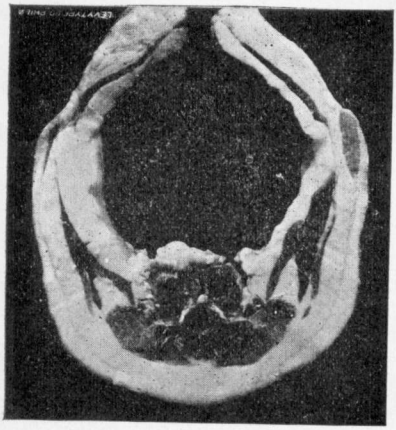


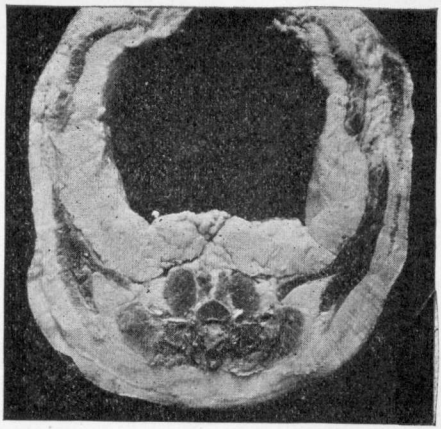
LOT II.—Nos. 4 and 6; fed on cowpeas.





LOT III.—Nos. 7 and 9; fed on a mixture of corn and cowpeas.





NOT IV.—Nos. 10 and 11; fed on a mixture of corn and wheat bran.

APPENDIX.

TABLE I.—*Composition and amount of solid and liquid manure amounts of nitrogen, phosphoric acid, and potash in excremen of 48 hours.*

Lot.	Food.	Nitrogen.	Phosphoric acid.	Potash.	Lbs. solid and liquid manure in 48 hours.	In excrement of 48 hours.		
						Nitrogen.	Lbs. Phosphoric acid.	Potash.
		Per cent.	*Per cent.*	*Per cent.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
I.	Corn	1.358	.966	.659	7.5	.102	.072	.050
II.	Cowpeas	1.467	.885	.642	11.4	.167	.101	.073
III.	Corn and cowpeas	1.141	.724	.296	12.6	.144	.091	.037
IV.*	Corn and wheat bran	1.023	1.219	.353	16.8†	.172	.205	.059

*The results with Lot IV are less reliable than with the other lots; it was necessary to use for analysis only the excrement of 24 hours, instead of 48; moreover, the duplicate nitrogen determinations in this case varied very widely.

†Calculated for 48 hours.

TABLE II.—*Results for Period I; sex and date of slaughtering of pigs used in Period II.*

Lot.	Pig. No.	Weight Aug. 26.	Gain Aug. 26—Sept. 16.	Corn eaten Aug. 26—Sept. 16.	Lbs. corn per pound gain.	Sex.	When slaughtered.
			Lbs.				
I	1	62.5	13	126	3.57	Sow	Feb. 11, 1897.
	2	36.	13			Barrow	Jan'y 29, 1897.
	3	38.7	9.3			Sow	Jan'y 18, 1897.
II	4	51.	15	126	2.92	Barrow	Feb. 4, 1897
	5	46.3	15.9			Barrow	Jan'y 13, 1897.
	6	41.5	12.3			Sow	Feb 23, 1897.
III	7	53.	14.8	126	3.32	Barrow	Feb. 4, 1897.
	8	45.2	10.6			Sow	Jan'y 23, 1897.
	9	45 2	12.6			Sow	Feb. 12, 1897.
IV	10	52.	14.4	126	3.14*	Barrow	Feb. 3, 1897.
	11	45.3	12.3			Sow	Feb. 10, 1897.
	13*	.....	.....			Barrow	Jan'y 22, 1897.

* No. 13 was not in the experiment until Sept. 16 when he was put in as a substitute for No. 12 which during Period I had proved unfit for the experiment. Results for Lot IV during Period I are calculated from results with Nos. 10 and 11.

LOT I.—CORN.

TABLE III.—*Statement of weekly weights of pigs, food eaten, gain made, and pounds of food per pound of increase in live weight.*

1896–'97. Week ending	Pig No. 1.		Pig No. 2.		Pig No 3.		Total, Lot I.		Food.			Total gain of lot 1 from Sept. 23.	Lbs. food eaten per lb. gain, from Sept. 23.
	Wgt.	Gain.	Wgt,	Gain.	Wgt.	Gain.	Wgt.	Gain.	Offered.	Refused.	Eaten		
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Sept. 23	74.7		49.0		49.5		173.2						
Sept. 30	80.2	5 5	50.5	1.5	51.1	1.6	181.8	8.6	84	10	74	8.6	
Oct 7	80.3	.1	52.3	1.8	52.1	1.0	184.7	2.9				11.5	6.43
Oct. 14	83.0	2.7	52.5	.2	52.5	.4	188.0	3.3	36	1.8	34.2	14.8	7.35
" 21	84.3	1.3	53.9	1.4	54.6	2.1	192.8	4.8	38	1.1	36.9	19.6	7.40
" 28	88.6	4.3	54.1	.2	54.5	- 1	197.2	4.4	31	3.1	27.9	24.0	7.20
Nov. 4	94.8	6.2	56.0	1.9	57.5	3.0	208.3	11.1	44.5	.....	44.5	35.1	6.19
" 11	101 5	6.7	59.0	3 0	63	5.5	223.5	15.2	46	.....	46.	50.3	5.24
" 18	104.6	3.1	64 0	5.0	64.6	1.6	233.2	9.7	54	.....	54.	60.0	5.29
" 25	109.0	4.4	66.5	2.5	68.	3.4	243.5	10.3	56	.....	56.	70.3	5.31
Dec. 2	113.0	4.0	69.5	3.0	69.2	1.2	251.7	8.2	56	.....	56.	78.5	5.47
" 9	118.6	4 6	74.8	5.3	74.2	5.0	267.6	15.9	67.5	1.5	66.	94.4	5.25
" 16	124.3	5.7	80.1	5.3	79.2	5.0	284.6	17.0	70	.9	69.1	111.4	5 07
" 23	131.1	6.8	86.5	6.4	83 5	4.3	301.1	16.5	70	.....	70.	127.9	4.96
' 30	144.0	12 9	93.3	6.8	92.1	8.6	329.4	28.3	70	.....	70.	156.2	4.51
n. 6	138.0	-6.	96.2	2.9	93.1	1.0	327.3	-2.1	70	.....	70.	154 1	5.03
' 13	151.2	13.2	98.8	2.6	96.5	3.4	346.5	19.2	70	.4	69.6	173.3	4 87

LOT II—COWPEAS.

TABLE IV.—*Statement of weekly weights of pigs, food eaten, gain made, and pounds of food per pound of increase in live weight.*

1896-'97. Week ending.	Pig, No. 4.		Pig, No. 5.		Pig, No. 6		Total Lot II.		Food.			Total gain of lot 1 from Sept. 23.	Lbs. food eaten per lb. gain, from Sept. 23
	Wgt.	Gain.	Wgt.	Gain	Wgt.	Gain.	Wgt.	Gain.	Offered.	Refused.	Eaten		
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Sept. 23	64.5	.....	63		52.5	.....	180.0						
" 30	67.1	2.6	66.8	3.8	53.3	.8	187 2	7.2	84	....	84		
Oct. 7	72.0	4.9	70	3.2	56.7	3.4	198.7	11.5				18.7	4.49
" 14	76 8	4.8	73.1	3 1	58 7	2.0	208.6	9.9	46	1	45	28.6	4.51
" 21	75.6	—1.2	75	1.9	59.6	.9	210.2	1.6	44	.....	44	30.2	5.72
" 28	80 8	5.2	82.3	7.3	65.3	5.7	228.4	18 2	49	.....	49	48.4	4 58
Nov. 4	88.0	7.2	89 3	7 0	69.7	4.4	247.0	18.6	49	.....	49	67.0	5 59
" 11	92.0	4.0	94	4.7	74.2	4.5	260 2	13.2	53	.....	53	80.2	4.83
" 18	95.1	3.1	109	15.0	78.1	3.9	282.2	22.0	61	.....	61	102.2	4 80
" 25	100.1	5.0	105	—4.0	84.4	6 3	285 5	3.3	63	.....	63	105.5	4.38
Dec. 2	101 8	1.7	109.5	4 5	85 0	.6	296 3	10.8	63	.....	63	116.3	4.84
" 9	107.0	5.2	114.5	5.0	88.5	3.5	310.0	13 7	71.5	.....	71.5	130.0	5 00
" 16	112.3	5.3	119.5	5 0	92.1	3.6	323.9	13 9	84	....	84	143.9	5.12
" 23	115.5	3.2	117 5	—2.0	96.5	4.4	329.5	5.6	81	3.3	77.7	149.5	5.16
" 30	128.3	12.8	138 1	20.6	104.0	7.5	370.4	40.9	70	.....	70	190.4	4.27
Jan. 6	128.8	—.5	136.8	—1 3	102 1	-1.9	367.7	-2.7	70	.....	70	187 7	4.71
" 13	132.0	3.2	141	4.2	105.1	3.0	378 1	10.3	70	.....	70	198.1	4 81

LOT III.—EQUAL WEIGHTS OF CORN AND COWPEAS.

TABLE V.—*Statement of weekly weights of pigs, food eaten, gain made and pounds of food per pound of increase in live weight.*

1896-7. Week ending—	Pig No. 7.		Pig No. 8.		Pig No. 9.		Total Lot III.		Food.			Total gain of Lot III from Sept. 23.	Lbs. food eaten per lb. gain from Sept. 23.
	Wgt.	Gain.	Wgt.	Gain.	Wgt.	Gain.	Wgt.	Gain	Offered.	Refused.	Eaten		
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Sept. 23	70.0		56		60.2		186.2	9.4	84	6	78	9.4	
" 30	76.5	6.5	57.8	1.8	61 3	1.1	195.6						
Oct. 7	79.6	3.1	61.0	3.2	63.5	2.2	204.1	8.5				17.9	4.69
" 14	81.0	1.4	61.1	.1	65.6	2.1	207.7	3.6	34	.5	33 5	21.5	5 19
" 21	81.9	.9	59.5	1.6	65.0	-.6	206 4	-1.3	28	.....	28	20.2	6.96
" 28	89.7	7.8	63.2	3.7	72.7	7.7	225.6	19.2	44	4.8	39.2	39.4	4.55
Nov. 4	98.0	8.3	64.7	1.5	77.5	4.8	240 2	14 6	46	4	42	54.0	4.09
" 11	107.0	9.0	68 3	3.6	82.5	5.0	257.8	17 6	50	.....	50	71 6	3.78
" 18	112.4	5 4	71.5	3.2	88.1	5.6	272.0	14.2	66	10	56	85 8	3 81
" 25	119.1	6.7	71.5	0.0	93.6	5.5	284.2	12.2	70	.....	70	98.0	4.04
Dec. 2	127.5	8.4	72.6	1.1	100.5	6.9	300.6	16.4	70	9.7	60	114.4	3.99
" 9	136.5	9.0	76.5	3.9	104.5	4.0	317.5	16.9	77	5	72	131.3	4.02
" 16	145.6	9.1	80.5	4.0	108.5	4 0	334 6	17.1	84	.....	84	148.4	4.13
" 23	151.0	5.4	82.5	2.0	111.7	3.2	345 2	10.6	84	3	81	159.0	4.05
" 30	165.5	14.5	88.7	6.2	122.7	11 0	376.9	31.7	76	1.3	74.7	190.7	4.03
Jan. 6	168.2	2.7	89 3	.6	123.8	1.1	381 3	4.4	70	.....	70	195.1	4 29
" 13	173.5	5.3	95.0	5.7	127.2	3.4	395.7	14.4	70	.....	70	209.5	4.33

LOT IV.—EQUAL WEIGHTS OF CORN AND WHEAT BRAN.

TABLE VI.—*Statement of weekly weights of pigs, food eaten, gain made and pounds of food per pound of increase in live weight.*

1896-7. Week ending—	Pig No. 10.		Pig No. 11.		Pig No. 13.		Total Lot IV.		Food.			Total gain of Lot IV from Sept. 23.	Lbs. food eaten per lb. gain from Sept. 23.
	Wgt.	Gain	Wgt.	Gain	Wgt.	Gain	Wgt.	Gain.	Offered.	Refused.	Eaten		
	Lbs.	*Lbs*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs*	*Lbs.*
Sept. 23	68.0		59.5		51.0		178 5		84	.....	84	8 0	
" 30	74.0	6.0	63.5	4.0	49.0	-2.0	186.5	8.0					
Oct. 7	76.0	2.0	65.6	2.1	54.3	5.3	195.9	9 4				17 4	4.83
" 14	80.4	4.4	67.3	1.7	57.2	2.9	204.9	9 0	50	.....	50	26.4	5.07
" 21	79.0	-1.4	66 0	-1.3	55.2	-2.0	200.2	-4.7	46	..	46	21.7	8.25
" 28	84.7	5 7	74 0	8.0	63 0	7.8	221.7	21.5	57	3.7	53.3	43.2	5.40
Nov. 4	92.0	7.3	79.3	5.3	65.0	2.0	236.3	14.6	56	.....	56	57 8	5.00
" 11	97.8	5.8	82.7	3.4	71.0	6.0	215 5	15.2	64	.....	64	73.0	4.84
" 18	100.6	2.8	88.7	6.0	74.7	3.7	264	12.5	80	6.5	73.5	85 5	4.99
" 25	103.0	2.4	91.5	2.8	77.8	3.1	272.3	8.3	70	...	70	93.8	5 29
Dec. 2	110.7	7.7	96 6	5.1	80.5	2.7	287.8	15.5	70	...	70	109 3	5 18
" 9	116.9	6.2	99 8	3.2	83.0	2.5	309.7	21.9	78	5.6	72.4	131.2	4.87
" 16	123.1	6.2	103.0	3.2	85.5	2.5	313 6	3.9	84	6.6	77.4	135.1	5.30
" 23	132 6	9.5	110.7	7.7	89.3	3.8	332 6	19.0	84	....	84	154.0	5 13
" 30	142.6	10.0	116 1	5.4	97.8	8.5	356.5	23.9	84	2.2	81.8	178.0	4.95
Jan. 6	145.5	2 9	118.3	2.2	99.5	1 7	363.3	6.8	84	.....	84	184.8	5.22
" 13	151.1	5.6	125 2	6 9	102 5	3.0	378 8	15 5	84	6	78	200.3	5.21

TABLE VII.—*Weight and percentage (live weight=100) of dressed carcass, liver, lungs, kidneys, spleen, heart, and fat on stomach and intestines.*

Lot.	Pig No.	Live. Wgt.	Dressed carcass.	Liver.	L'ngs.	Kid-neys.	Spleen.	Heart	Fat on stom'ch and in-testines	Dressed weight.	Liver.	L'ngs.	Kid-neys.	Spleen.	Heart	Fat on stom'ch and in-testines
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*%*	*%*	*%*	*%*	*%*	*%*	*%*
I.	1	155.3	125.9	2.10	.70	.20	.10	.40	4.10	81	1 35	.45	.13	.06	.26	2.64
	2	104.0	77.1	1.98	.50	.25	.109	.21	2.30	74	1.90	.50	.25	.10	.20	2.20
	3	100.5	74.5	1.88	.45	.17	.078	.19	2.00	74	1.87	.45	.17	.08	.19	2.00
	Av.	**119.9**	**92.5**	**1.99**	**.55**	**.21**	**.096**	**.27**	**2.80**	**76**	**1.71**	**.47**	**.18**	**.08**	**.22**	**2.30**
II.	4	145.0	109.6	2.50	.50	.34	.171	.32	1.40	76	1 72	.34	.23	.11	.22	.90
	5	141.0	107.3	3.10	.50	.44	.200	.36	1.00	76	2 20	.35	.26	.14	.26	.70
	6	131.0	96.6	2.60	.62	.36	.156	.328	2.50	74	1.90	.40	20	.11	.20	1.80
	Av.	**139.0**	**104.5**	**2.73**	**.54**	**.38**	**.175**	**.336**	**1.63**	**75**	**1.94**	**.36**	**.20**	**.12**	**.23**	**1.10**
III.	7	179.5	135.0	2.50	.60	.38	.156	.39	2.60	76	1.39	.33	.21	.08	22	1.38
	8	96.6	72.7	1.55	.45	.20	.109	.25	2.10	73	1.60	.47	.21	.11	.26	2.17
	9	144.1	111.2	2.11	.61	.34	.140	.33	3.00	77	1.46	.42	.23	.10	.23	2.08
	Av.	**140.1**	**106.3**	**2.05**	**.55**	**.31**	**.135**	**.32**	**2.57**	**75**	**1.48**	**.41**	**.22**	**.10**	**.24**	**1.88**
IV.	10	165.0	126.7	2.70	.64	.34	.133	.34	3.30	77	1.64	.39	.21	.08	.21	2.00
	11	134.8	101.9	3.00	.67	.33	.150	.31	1.80	76	2.22	.49	.25	.11	.23	1 29
	13	110.9	80.4	2.56	.64	.28	.125	27	2.20	72	2.30	.57	.25	.11	.24	1.98
	Av.	**136.9**	**103.0**	**2.75**	**.65**	**.32**	**.136**	**.31**	**2.43**	**75**	**2.05**	**.48**	**.24**	**.10**	**.23**	**1.76**