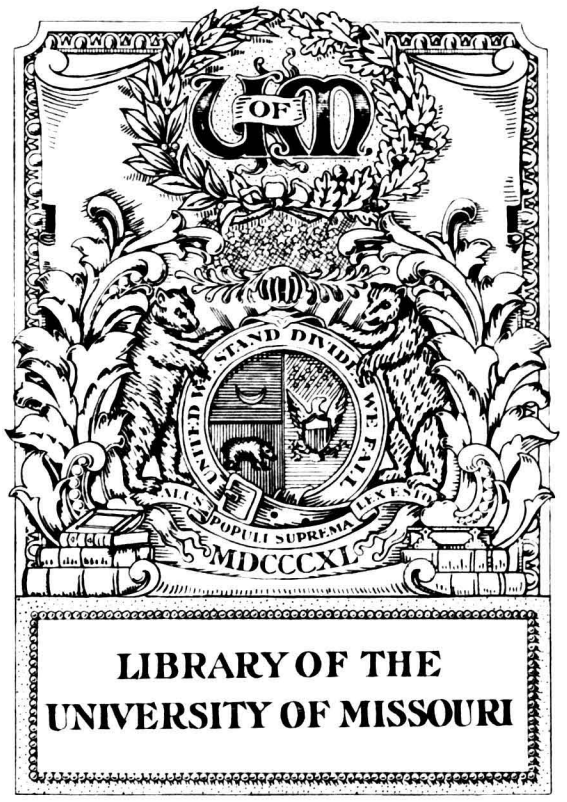

A STUDY OF THE EFFECT OF THE PERIODS OF GESTATION AND LACTATION UPON THE GROWTH AND COMPOSITION OF SWINE

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Introduction

Growth is at the base of organic production. In recent years an increasing importance has been attached to its study and to the conditions affecting it.

Davenport(1) says: '' The importance of the study of growth cannot be over estimated. The maintenance of the human race depends upon that property which protoplasm alone displays of increasing itself for an indefinite time and to an indefinite amount. The supplies of the world are produced largely by growth each year. ***** The only thing then that limits growth is the limitations in the conditions of growth.''

The same author(2) defines organic growth as increase in volume which may result from increase in volume of either the living substance or the formed matter of which organisms are composed.

It is well known that there are many factors that influence growth and development. Among these are light, temperature, moisture, oxygen supply, food, climate, season of year, age, and species. Among factors less easily analyzed and explained, but dependent in greater or less degree upon the foregoing, may be mentioned the inherent tendency to reach a certain size and form, cell activities, and glandular secretions and excretions, Certain pathological conditions, pregnancy, and lactation may exert very marked influences on growth and development. The purpose of this study was to find the effect on growth of the conditions of pregnancy and lactation.

It seems reasonable to expect that the production of

milk would greatly check growth. The common observation of animals becoming thin in flesh while producing milk is sufficient evidence that the food is used for milk production even when there is not an excess over the amount the animal could use for the maintenance of its own body or for the increase of its own substance.

It is well established that under conditions of insufficient nutrition, material may be drawn from the tissues for the production of milk.

The effects of pregnancy are not so obvious. Unquestionably, the mother must provide the materials for building the new individual. Marshall[3] says there is evidence that in the early stages of pregnancy the materials, whatever their source and constitution, are broken down and partly resynthesized by the tropoblast, while later in pregnancy they are metabolized by the fetal cells themselves. This being the case, the maternal duties of the mammal do not include, in the latter part of pregnancy, the formation of fetal tissue-components, but only to the supplying of food and oxygen to and the removal of waste matter from the fetus, together with the preparation of an organ of nutrition for the new born young. Whether this material for the fetal tissues comes from the tissues of the mother or consists of unorganized substances absorbed from the food, its deflection to the fetus must check the growth of the mother, unless the physiological condition of pregnancy causes her to consume more food, enables her to

digest a larger proportion of the food consumed, to better utilize the digested food, or causes her metabolism to be more economical.

Historical

It has been easy to find literature on the subject of growth in general, and on the effects of pregnancy and lactation. Not a great deal, however, has been found dealing with the effects of these two conditions on growth, the greater part of the experimental work on this line having been done with mature animals.

Minot(4) has published the most complete work on this line of study that the writer has been able to find. His experimental work extended over a period of more than five years with a large number of guinea pigs. He used increase in weight as the sole criterion of growth.

From the weights of 66 mothers within three days after delivery of litters he found an average body weight of 588.0 grams. The corresponding weights of females not pregnant was 532.1 grams--an excess of 55.9 grams in favor of the gestating females. Taking 68 days, which he found the usual length of the period of gestation, the average daily gain of the pregnant females over the open females was about 0.8 grams. From another table of weights the average daily gain for guinea pigs of the same age thru the same number of days is not far from 1.8 grams. This indicates that the 0.8 grams daily excess is a decided percentage increase. The impression is not left that increase is uniform thruout the period, but it is specific-

ally stated that the percentage increase in weight is much greater in the last half of the period. Minot says that his observations confirm the conclusions of Edelfsen and Hensen(5) that female guinea pigs grow about the same whether they have young or not during their own growing period. He says "So far then as we now know gestation does not represent a tax upon the parent but a stimulus--it does not impede growth, but on the contrary favors it."

No record is given of the amount of feed consumed by the pregnant and open animals, and therefore this work does not answer the question as to whether the increased gain in weight comes from a greater consumption of feed, better utilization of the feed consumed, or from a less expensive metabolism. Neither has it been determined of what the increased weight consists. Unpublished data from the Missouri Experiment Station shows that an animal may draw material from its tissues and replace it with water, thus keeping its body weight the same when there is an actual loss of dry substance. May this not be the case under the above circumstances? If such is the case, should the increase in weight be called growth?

To quote Minot further, "It is probable that during gestation there is an accumulation of material in the mother's body which afterwards is exhausted for the production of milk."

It is well known that milch cows take on flesh while pregnant, especially when not producing milk, and become thinner after calving, even when consuming more feed than before parturition.

Forbes[6] in a review of the literature on phosphorus metabolism during pregnancy presents the following:

Hoffstrom (1910) studied metabolism of a woman during pregnancy, the subject receiving an ordinary mixed diet, and reached the following conclusions:

There was less phosphorus excreted in the urine during the second half of the period than during the first;

There was shown a greater tendency to hold back nitrogen than phosphorus; the average phosphorus storage was 0.331 grams daily, and the entire amount stored reached 56 grams at end of the period; of this amount 18 grams were deflected to the fetus, and consequently 38 grams retained by the mother organism itself.

E. Landsberg(1912) found in human pregnancy a retention of nitrogen four times as great and of sulfur and phosphorus twice as great as that required fór the fetus.

Ver Eecke(1900) studied metabolism as affected by pregnancy in rabbits. He connected the decreased phosphorus outgo observed the last few days of pregnancy with the increase in activity of the mammary glands.

These experiments, together with many others, seem to establish beyond question that a pregnant female does store up material in her own body. This increased material does not, however, necessarily represent growth in the ordinary sense of the term.

That the production of milk may be a heavy drain

upon an animal seems too obvious to require discussion. Only one instance of work along this line will be considered. Lusk(7), quoting from the work of Ostertag and Zuntz, says that a sow may yield milk rich in fat, 12.9 per cent, and in such quantity that the energy content may amount to from two to five times that required for the mother sow's metabolism. What effect has this drain upon the growth of immature mothers? Does it retard or stop growth, or is there ''a surplus or reserve capacity for assimilation'' which ''would be called in to meet the demand, and the parent organism meanwhile kept on growing as before.''? Minot(4) thinks that such is the case in pregnancy, because he found young females that had produced young heavier than corresponding females that had not been pregnant; yet he found these same females lose weight while in lactation. Must we then conclude that young females grow when pregnant and ''ungrow'' while producing milk? Evidently some other measure of growth than the weight of the animal is needed. That an animal may remain at constant weight and yet grow has been established by actual measurements of cattle at the Missouri Experiment Station.

Purpose of the Experiment

The purpose of the experiment is to study the effect of the periods of gestation and lactation on the growth and composition of swine. To gain most from such a study it is necessary to eliminate as many as possible of the other factors that influence growth and compositon. How it was attempted to eliminate these factors will appear in the plan and progress of the experiment.

Plan

The plan was to secure ten spring gilts as nearly uniform in breeding, age, size, and condition as possible. To breed some of them and to leave others open--all other conditions to be as nearly uniform for all animals as possible. The growth was to be determined by individual daily weights, and measurements, together with the slaughter and analysis of representative animals at the beginning and at the close of the periods. Pictures were to be taken also.

All these gilts were to be kept on the same ration for two or three weeks, when one was to be slaughtered as a check animal, ~~Then~~ six of the gilts were to be bred as soon as possible, and the other three left open as checks. ~~To~~ eliminate the effect of different amounts and kinds of feed, all animals were to be given the same ration thruout the experiment, except for differences in the amount as given below. All were to receive the same amount of the same ration thruout the period of gestation, the aim being to secure good thrifty growth without fattening. After farrowing, the gilts

suckling pigs were to receive all the feed they would consume, except one whose ration was to be limited to the amount consumed by the open gilts.

At the close of the gestation period one gilt was to be slaughtered just before farrowing, one just after farrowing, and at the same time one open gilt as a check.

The pigs were to be taken from one gilt that she might have the effect of the period of gestation without being subject~~ed~~ to the drain of lactation.

At the close of the lactation period, or when it was considered that lactation had made its greatest drain, there were to be slaughtered one open gilt, the one that had produced a litter but had had no period of lactation, the one that had suckled her litter on a limited ration, and one that had suckled her litter on full feed.

After the close of the lactation period, the open gilt left, and the remaining one that had suckled pigs were to be given full feed until the latter reached market conditon, when they were both to be slaughtered for analysis.

It was also planned to run digestion trials in each period to compare the digestion coefficients of the open and pregnant gilts and of suckling and non-suckling gilts.

As was anticipated might be the case, conditions arising in the progress of the experiment made it seem advisable to change some of the details of the plan. While the general plan has been adhered to, such changes were made as seemed best to take advantage of varying conditons which it was impossible to control.

The Experiment

Ten Duroc Jersey gilts were secured. Five of these, numbers 1, 2, 3, 4, and 5 were litter sisters farrowed March 1, 1914. Of the other five, numbers 7 and 8 were litter sisters, farrowed March 23; number 6, farrowed March 24 was from a dam that was a full sister of the dam of numbers 7 and 8; numbers 9 and 10 were also litter sisters farrowed March 7. All ten gilts were from the same sire.

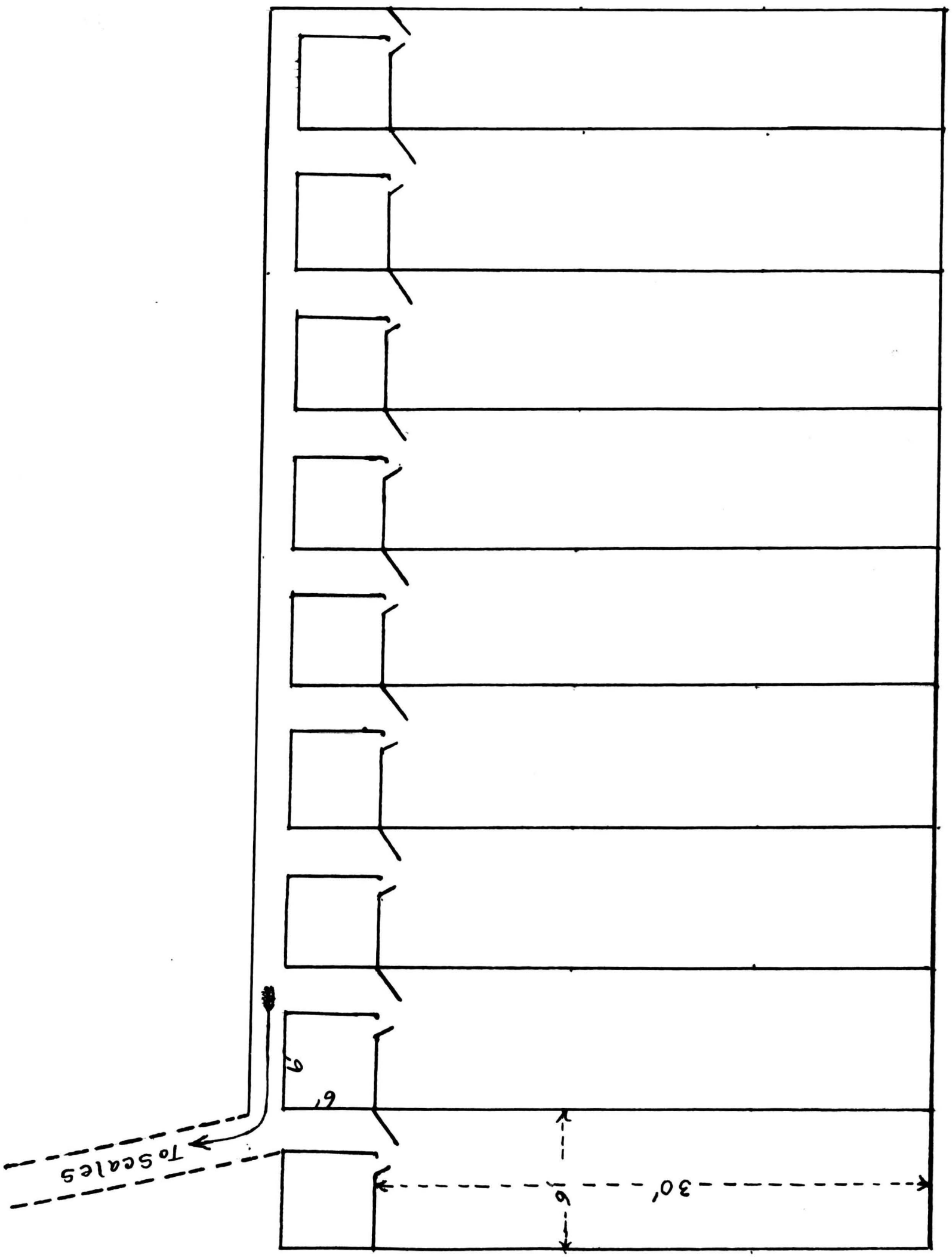
Numbers 1, 2, 3, 4, and 5 had been fed corn and tankage with oats and rape for forage. The others had been fed corn and tankage on blue grass pasture.

These gilts were delivered at the State Farm October 6, 1914, and were at once given the single serum treatment against cholera. They received this treatment about every sixty days thruout the experiment.

Individual cots, 6' X 6' with a sloping roof 4 feet high in front and 2 1/2 feet high in rear, were placed facing southward, at the north end of pens 9' X 30'. There is a door in the front of each cot and at top of front side an open window 1' X 4', covered with woven wire. The cots have wooden floors and are well made so that they afford good shelter. When the weather became cold, wheat straw was allowed for bedding, and the animals were kept quite comfortable except in the very severest weather. The pens were fenced with 30 inch woven wire with a 6 inch board at top and bottom. Back of the cots was an alley way, from which hurdles were used to set up a runway to scales. These quarters were located on an east-[illegible] hill

slope where the drainage was good.

The diagram shows the arrangement of pens and cots.



October 8th the animals were placed in separate pens except that Nos. 9 and 10 were kept in the same pen until October 29th when they were separated. From this time each gilt was kept in her own pen all the time so that one could not pick up the droppings of another and thus vary the amount of food ingested.

The pens had been cleared of vegetation except for weed and grass roots in the soil. Shortly after the gilts were placed in the pens rains made the ground very soft and the gilts did much rooting, working the soil over very thoroly. After the first few days there was no organic matter left for them to get. All were rung October 14th. They were sprayed occasionally with oil to free them from lice. A worm eradicator was given two or three times in the feed. This consisted of

3 parts sal soda
3 " Glauber salts
3 " copperas
3 " common salts
1 part sulfur

The ration chosen consisted of 4 parts ship stuff, 2 parts corn chop, 2 parts wheat bran, and 1 part linseed meal, old process. This ration has a nutritive ratio of about 1 to 4.5, and is perhaps a better ration for growing or breeding animals than hogs in dry lots usually get. According to Forbes(8) this ration probably does not contain enough ash for maximum growth, but it was not the aim of this experiment to study the animals kept under the most favorable conditions

possible; it was considered better rather to keep the animals under 'good average' conditions. Furthermore, the use of this ration would permit of closer correlation of the results of this experiment with other work in animal breeding at the Missouri Experiment Station.

It was considered impracticable to feed the same amount of feed per hundred pounds live weight, but each gilt was given the same amount. They were fed twice each day. The amount given at first was 4 pounds each daily of the mixed feed, but after two days a few of them did not eat all the feed and the amount was reduced to 3.4 pounds daily. This amount was gradually increased, the aim being to secure good thrifty growth without fattening. The feed was weighed and put in the troughs dry, then water added to moisten thoroly--the animals being shut in the cot while the feed was being prepared. They ate the feed readily and wasted very little, after the feed was eatem, water was put in the troughs that each gilt might have all the water she desired. Salt was given in the feed from time to time.

The gilts were weighed daily after the morning feed, and before they had drunk any water except that given in the feed. The first weighing was October 10th, in the afternoon. The weights were as follows: No. 1, 135 pounds; No. 2, 165 pounds; No. 3, 160 pounds; No. 4, 154 pounds; No. 5, 154 pounds; No. 6, 114 pounds; No. 7, 143 pounds; No. 8 136 pounds; No. 9, 140 pounds; No. 10, 122 pounds. The average weight was 141.3

pounds; the difference between the largest and smallest was 51 pounds.

Measurements

The measurements were taken about every thirty days as follows:

1. Height at withers
2. Height at croup
3. Width of shoulders
4. Width of shoulder points
5. Width of hams
6. Width of ham points
7. Width of head.
   This measurement was taken with calipers at the bones just below and back of the ears.
8. Heart girth
9. Paunch girth
10. Flank girth
11. Length of body
    This measurement was taken from the first long process of the spinal column, at the withers, to the tail head.
12. Depth of chest
13. Circumference of front cannon bone at smallest place.
14. Circumference of rear cannon bone at smallest place.
15. Distance from elbow to ground
16. Distance from shoulder point to ground.

In addition to the above measurements an adjustable chain was used to get the contour of the body at the heart girth, at the paunch girth, and at the flank girth. The first measurements were taken October 18th.

Pictures showing side and rear view of each animal were taken at the beginning of the experiment, at the close of ~~the~~ gestation, and at the close of the lactation period. The first pictures were made October 28th.

October 29th, the first check animal, No. 4, was slaughtered for analysis. The importance of choosing for this check an animal as nearly typical of the whole group as possible was recognized. Mr. L. A. Weaver of the Animal Husbandry Department was asked for assistance and selected No. 4 as probably best meeting the requirement.

After the slaughter of No. 4, No. 9 was put into the vacant pen, and it was considered that the experiment was really begun.

The preliminary period, from October 6th to October 29th, is of considerable value because the animals were all getting the same amounts of the same ration. It seems that this period, twenty three days, is long enough to eliminate, or at least greatly reduce, any differences in capacity for growth or utilization of food due to the slight difference in the previous ration. It also serves to indicate differences in the animals due to individuality. To show how nearly uniform were their gains in weight the following table is presented.

The top line of figures shows the weights in pounds October 16th, The second, the weights October 29th, and the third line, the gains.

Table No. 1.

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
135	165	160	154	154	114	143	126	140	122
145	173	173	163	164	124	160	138	155	135
10	8	13	9	10	10	17	12	15	13

The average gain for this period is 11.7 pounds, not far from ~~one-half~~ 0.6 pounds per day. No. 7 shows a tendency to put on more weight than the others.

After the slaughter of the check, the gilts were bred as soon as possible, on the following dates; No. 3, November 6; No. 9, November 12; No. 5, November 15; No. 2, November 18; No. 1, November 23; and No. 7, December 4. December 26th No. 7 was again in heat, but was very lame (one hind leg being broken) and it was decided to breed another gilt instead. No. 8 was bred December 30,

Beginning January 23rd a ten day digestion trial was run with two pregnant gilts, Nos. 5 and 9, and two open gilts, Nos. 6 and 10.

It was decided best to let conditions determine which gilt should be slaughtered just before farrowing, which just after farrowing, and which should be allowed to suckle litters.

March 1st, No. 3 farrowed seven pigs, only two of which were alive. Since this made her litter so small it was decided to slaughter her as the one just after farrowing,

and she was slaughtered March 2nd. The two live pigs were killed for analysis also.

No. 7 had apparently completely recovered from her injury, her apparent good condition and her gain in weight indicated that she might be used as a check at the close of the gestation period. Accodingly, she was killed at this time. It was found however that she was pregnant, having four pigs in utero. Dr. L. S. Backus of the Veterinary Department was consulted and he decided, after examination, that conception had occurred at the time of breeding, December 4th. This being the case, the gilt was 88 days in pregnancy. This made it necessary to slaughter another animal as a check at the close of the gestation period. No. 10 was slaughtered March 9th.

No. 9 farrowed March 5th. She produced five pigs, but one became chilled so that it died. She killed another, leaving only three. March 10th No. 5 farrowed, producing six pigs. March 13th No. 2 produced three pigs, one of which was only about half normal size and lived only about two days. The morning of March 14th the three pigs were taken from No. 9 and placed with No. 2. She took them without protest and they all grew nicely for several days, when one of them went off feed. It died March 25th. Postmortem showed indications of cholera. All the little pigs were then vaccinated, but all those with No. 2 became sick and two of them died April 14th and 15th. After this time No. 2 suckled

No. 1 was slaughtered March 16, 113 days in pregnancy, Gestation. She had every appearance of being within a few hours of parturition.

only two pigs. She has never seemed to produce much milk.

No. 9 suffered some inconvenience from inflammation of the mammary glands for a few days, but soon appeared to be normal and was continued thru the lactation period of the other gilts as being the nearest practicable approach, under the circumstances, to a gilt having the effect of pregnancy for the full period and without the drain of lactation.

April 15th, 106 days after breeding, No. 8 produced five pigs, one of which was dead. The others lived only two days. Postmortem showed they were not fully developed. It had seemed best that No. 8 should be carried to market condition after the close of her lactation period, but since her litter was lost it was decided best to slaughter her for analysis as another animal slaughtered after farrowing. She was slaughtered April 17th. One pig was found in utero.

March 14th after the three pigs were taken from No. 9 and given to No. 2 there were the two gilts with litters, No. 5 with her own six pigs and No. 2 with five pigs, two of which were her own. It was decided to feed No. 5 all she would eat and limit the ration of No. 2 to the amount that the open gilt would consume. It was impossible to get No. 5 to eat ~~very much~~ * more feed than the non-suckling gilt would eat. She never ate more than 6.6 pounds and that much only for one day. The others readily ate 6 pounds daily and would have eaten some more. April 5th No. 5 went off feed with a severe attack of scours, and was not back on full feed until April 11th. In this period she ate less than half her usual amount. She was separated from her pigs except for a few minutes at a time

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Table Ia. Chronology of the Experiment.

No. of Gilt	1	2	3	4	5	6	7	8	9	10
Date of Birth in 1914	Nov. 1	Mar. 1	Mar. 1.	Mar. 1	Mar. 1.	Mar. 24	Mar. 23	Mar. 23	Mar. 1	Mar. 1
Age in days when rec'd Oct. 6, 1914,	220	220	220	220	220	191	198	198	214	214
Weight when weighed at Station, Oct. 10, Pounds	135	165	160	154	154	114	143	126	140	122
Weight on Oct. 29 when No. 4 Check was Slaughtered, pounds.	145	173	173	163	164	124	160	138	153	135
Gain in weight from Oct. 10 to Oct. 29, pounds	10	8	13	9	10	10	17	12	13	13
Date of Breeding	Nov. 23	Nov. 18	Nov. 6	——	Nov. 13		Dec. 4	Dec. 30	Nov. 12	
Age at Breeding, days	268	263	251		260		257	283	253	
Weight at Breeding, pounds	167	185	178		176		188	208	163	
Date of Farrowing, 1915	Mar. 16	Mar. 13	Mar. 1		Mar. 10		——	Apr. 15	Mar. 5	
Age at Farrowing, days	381	378	365		375			378	363	
Weight just before Farrowing, pounds	260	274	270		272			273[2]	262	
Weight just at close of Farrowing, pounds	——	255[4]	246[5]		247[6]			253[5]	242	
Number of pigs	10	3	1		6		4	6	5	
Weight of litter, pounds	18.56	5.70	7.75		14.65		4.6[3]		11.4	
Number of pigs suckled thru lactation		2			6					
Weight at close of lactation		250			188					
Date of slaughter	Mar. 16	May 20	Mar. 2	Oct. 29, (14)	May 17	May 17	Mar. 2	Apr. 17	May 12	Mar. 9
Age at time of slaughter, days	381	446	366	243	443	417	344	380	431	367
Weight at slaughter, pounds	261	258	246	163	188	267	256	252	287	227
No. of days on experiment, from Oct. 29th to slaughter	138	203	123	0	200	199	120	154	194	150
Gain in weight from Oct. 29th to slaughter	116	130	86	0	34	153	113	126	147	105
Average gain in weight per day Pounds.	.84	.64	.70	0	.17	.77	.92	.77	.76	.81

[1]See page 16 [2]See page 17 [3]See page 16

[4]Four days after [5]Delivery not complete. See page 17

[6]Seven days after

four or five times a day, and she was allowed some blue grass to hasten her recovery.

April 27th a ten-day digestion trial was started with Nos. 5, 9, and 6 (No. 5 suckling six pigs, No. 9 having produced a litter, No. 6 open).

It was thought best to wait a few days after the close of the digestion trial, May 7th, before slaughtering for analysis. Each animal that had produced pigs was to be slaughtered the same number of days (68) after farrowing--the date for slaughter was as follows: No. 9, May 12; Nos. 5 and 6, May 17; and No. 2, May 20.

It should be noted here that May 11, No. 5 went slightly off feed. She was not violently ill, but she seemed to suffer more than the others from the heat; she appeared to be somewhat rheumatic, a little lame, slow in her movements, and a little uncertain on her feet. Her general appearance reminded the writer of some low ash diet calves, and the analysis of this animal for ash is awaited with much interest.

No. 2 was the last of the ten gilts with which the investigation was begun, thus her slaughter closed the experiment with the live animals.

In order to facilitate a study of the chronology of the experiment the following table, No. 1a, is introduced in recapitulation.

In the following pages we shall attempt to describe, in enough detail to give an understanding of the conditions, such phases of the work as appear to need any further explanation; present enough of the original data to enable the reader to make his own study and draw his own conclusions; and make some comparisons and give some discussion of the results.

Weights

Minot[4] considers weight the best single measure of the growth of an organism. It may be a measure of the increase in fatness as well. These weighings were made under as nearly uniform conditions as was possible with the conditions under which the work was done. Variations in weight were to be expected. When the pens were muddy each animal might carry more or less mud when she was weighed. When it was rainy water was carried in the hair. The weight ~~also~~ also was affected by whether urination or defacation had occurred just before the animal was driven on the scales. The variation in the weight of a gilt from day to day was frequently three to five pounds, sometimes running as high as six or seven pounds for no apparent reason. Therefore a small variation where only one day's weight is taken cannot be considered significant.

The accompanying table No. 2 makes a comparison of the gains in weight of five pregnant gilts and two open gilts for each half of the gestation period, and for the entire period. The weights for the first half include the weights of the developing litters. In the comparisons for the second half and for the entire period, when the weight was known, the weight of litter and afterbirth was subtracted from the total gain because we are trying to find the effect upon the mother, not upon the litter. The subtraction of this weight from the gain in ~~for~~ the second half of the period introduces an error of whatever weight the young had attained in the first half of the period. There should be deducted only the amount that the young had increased in weight

Table No. 2

Comparison of Gains in Pounds Live Weight of

Pregnant and Open Gilts.

All Weights are three day Averages.

	Pregnant Gilts					Open Gilts[2]	
	For first half of the Gestation Period						
	No. 1	No. 2	No. 3	No. 5	No. 9	No. 6	No. 10
Weight at Breeding	166.00	185.00	177.00	176.00	163.00	132.00	147.00
Age at Breeding, days	268	263	251	260	253		
Weight 57 days later	206.00	228.00	216.00	220.00	210.00	178.00	186.00
Gain in Weight	40.00	43.00	39.00	44.00	47.00	46.00	39.00
Av. Daily gain	0.70	0.75	0.68	0.77	0.82	0.80	0.68
Av. Daily for Group			0.75			0.74	
	For second half of the Gestation Period						
Weight at Beginning	206.00	228.00	216.00	220.00	210.00	178.00	186.00
Weight at Farrowing	260.00	274.00	270.00	272.00	262.00	215.00	222.00
Gains	54.00	46.00	54.00	52.00	52.00	37.00	36.00
Weight Litter and Afterbirth	23.00*	8.00	10.00	17.00	13.00		
Net Gains	31.00	36.00	44.00	35.00	39.00		
No. days	55	55	57	57	56	57	57
Av. Daily Gain	0.56	0.67	0.77	0.61	0.70	0.65	0.63
Av. Daily for Group			0.66			0.64	
	For Entire Gestation Period						
Total Net Gain	71.00	81.00	83.00	79.00	86.00	83.00	75.00
No. Days	112	112	114	112	113	114	114
Av. Daily Gain	0.63	0:72	0.73	0.70	0.76	0.73	0.66
Av. Daily for Group			0.71			0.70	

*This weight is too high to be comparable with the others because it includes the amniotic fluid

[2] For this comparison the first weights of the open gilts were taken November 15--about the middle of the breeding period.

thru this period. This error is probably not very great and is somewhat offset by the fact that the weight subtracted does not, except in the case of gilt No. 1, include the weight of the amniotic fluid, which probably is fully as great as the weight attained by the young in the first half of the period.

A comparison for this second period using the gross weight of the pregnant gilts before farrowing shows an average of 0.28 pounds daily gain in favor of the pregnant gilts. This amounts in 57 days to 15.96 pounds. This is 1.76 pounds greater than the average of the amount subtracted as the weight of litter and afterbirth. It should be remembered, however, that the weight subtracted is, except in the one instance, less than the weight expelled at parturition because the weight of the amniotic fluid could not be ascertained. It may also be remarked here that the weight of the mother includes the temporarily increased weight of the reproductive organs, which the slaughter house data indicates is from 2 to 3 pounds. To be sure, this increased weight is a part of the mother organism as is also the increased mammary, but it seems questionable whether this temporary increase should be considered growth.

The average daily gains for the two groups in all three of the comparisons show very little difference, 0.01 pounds for the first half and for the whole period, and 0.02 pounds for the second half of the gestation period. An examination of the average daily gains of each animal shows in the first half of the period the highest gain by a pregnant gilt, and the second highest by an open gilt, the other open gilt tying

with another pregnant one for low place. For the second half of the period the three highest gains are by pregnant gilts, but the two lowest places are also held by pregnant animals. For the whole period the first place is taken by a pregnant gilt; one pregnant and one open tying for second place, with a pregnant one last.

From this comparison of weights then we can not conclude that there is any difference in the pregnant and open animals, the difference between groups in each case being less than the differences within the groups.

It may be significant that the gilt, No. 1, showing the least gain for the second half and for the entire period is the pregnant gilt that produced the largest litter.

Ration

Thru the gestation period each animal received the same amount of feed daily, i.e., the feed for all gilts was increased the same amount at the same time. The different times of breeding, however, resulted in a slight variation in the total amount consumed. For example, Gilt No. 3 was bred November 6th and farrowed March 1st, while Gilt No. 1 was not bred till November 23rd and was slaughtered March 16th, presumably one day before farrowing. No. 1 received a little more feed per day after the slaughter of No. 3 than No. 3 received before the breeding of No. 1.

November 15th, about the middle of the breeding period, was chosen as the beginning date for the open gilts to compare both gains in weight and weight of feed consumed. The variations in the amount of feed consumed seem not large

enough to make an appreciable difference in the results. Table No. 3 shows the amount consumed by each gilt for the different months. The average for the five pregnant gilts is 2.1 pounds less for the period than the amount consumed by each open gilt.

We cannot present a complete analysis of all the feed used in this experiment as the analytical work is not yet completed. Since the same kind of feed was used thruout the experiment a comparison of the amounts consumed will introduce no appreciable error in the results of this one experiment.

In a discussion of the gains in weight during pregnancy it was observed that the smallest average daily gain was made by the gilt producing the largest litter. In this table of feed consumed it is shown that she consumed the greatest amount of feed. The excess is not great, only 3.9 pounds for the period more than was consumed by the open gilts, but this makes us sure that her smaller gain was not due to a smaller amount of feed.

Measurements

That opportunity may be afforded for study of the individual animals and comparison of their growth from time to time, a complete record of the measurements is presented in the following tables, Nos. 4 to 12. These tables show the growth of the animals and also serve to indicate the degree of accuracy with which it is possible to make such measurements.

Table No. 3

	Weight of Feed consumed in Pounds during Pregnancy						
	Pregnant Gilts					Open Gilts for 114 days, Beginning Nov. 15	
	No. 1	No. 2	No. 3	No. 5	No. 9	No. 6	No. 10
Date of Breeding	10/23	10/18	10/6	10/15	10/12		
November	32.2	54.1	100.3	66.1	78.1	66.1	66.1
December	142.8	142.8	142.8	142.8	142.8	142.8	142.8
January	148.8	148.8	148.8	148.8	148.8	148.8	148.8
February	147.9	147.9	147.9	147.9	147.9	147.9	147.9
March	81.0	54.0	5.4	37.8	27.0	43.2	43.2
Total	552.7	547.6	545.2	543.4	544.6	548.8	548.8

Table 4

Measurements of Gilt No. 1 in centimeters.

Date of Birth, March 1, 1914.

Date	10/18/14	11/21/14	12/31/14	2/4/15	2/28/15
Weight, Pounds	140.0	163.0	189.0	223.0	246.0
Height at Withers	51.0	55.0	56.5	56.0	59.0
Height at Croup	59.0	60.0	63.5	65.0	66.0
Width of Shoulders	26.0	27.0	28.5	33.0	32.0
Width of Shoulder Points	21.0	22.0	23.5	24.0	24.0
Width of Hams	24.0	26.0	27.0	30.0	31.0
Width of Ham Points	19.0	20.0	22.0	23.0	25.0
Width of Head	15.0	15.0	18.0	18.0	17.5
Heart Girth	95.0	99.0	102.0	112.0	120.0
Paunch Girth	100.0	109.0	113.0	124.0	133.0
Flank Girth	90.0	98.0	101.0	115.0	120.0
Length of Body	82.0	87.0	87.5	91.0	94.0
Depth of Chest	29.0	30.0	32.5	35.0	36.0
Circumference of Cannon, front	14.0	15.0	15.0	15.0	16.0
Circumference of Cannon, rear	14.5	15.0	15.5	15.5	16.5
Distance from Elbow to Ground	26.0	29.0	29.5	29.0	28.0
Distance from Shoulder Point to Ground	28.0	30.0	31.0	30.0	31.0

Table 5

Measurements of Gilt No. 2, in centimeters

Date of Birth, March 1, 1914.

Date	10/18/14	11/21/14	12/31/14	2/4/15	2/28/15	4/10/15	5/11/15
Weight, Pounds	168.0	186.0	215.0	240.0	266.0	252.0	251.0
Height at Withers	52.0	53.0	55.0	56.0	56.0	56.0	59.0
Height at Croup	61.0	63.0	64.0	63.0	65.0	62.0	65.0
Width of Shoulders	29.0	31.0	32.0	35.0	36.0	34.0	34.0
Width of Shoulder Points	23.0	23.0	25.0	25.0	2770	26.0	27.0
Width of Hams	26.0	28.0	30.5	33.0	33.0	33.0	33.0
Width of Ham Points	21.0	22.0	24.0	25.0	26.0	24.0	25.0
Width of Head	15.5	16.0	18.0	17.5	18.0	18.0	17.0
Heart Girth	96.0	102.0	108.0	113.0	124.0	115.0	115.0
Paunch Girth	108.0	113.0	120.0	126.0	137.0	134.0	133.0
Flank Girth	99.0	99.0	111.0	113.0	115.0	120.0	119.0
Length of Body	82.0	88.0	88.0	93.0	97.0	99.0	98.0
Depth of Chest	30.0	31.0	33.0	33.0	34.0	35.0	36.0
Circumference of Cannon, front	15.0	15.5	16.0	15.5	16.0	16.5	16.5
Circumference of Cannon, rear	15.5	16.0	16.5	16.0	16.5	16.5	17.0
Distance from Elbow to Ground	27.0	28.0	29.0	28.0	28.0	28.0	28.0
Distance from Shoulder Point to Ground	30.0	30.0	31.0	30.0	30.0	30.0	30.0

Table 6

Measurements of Gilt No. 3, in centimeters

Date of Birth, March 1, 1914.

Date	10/18/14	11/21/14	12/31/14	2/4/15	2/28/15
Weight, Pounds	165.0	186.0	217.0	245.0	271.0
Height at Withers	54.0	55.0	59.0	60.0	58.0
Height at Croup	64.0	64.0	66.0	68.0	67.0
Width of Shoulders	30.0	30.0	30.0	33.0	35.0
Width of Shoulder Points	23.0	23.0	24.0	25.0	28.0
Width of Hams	26.0	27.0	29.0	29.0	32.0
Width of Ham Points	21.0	22.0	24.0	24.0	24.0
Width of Head	15.0	15.0	16.5	16.0	17.5
Heart Girth	98.0	105.0	110.0	119.0	121.0
Paunch Girth	110.0	121.0	123.0	135.0	141.0
Flank Girth	94.0	104.0	109.0	120.0	124.0
Length of Body	82.0	89.0	90.0	96.0	97.0
Depth of Chest	31.0	32.0	34.0	35.0	36.0
Circumference of Cannon, front	14.5	15.0	15.5	15.0	15.5
Circumference of Cannon, rear	15.0	15.3	15.5	15.2	15.2
Distance from Elbow to Ground	27.0	28.0	28.5	28.0	29.0
Distance from Shoulder Point to Ground	29.5	30.5	31.0	29.0	32.0

Gilt No. 4

Date of Birth, March 1, 1914

Date	10/18/14
Weight, Pounds	154.0
Height at Withers	53.0
Height at Croup	59.0
Width of Shoulders	28.0
Width of Shoulder Points	23.0
Width of Hams	26.0
Width of Ham Points	20.0
Width of Head	15.0
Heart Girth	95.0
Paunch Girth	104.0
Flank Girth	94.0
Length of Body	82.0
Depth of Chest	31.0
Circumference of Cannon, front	15.5
Circumference of Cannon, rear	15.5
Distance from Elbow to Ground	26.0
Distance from Shoulder Point to Ground	29.0

Table No. 7

Measurements of Gilt No. 5, in centimeters.

Date of Birth, March 1, 1914.

Date	10/18/14	11/21/14	1/1/15	2/4/15	2/28/15	4/10/15	5/11/15
Weight, Pounds	160.0	180.0	207.0	240.0	265.0	203.0	194.0
Height at Withers	54.0	55.0	57.0	59.0	62.0	57.0	57.0
Height at Croup	62.0	60.0	64.0	64.0	67.0	68.0	66.0
Width of Shoulders	29.0	28.0	29.0	33.0	35.0	30.0	30.0
Width of Shoulder Points	21.0	24.0	24.5	24.0	27.0	24.0	26.0
Width of Hams	27.0	28.0	28.0	31.0	32.0	29.0	28.0
Width of Ham Points	21.0	21.0	22.0	24.0	25.0	21.0	21.0
Width of Head	16.0	15.5	17.5	17.5	17.5	17.0	17.0
Heart Girth	95.0	98.0	109.0	114.0	126.0	105.0	103.0
Paunch Girth	105.0	116.0	120.0	129.0	140.0	119.0	118.0
Flank Girth	95.0	100.0	107.0	118.0	125.0	109,0	107.0
Length of Body	85.0	88.0	90.0	96.0	95.0	96.0	93.0
Depth of Chest	31.0	31.0	34.0	34.0	38.0	34.0	34.0
Circumference of Cannon, front	15.0	15.0	16.0	15.0	15.5	16.0	16.0
Circumference of Cannon, rear	15.0	15.8	16.0	16.0	16.0	16.0	15.5
Distance from elbow to Ground	27.0	27.0	28.0	28.5	29.0	31.0	29.5
Distance from Shoulder Point to Ground	30.0	30.0	31.0	31.0	32.0	32.0	31.0

Table No. 8

Measurements of Gilt No. 6, in centimeters.

Date of Birth, March 24, 1914.

Date	10/18/14	11/21/14	1/1/15	2/4/15	2/28/15	4/10/15	5/11/15
Weight, Pounds	120.0	139.0	160.0	194.0	213.0	243.0	260.0
Height at Withers	50.0	51.0	54.0	54.0	57.0	61.0	64.0
Height at Croup	57.0	57.0	61.0	60.0	64.0	68.0	70.0
Width of Shoulders	26.0	26.0	28.0	30.0	32.0	33.0	37.0
Width of Shoulder Points	20.0	21.0	24.0	22.5	25.0	26.0	27.0
Width of Hams	24.0	26.0	27.0	30.0	31.0	32.0	33.0
Width of Ham Points	18.0	20.0	21.5	21.0	22.0	24.0	25.0
Width of Head	14.0	14.0	16.5	15.5	17.0	18.0	18.0
Heart Girth	88.0	92.0	97.0	106.0	111.0	118.0	120.0
Paunch Girth	100.0	104.0	107.0	113.0	122.0	125.0	125.0
Flank Girth	91.0	94.0	102.0	105.0	110.0	117.0	115.0
Length of Body	76.0	79.0	81.0	91.0	93.0	98.0	99.0
Depth of Chest	29.0	29.0	32.0	32.0	33.0	36.0	38.0
Circumference of Cannon, front	13.5	13.5	14.0	14.5	15.0	15.0	16.0
Circumference of Cannon, rear	13.5	14.0	14.5	15.0	15.5	16.0	16.5
Distance from elbow to Ground	25.0	26.0	27.0	26.0	26.0	29.0	30.0
Distance from Shoulder Point to Ground	27.0	28.0	28.5	28.0	28.0	31.0	33.0

Table No. 9

Measurements of Gilt No. 7, in centimeters.

Date of Birth, March 23, 1914.

Date	10/20/14	11/21/14	1/1/15	2/4/15	2/28/15
Weight, Pounds	153.0	179.0	199.0	233.0	252.0
Height at Withers	52.0	53.0	Too	59.0	59.0
Height at Croup	58.0	60.0	lame	62.0	62.0
Width of Shoulders	29.0	30.0	to	36.0	37.0
Width of Shoulder Points	22.0	24.0	measure.	26.0	28.0
Width of Hams	28.0	29.0	Leg	31.0	34.0
Width of Ham Points	21.0	22.5	broken.	25.0	27.0
Width of Head	14.0	15.0		17.0	17.0
Heart Girth	97.0	104.0		119.0	122.0
Paunch Girth	113.0	119.0		128.0	139.0
Flank Girth	104.0	108.0		110.0	120.0
Length of Body	80.0	83.0		90.0	92.0
Depth of Chest	31.0	32.0		36.0	36.0
Circumference of Cannon, front	14.5	14.5		16.0	16.0
Circumference of Cannon, rear	13.5	14.5		15.0	16.0
Distance from Elbow to Ground	27.0	28.0		26.0	27.0
Distance from Shoulder Point to Ground	29.0	29.0		29.0	30.0

Table No. 10.

Measurements of Gilt No. 8, in centimeters.

Date of Birth, March 23, 1914.

Date	10/20/14	11/21/14	1/1/15	2/4/15	2/28/15	4/10/15
Weight, Pounds	133.0	151.0	173.0	210.0	232.0	272.0
Height at Withers	48.0	51.0	54.0	56.0	61.0	60.0
Height at Croup	56.0	57.0	61.0	62.0	65.0	66.0
Width of Shoulders	26.0	27.0	28.0	31.0	32.0	34.0
Width of Shoulder Points	21.0	22.0	24.0	23.0	26.0	26.0
Width of Hams	25.0	27.0	27.5	30.0	31.0	33.0
Width of Ham Points	18.0	20.0	22.0	23.0	23.0	26.0
Width of Head	13.0	14.0	16.0	15.5	17.0	17.5
Heart Girth	89.0	89.0	98.0	107.0	115.0	120.0
Paunch Girth	98.0	105.0	109.0	118.0	127.0	140.0
Flank Girth	94.0	92.0	100.0	107.0	116.0	125.0
Length of Body	79.0	87.0	89.0	93.0	93.0	100.0
Depth of Chest	29.0	29.0	32.5	33.0	34.0	37.0
Circumference of Cannon, front	14.5	16.0	14.0	15.0	15.5	15.0
Circumference of Cannon, rear	13.5	15.0	14.0	14.5	16.0	16.0
Distance from Elbow to Ground	26.0	26.0	27.0	28.0	26.0	29.0
Distance from Shoulder Point to Ground	28.0	28.0	29.0	30.0	29.0	31.0

Table No. 11

Measurements of Gilt No. 9, in centimeters.

Date of Birth, March 7, 1914.

Date	10/20/14	11/21/14	12/31/14	2/4/15	2/28/15	4/10/15	5/11/15
Weight, Pounds	148.0	172.0	201.0	237.0	257.0	265.0	281.0
Height at Withers	52.0	54.0	56.0	57.0	62.0	61.0	66.0
Height at Croup	60.0	62.0	63.0	64.0	67.0	67.0	71.0
Width of Shoulders	28.0	28.0	30.0	33.0	35.0	35.0	35.0
Width of Shoulder Points	21.0	23.0	24.0	24.0	26.0	25.0	27.0
Width of Hams	25.0	26.0	29.0	31.0	32.0	34.0	32.0
Width of Ham Points	19.0	21.0	24.0	23.0	24.0	24.0	25.0
Width of Head	14.0	14.5	16.0	16.0	16.5	17.5	17.5
Heart Girth	95.0	99.0	104.0	114.0	123.0	119.0	125.0
Paunch Girth	101.0	113.0	117.0	132.0	140.0	134.0	135.0
Flank Girth	95.0	107.0	105.0	113.0	127.0	122.0	120.0
Length of Body	81.0	87.0	88.0	91.0	95.0	98.0	102.0
Depth of Chest	30.0	31.0	34.0	34.0	35.0	38.0	38.0
Circumference of Cannon, front	14.0	15.5	14.5	14.5	15.5	15.0	15.5
Circumference of Cannon, rear	14.0	15.0	14.5	15.0	16.0	16.0	16.0
Distance from Elbow to Ground	26.5	28.0	28.5	28.0	28.0	29.0	31.0
Distance from Shoulder Point to Ground	29.0	30.0	31.5	30.0	31.0	32.0	33.0

Table No. 12.

Measurements of Gilt No. 10, in centimeters.

Date of Birth, March 7, 1914.

Date	10/20/14	11/21/14	1/1/15	2/4/15	2/28/15
Weight, Pounds	132.0	152.0	173.0	202.0	220.0
Height at Withers	50.0	53.0	54.0	57.0	59.0
Height at Croup	58.0	60.0	61.0	64.0	65.0
Width of Shoulders	27.0	28.0	28.0	31.0	33.0
Width of Shoulder Points	19.0	22.0	24.5	22.0	26.0
Width of Hams	24.0	26.0	27.5	30.0	31.0
Width of Ham Points	19.0	21.0	22.0	23.0	23.0
Width of Head	14.0	15.0	17.0	16.0	17.5
Heart Girth	87.0	94.0	98.0	103.0	110.0
Paunch Girth	98.0	108.0	109.0	113.0	120.0
Flanks Girth	87.0	97.0	100.0	103.0	107.0
Length of Body	80.0	87.0	88.0	90.0	97.0
Depth of Chest	28.0	29.0	32.0	32.0	33.0
Circumference of Cannon, front	14.0	15.0	14.5	16.0	15.0
Circumference of Cannon, rear	15.0	15.0	15.5	16.0	15.0
Distance from Elbow to Ground	25.0	27.0	27.5	28.0	26.0
Distance from Shoulder Point to Ground	27.0	29.0	31.0	29.0	29.0

In table No. 13 is shown a comparison of the gains made by the different animals as determined by these measurements. These gains are from the first measurement October 18, 1914, to the last measurement before farrowing began, February 28, 1915. This covers more time than the gestation period, but the differences from month to month are so small that this is of little moment, since the time is the same for all the animals.

The averages for gain in height at both withers and croup are in favor of the open gilts, but a comparison of the gains by different individuals does not support the idea that the average represents the true situation. In gain in height at withers one of the pregnant gilts is highest, while two others are higher than one of the open gilts. That is to say that the average for three of the five pregnant gilts is higher than is the average for the two open gilts. In gain in height at croup two of the pregnant gilts have just exactly equalled the two open ones.

In length of body there appears to be a uniform gain in favor of the open ones. In width of head the gain appears to be slightly in favor of the open gilts. The above measurements most nearly indicate skeletal growth, except for the measurements of cannons which show very little difference. While the averages indicate that there is possibly greater growth made by the open animals than by the pregnant, a more careful study points out the fact that the greatest differences are individual differences rather than group differences. In the case of the length of body this is not so apparent, but even

Table No. 13

Growth of Gilts as Shown by Measurements, in centimeters, from First Measurement to Close of Gestation Period, Feb. 28, 1915.

	No.1	No.2	No.3	No.5	No.7*	No.8*	No.9	Average for five pregnant Gilts
Height at Withers	8.0	4.0	4.0	8.0	7.0	6.0	10.0	6.8
Height at Croup	7.0	4.0	3.0	5.0	4.0	5.0	7.0	5.2
Length of Body	12.0	15.0	15.0	10.0	12.0	11.0	14.0	13.2
Distance from elbow to ground	2.0	1.0	2.0	2.0	0.0	2.0	1.5	1.7
Distance from shoulder point to ground	3.0	0.0	3.0	2.0	1.0	2.0	2.0	2.0
Depth of Chest	7.0	4.0	5.0	7.0	5.0	4.5	5.0	5.6
Circumference of front Cannon	2.0	1.0	1.0	0.5	2.0	1.0	1.5	1.2
Circumference of rear Cannon	2.0	1.0	0.2	1.0	2.5	2.0	2.0	1.2
Width of Head	2.5	2.5	2.5	1.5	3.0	1.5	2.5	2.3
Width of Shoulder Points	3.0	4.0	5.0	6.0	6.0	2.0	5.0	4.6
Width of Shoulders	6.0	7.0	5.0	6.0	8.0	6.0	7.0	6.2
Width of Hams	7.0	7.0	6.0	5.0	6.0	5.5	7.0	6.4
Width of Ham Points	6.0	5.0	3.0	4.0	6.0	4.0	5.0	4.6
Heart Girth	25.0	28.0	23.0	31.0	25.0	22.0	28.0	27.0
Gain in Weight, Pounds	106.0	98.0	106.0	105.0	99.0		109.0	105.0

	No.6	No.10	Average for open Gilts
Height at Withers	7.0	9.0	8.0
Height at Croup	7.0	7.0	7.0
Length of Body	17.0	17.0	17.0
Distance from elbow to ground	1.0	1.0	1.0
Distance from shoulder point to ground	1.0	2.0	1.5
Depth of Chest	4.0	5.0	4.5
Circumference of front Cannon	1.5	1.0	1.3
Circumference of rear Cannon	2.0	0.0	1.0
Width of Head	3.0	3.5	3.3
Width of Shoulder Points	5.0	7.0	6.0
Width of Shoulders	6.0	6.0	6.0
Width of Hams	7.0	7.0	7.0
Width of Ham Points	4.0	4.0	4.0
Heart Girth	23.0	23.0	23.0
Gain in Weight, Pounds	93.0	88.0	91.0

*No. 7. 88 days in pregnancy. No. 8, from Jan. 1 to Apr. 10. These two omitted from average.

here the difference between the greatest gain by a pregnant gilt and the gain by an open one is only two centimeters, while a difference of five centimeters is shown between the gains of two of the pregnant gilts. Therefore we may conclude that these results indicate that the factor of individuality is strong enough to account for the differences observed.

Pictures

Pages 37 to ~~44~~ 50

These pictures are given that the reader may see for himself something of how nearly uniform the animals were at the beginning of the experiment, and the change in appearance as the experiment progressed.

The first pictures were taken October 28, 1914, the second, February 25, 1915,--120 days later. Pictures were taken again May 12th of all the gilts then alive. Each time a rear and a side view ~~was~~ were taken of each animal. The distance was always 320 centimeters. It was not always possible to get the animal to stand just exactly where it was desired and it was necessary to move the camera. Needless to say, we could not take a measurement for each changed position, but the distance was marked on the ground and care was observed to keep the same distance between the camera and the animal.

Digestion Trials

Each animal on digestion trial was confined in a crate where she could not turn around. Each crate is 5 feet long, 3 feet high, and 22 inches wide. Two iron rods back of the animal prevent it from backing from the crate and

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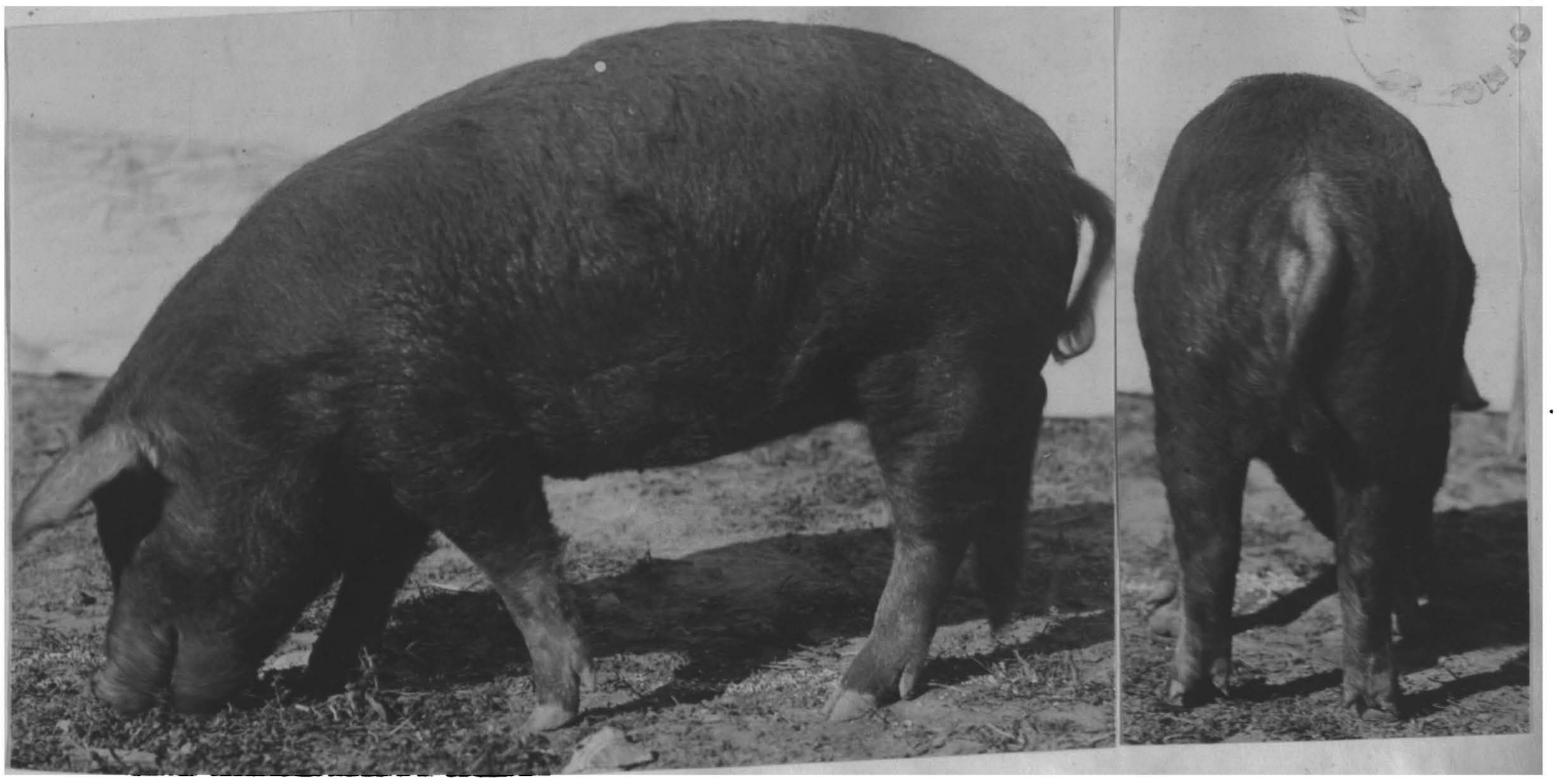
Gilt No. 1.



Oct. 29, 1914 – 7mo. 29 days

Feb. 25, 1915 – 11mo. 25 days

38

Gilt No. 2.

Oct. 29, 1914 – 7mo. 29 days

Feb. 25, 1915 – ~~7mo. 29 days~~ 11mo. 25 days

37 3

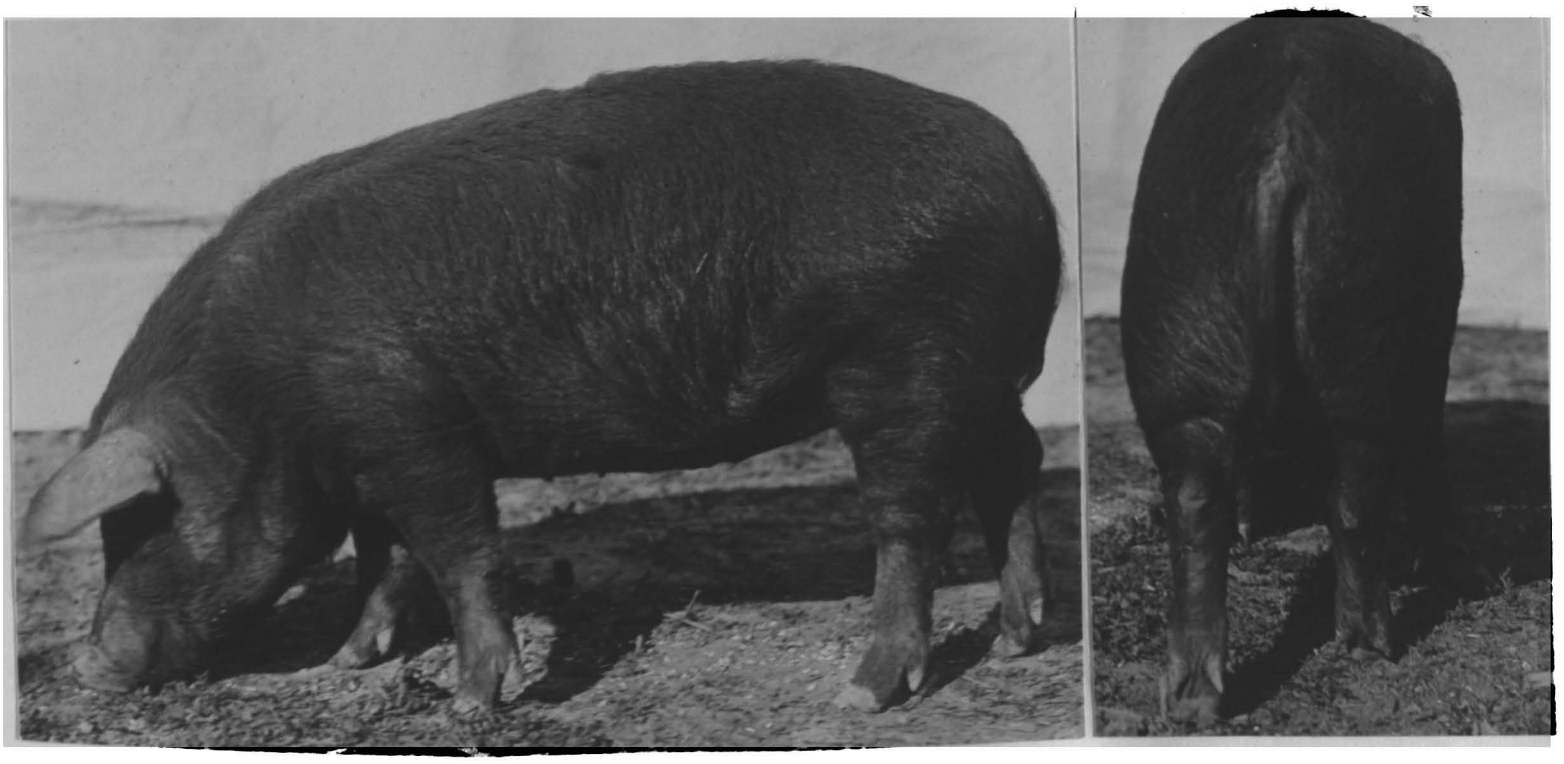
Gilt No. 3.

Oct. 29, 1914 — 7mo. 29 days

Feb. 25, 1915 — 11mo. 25 days

40

Gilt No. 4.



Oct. 29, 1914 — 7mo. 29 days

41

Gilt No. 5.

Oct. 29. 1914 – 7mo. 29days

Feb. 25, 1915 – 11mo. 25 days

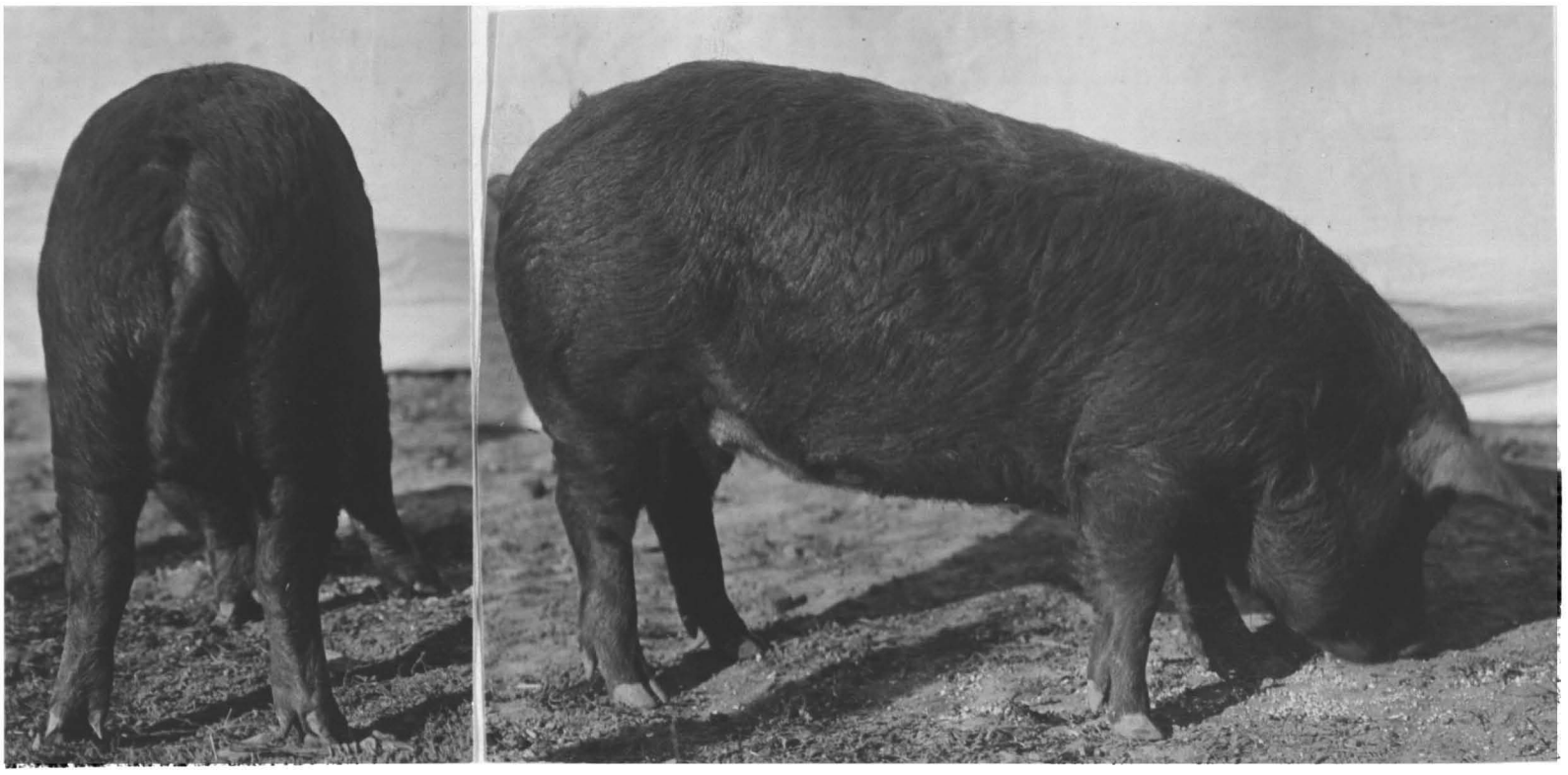
42

Gilt No. 6

Oct. 29, 1914 – 7mo. 5 days

Feb. 25, 1915 – 11mo. 1 day

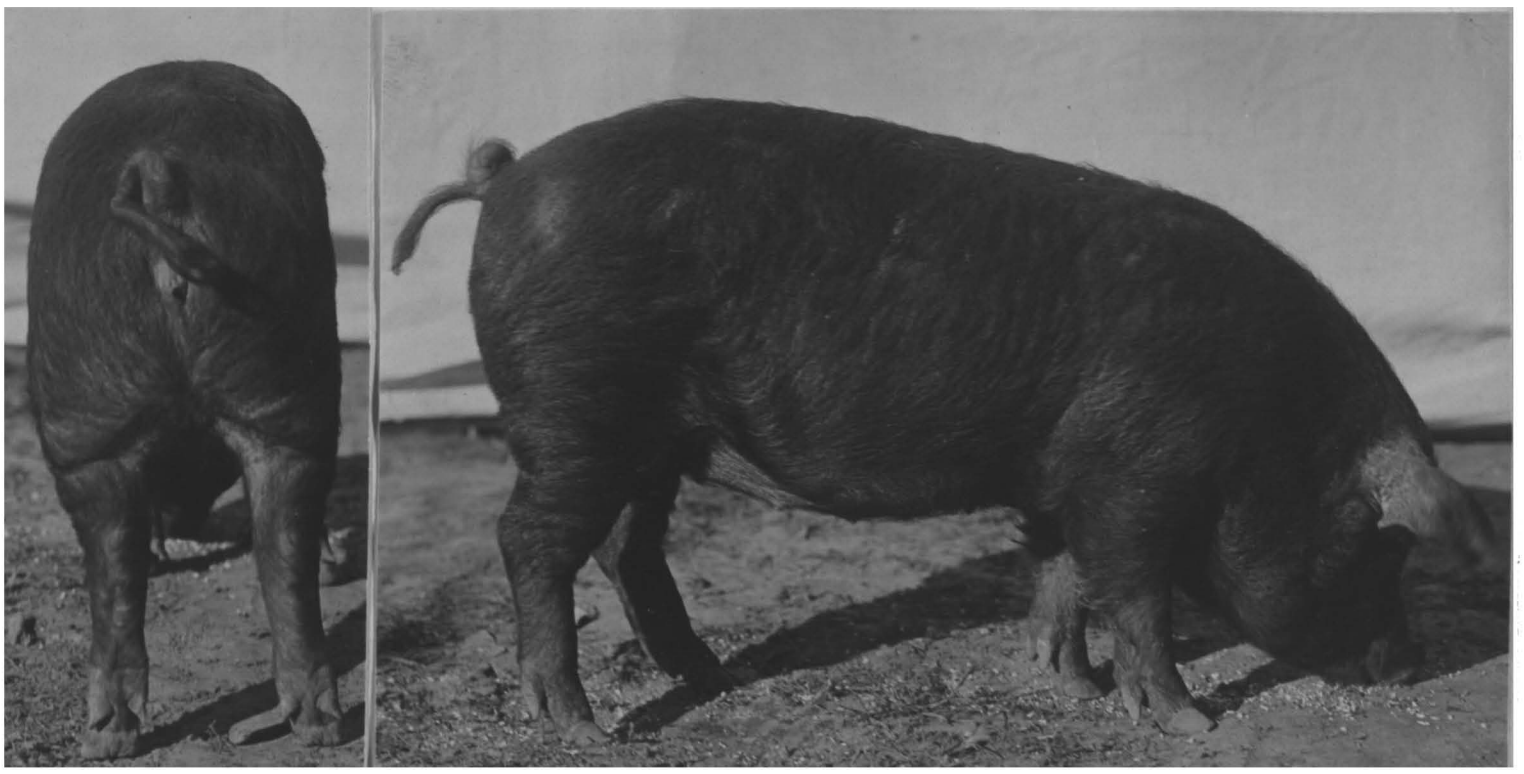
Gilt No. 9.



Oct. 29, 1914 — 7 mo. 22 days

Feb. 25, 1915 — 11 mo. 18 days

Gilt No. 10.



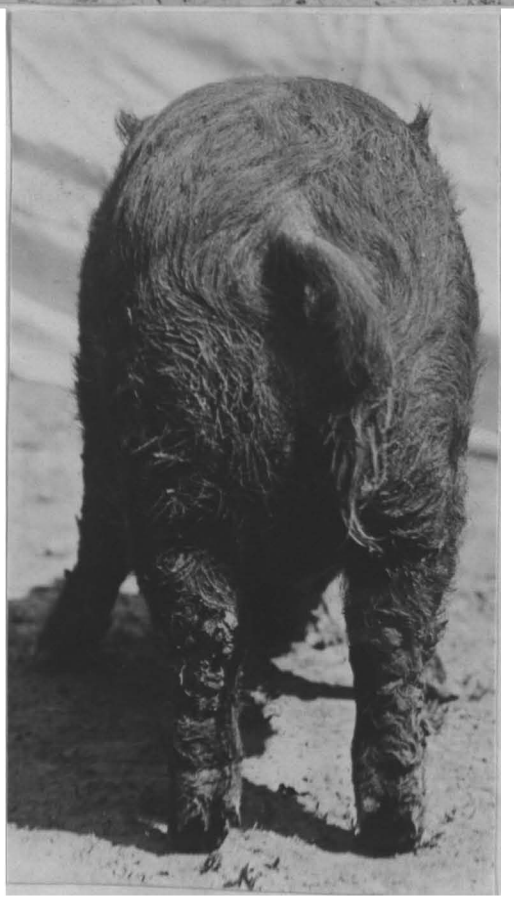
Oct. 29, 1914 — 7mo. 22 days

Feb. 25, 1915 — 11mo. 18 days

47

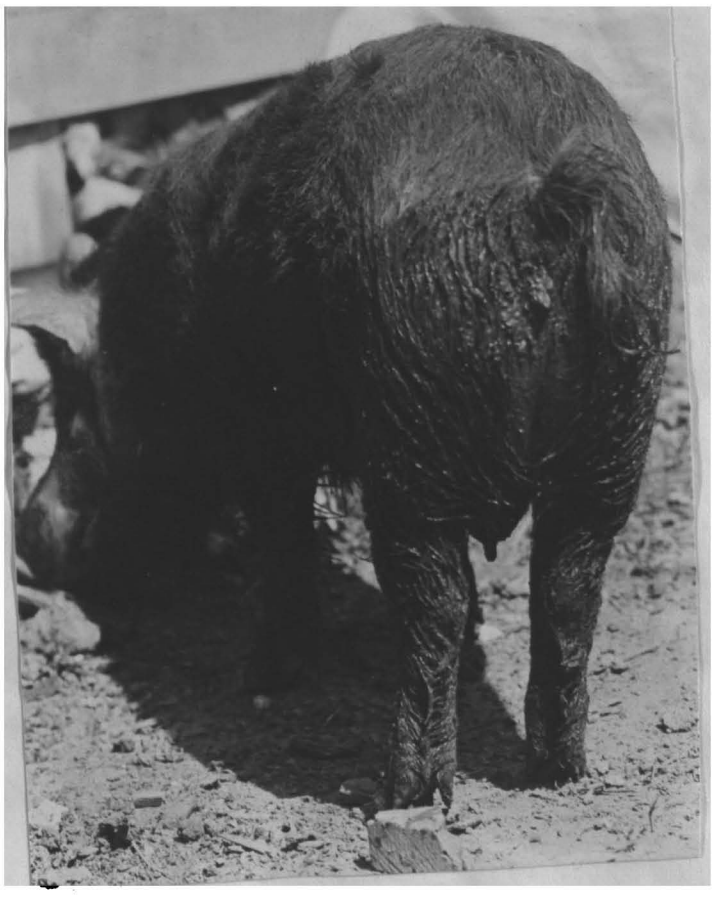
Gilt No. 2.

May 12, 1915 – 14 mo. 12 days



Gilt No. 5.

May 12, 1915 — 14 mo. 12 days



Gilt No. 6.

May 12, 1915 — 13 mo. 18 days

Gilt No. 9.
May 12, 1915 — 14 mo. 5 days

permit the catching of the droppings. The back 28 inches of the bottom of the crate is covered with tin. This allows the droppings to be recovered if they are not caught and prevents the urine from soaking into the boards. A tin pan 24 inches by 4 inches by 2 inches was placed under the rear end of each crate to catch any urine that might not be caught in the dippers. The front of the crate was closed by a sliding door which was raised to allow the animal to step forward to a trough placed at the front of the crate.

Four animals, two pregnant and two open, were placed in these crates in a room where the temperature could be controlled, January 22, 1915. The collection, for ~~and~~ composite, of feces and urine began January 23rd. The animals were watched all the time and an effort made to catch all the feces and urine in dippers. Owing to the tendency of the four animals to act in unison, this was not always possible, and it sometimes was necessary to collect some of the feces from the tinned bottom of the crate, and to collect the urine from the tin pan under the rear end of the crate.

The weather was very cold and the temperature in the room thruout the trial was about 2° to 6°C. At first it was attempted to make the animals more comfortable by allowing them straw to lie on. It was found to be impossible to keep the straw away from the back part of the crate where the feces dropped if they were not caught, so the straw was all taken away before collections were begun.

One dipper for feces and one for urine for each animal was marked and tared. Each weighing was recorded as gross weight that no errors would come from attempting to get the net weight. The feces were placed in a tared container with a close fitting lid. A record was kept of the time and amount of each defacation and urination. At 3:00 P. M. each day the weight of feces in the container was compared with the weight for the day as shown by the record to make sure no error had been made. The feces from each animal collected for the twenty four hours was thoroly mixed and an aliquot put in a container for the composite, ~~for the whole ten-day trial~~. All containers for feces were rinsed out with a thymol solution.

At the close of the twenty four hour period the urine collected for the period was thoroly mixed and 50 cubic centimeters drawn off for the composite for analysis. This did not give a true composite because the amount of urine voided varied from day to day, but since the digestion coefficient does not depend upon the urine, it was decided to use this plan rather than to add to the amount of labor at time of sampling. A little chloroform was added to the urine composite.

To see if there was any difference in the first and last parts of the ten-day trial, separate composites were made for the first and second five-day periods.

That the animals might be kept as nearly normal as possible each gilt was taken from her crate and driven about the room for fifteen to twenty minutes each day.

The four gilts were each given the same amount, 5 pounds daily, of the same feed thruout the trial. This was

the same amount they had been receiving for eighteen days before the trial began.

All animals seemed to be in good health thruout the trial. All ate well and did not seem much distressed by the confinement and the small amount of exercise.

At the time of this digestion trial the two pregnant gilts had reached the sixty-ninth and seventy-second day of the period. That is to say, about six-tenths of the gestation period had passed.

It so happened that both open gilts were in heat at the beginning of the trial. They were, however, no more restless while this condition lasted than they were after the close of the oestrus period.

The following tables Nos 14 and 15, show the amount of feces and urine voided daily, the number of times of voiding daily, and the average amount at one voiding. The amounts of urine are seen to vary considerably from day to day for each animal. The total highest amount voided during the period was by a pregnant gilt, and the next greatest amount by an open one. In the number of times of voiding there is a similar condition, except it is reversed for the groups. There seems to be no relation between the number of times of voiding and the total amount. No. 5 with 39 voidings for the ten days yielded a greater amount than did No. 6 at 116 voidings. The frequency of voiding may serve as an index of the restlessness of the animal.

Table No. 14

	Weight of Feces voided Daily Ounces				Number of times Feces were voided Daily			
	Pregnant Gilts		Open Gilts		Pregnant Gilts		Open Gilts	
	No. 9	No. 5	No. 6	No. 10	No.9	No.5	No.6	No.10
First Day	118.3	102.2	111.2	130.0	10	8	15	14
Second Day	98.6	61.7	94.4	117.4	8	5	12	13
Third Day	88.2	95.4	99.9	105.0	8	6	12	10
Fourth Day	104.1	105.9	102.7	106.5	8	7	12	11
Fifth Day	113.4	99.1	116.5	95.4	9	7	16	10
Sixth Day	105.1	107.3	97.4	103.1	8	8	14	10
Seventh Day	113.7	93.4	101.3	122.4	9	5	12	11
Eighth Day	102.3	92.2	90.6	70.7	8	6	11	6
Ninth Day	103.3	99.7	101.1	113.8	7	6	12	10
Tenth Day	80.5	96.6	95.9	95.5	6	6	13	8
Total	1027.5	953.5	1011.0	1059.8				
Daily Average	102.75	95.35	101.1	105.98	8.1	6.4	12.9	10.3
Average Daily for Groups	98.05		103.54		7.25		11.6	

	Average Weight of Feces at one voiding, Ounces			
	Pregnant Gilts		Open Gilts	
	No. 9	No. 5	No. 6	No. 10
First Day	11.8	12.8	7.4	9.3
Second Day	12.3	12.3	7.9	9.0
Third Day	11.0	15.9	8.3	10.5
Fourth Day	13.0	15.1	8.6	9.7
Fifth Day	12.6	14.2	7.3	9.5
Sixth Day	13.1	13.4	7.0	10.3
Seventh Day	12.6	18.7	8.4	11.1
Eighth Day	12.8	15.4	8.2	11.8
Ninth Day	14.8	16.6	8.4	11.4
Tenth Day	13.4	16.1	7.4	11.9

Table No. 15

	Weight of Urine voided Daily, Ounces				Number of times Urine was voided Daily			
	Pregnant Gilts		Open Gilts		Pregnant Gilts		Open Gilts	
	No. 9	No. 5	No. 6	No. 10	No.9	No.5	No.6	No.10
First day	62.8	110.3	144.7.	116.3	7	3	13	8
Second day	97.4	137.8	126.0	88.3	7	3	12	8
Third day	83.8	87.9	143.9	112.0	8	5	15	8
Fourth day	103.9	127.6	113.1	75.7	9	3	9	6
Fifth day	74.2	157.4	170.4	71.5	8	5	14	6
Sixth day	118.5	193.0	129.9	72.8	10	7	11	8
Seventh day	93.1	114.9	123.1	79.9	8	3	11	6
Eighth day	91.2	140.1	118.6	78.0	7	3	8	4
Ninth day	110.3	146.9	155.8	106.5	8	2	12	6
Tenth day	104.2	175.9	119.0	92.7	9	5	11	8
Total	939.4	1391.8	1344.5	893.7	81	39	116	68
Av. daily	93.9	139.2	134.5	89.4	8.1	3.9	11.6	6.8
Av. for Group	116.6		112.0		6.0		9.2	

	Average Weight of Urine at one voiding, Ounces			
	Pregnant Gilts		Open Gilts	
	No. 9	No. 5	No. 6	No. 10
First day	9.0	36.8	11.1	14.5
Second day	13.9	45.9	10.5	11.0
Third day	10.5	17.6	9.6	14.0
Fourth day	10.4	42.5	12.6	12.6
Fifth day	9.3	31.5	12.2	11.9
Sixth day	11.9	26.1	11.8	9.1
Seventh day	11.6	38.3	11.2	13.3
Eighth day	13.0	46.7	14.8	19.5
Ninth day	13.8	73.4	12.9	17.7
Tenth day	10.5	35.2	10.8	11.6

Thru the whole trial No. 5 was noticeably the most quiet and No. 6 was decidedly the most restless.

Also in the amount of feces voided there are daily variations, and again the two animals voiding the greatest amounts are not in the same group. In the number of times of voiding the same two animals hold the places for greatest and least frequency--No. 5 with 64 for the ten days, and No. 6 with 129.

The urine analysis table, No. 16, gives the percentages and weights of solids, nitrogen, and ash in the urine. The averages show that the pregnant gilts gave off in the 10 da. 18.8 grams more solids, 1.0 gram less nitrogen, and 28.8 grams less of ash. Here again we fail to find consistency in the groups, except for the solids.

The analytical tables, Nos. 17, 18, and 19, of the feces give the percentage of nutrients in the feces voided, the weights of nutrients voided, and a comparison of the amount of nutrients voided by the open and pregnant gilts.

There is found from a study of the table, No. 18, of weights of nutrients in the feces the following!

(1) In the first five days three animals voided in the feces more dry matter, three voided more protein, two voided more fiber, three voided more ash, and all voided more nitrogen free extract than in the second five days of the trial. This was to be expected since confining them in the crates virtually reduces the amount of feed by depriving the animal of the chance to eat its own droppings.

Table No. 16

Analysis of Urine.

	Weight grams	Solids Per cent	Nitrogen Per cent	Ash Per cent	Weight of Solids grams	Weight of Nitrogen grams	Weight of Ash grams
No. 9, first 5 da.	11964	4.724	1.535	0.297	565.2	183.6	35.5
No. 9, second 5 da.	14660	4.466	1.365	0.389	654.7	200.1	57.0
No. 9, ten days	26624	4.579	1.440	0.347	1219.9	383.7	92.5
No. 5, first 5 da.	17604	2.994	0.980	0.343	527.1	172.5	60.4
No. 5, second 5 da.	21847	3.148	0.881	0.330	687.7	192.5	72.1
No. 5, ten days	39451	3.080	0.925	0.336	1214.8	365.0	132.5
No. 6, first 5 da.	19788	2.750	0.966	0.314	544.2	191.2	62.1
No. 6, second 5 da.	18323	3.544	1.026	0.511	649.4	188.0	93.6
No. 6, ten days	38111	3.132	0.995	0.409	1193.6	379.2	155.7
No. 10, first 5 da.	13143	4.479	1.442	0.485	588.7	189.5	63.7
No. 10, second 5 da.	12185	5.046	1.495	0.519	614.9	182.2	63.2
No. 10, ten days	25328	4.752	1.468	0.501	1203.6	371.7	126.9
Average for Pregnant Animals, ten days	33038				1217.4	374.4	112.5
Average for Open Animals, ten days	31720				1198.6	375.5	141.3

Table No. 17

Percentage Composition of Feces.

Animal*	Weight of Feces grams	Moisture Per Cent	Nitrogen Per Cent	Fat Per Cent	Crude Fiber Per Cent	Ash Per Cent	N.F.E. Per Cent
lt No. 9, 1st 5 da.	14,813	77,610	0.572	1.704	4.047	2.858	10.206
lt No. 9, 2nd 5 da.	14,310	77,760	0.547	2.076	3.863	2.826	10.056
lt No. 5, 1st 5 da.	13,160	76.854	0.571	1.654	3.873	2.913	11.137
lt No. 5, 2nd 5 da.	13,866	77.216	0.602	2.212	3.913	2.769	10.127
lt No. 6, 1st 5 da.	14,870	77.018	0.632	1.925	3.727	2.666	10.714
lt No. 6, 2nd 5 da.	13,785	76.051	0.637	2.213	3.916	2.605	11.234
lt No. 10,1st 5 da.	15,712	77.940	0.671	1.832	3.225	2.633	10.176
lt No. 10,2nd 5 da.	14,330	77.528	0.589	2.067	3.710	2.556	10.458

* Nos. 9 and 5 pregnant. Nos. 6 and 10 Open.

Table No. 18

Weight of Nutrients in Feces, grams

Animal*	Weight of Feces	Dry Matter	Protein (N X 6.25)	Fat	Crude Fiber	Ash	N.F.E.
1st 5 da.	14,813	3316.6	529.4	252.4	599.5	423.4	1511.9
2nd 5 da.	14,310	3182.5	489.4	297.1	552.8	404.4	1439.0
for ten days	29,123	6499.1	1018.8	549.5	1152.3	827.8	2950.9
1st 5 da.	13,160	3046.0	469.4	217.7	509.7	383.4	1465.6
2nd 5 da.	13,866	3159.2	521.9	306.7	542.6	383.9	1404.2
for ten days	27,026	6205.2	991.3	524.4	1052.3	767.3	2869.8
1st 5 da.	14,870	3417.4	587.5	286.2	554.2	396.4	1593.2
2nd 5 da.	13,785	3301.4	548.8	305.1	539.8	359.1	1548.6
for ten days	28,655	6718.8	1136.3	591.3	1094.0	755.5	3141.8
1st 5 da.	15,713	3466.1	658.8	287.8	506.7	413.7	1598.9
2nd 5 da.	14,330	3220.2	527.5	296.2	531.6	366.3	1498.6
for ten days	30,042	6686.3	1186.3	584.0	1038.3	780.0	3097.5

*Nos. 9 and 5 pregnant, Nos. 6 and 10 open.

Table No. 19

Comparison of Weights of Nutrients in Feces from Pregnant and Open Gilts.

Grams.

	Weight of Feces	Dry Matter	Protein (N X 6.25)	Fat	Crude Fiber	Ash	N.F.E.
9 Pregnant	29,123	6499.1	1018.8	549.5	1152.3	827.8	2950.9
5 Pregnant	27,026	6205.2	991.3	524.4	1052.3	767.3	2869.8
l from Pregnant	56,149	12704.3	2010.1	1073.9	2204.6	1595.1	5820.7
age from regnant	28,075	6352.2	1005.1	537.0	1102.3	797.6	2910.4
6 Open	28,655	6718.8	1136.3	591.3	1094.0	755.5	3141.8
10 Open	30,042	6686.3	1186.3	584.0	1038.3	780.0	3097.5
l from Open	58,697	13405.1	2322.6	1175.3	2132.3	1535.5	6239.3
age from Open	29,349	6702.6	1161.3	587.7	1066.2	767.8	3119.7
age excess reted by n Gilts		350.4	156.2	50.7-	36.1	-29.8	209.3

(2) All animals voided more fat in second five days than in the first five days. Did the confinement impair the ability to digest the fat? This would seem quite likely, but it does not seem to hold consistently for the other nutrients.

(3) The greater amount of ash excreted in the feces by each animal during the first five days of the trial is probably due in large measure to the animals' eating dirt while out in the pens; this of course was prevented by placing them in the crates.

In the table, No. 19 , showing a comparison of the total nutrients in the feces excreted by the pregnant and open animals it is seen that each pregnant gilt excreted less dry matter, protein, fat, and nitrogen free extract than did either open animal. The average daily excess for an open gilt for the ten days is as follows: dry matter, 35.0 grams; protein, 15.62 grams; fat, 5.07 grams; and N. F. E., 20.93 grams.

In case of the crude fiber the groups are not consistent but the average amount excreted is highest for the pregnant gilts. The same is true of the ash. The daily average excess is: fiber, 3.61 grams; ash, 2.98 grams.

Since the amount of nutrients was the same for all animals, a smaller amount of any nutrient excreted by an animal means a larger amount of that nutrient digested by the animal; that is to say, a higher digestion coefficient.

If these amounts be taken as average for the whole gestation period and compared with the amounts of constituents

found by analysis in the largest litter we have the following:

	Weight Grams	
	Dry Matter	Protein
Excess digested by pregnant gilt	3994.6	1780.7
Constituents in litter	1257.9	799.8
Excess digested over amount in the litter	2736.7	980.9

This would look as if a pregnant gilt may, because of more efficient digestion, take enough more protein and dry matter from her food for the development of her litter.

The weight of each animal at beginning and close of the digestion trial is given in table 20. The weights are three day averages.

Table No. 20

	Pregnant Gilts		Open Gilts	
	No. 9	No. 5	No. 6	No.10
Weight at beginning, pounds	223	230	180	192
Weight at close, pounds	231	239	193	201
Gain	8	9	13	9

The surprising thing here was the greater gain of Gilt No. 6. Her smaller size gave her more feed per hundred pounds live weight, but she was so much more restless than any other one that the opposite result was expected. From the data now available it does not appear that her digestion coefficient can be much higher than that of the others. She voided in her feces more total dry matter than each of two of the others,

more protein and crude fiber than each of two of the others, and more fat and nitrogen free extract than any other one.

Is her smaller weight and consequent lower maintenance cost sufficient to account for her greater gain? It may be possible to find an answer to this question when the analysis of the feed is completed. In addition to whatever amount the confinement may have impaired digestion it should not be forgotten that the digestion coefficient determined from this digestion trial will probably be too low to indicate the amount of nutriment actually digested by the animals in the pens where each had access to her droppings.

Slaughtering

The animals were not stunned, but were hung up by the hind feet before bleeding, so they would bleed out well and all the blood could be caught. The scalding was done in a barrel and all hair and scurf carefully saved for analysis. After scraping and washing, the animal was opened and the internal organs removed. These organs were separated and each organ weighed. The stomach and intestines were emptied of their contents, cleaned and weighed, the weight of contents noted. The length of large and small intestines was measured. If intestines became smeared with the contents they were washed and carefully wiped with cloths.

After the removal of the internal organs the carcass was split in halves and hung up to chill before cutting up.

The following gross cuts were made for each ~~side~~ half: head, shoulder, side, and ham. Each cut was trimmed and the weight of the trimmed cut and trimmings recorded. All the cuts and trimmings from the right ~~side~~ half of the animal were hand separated into skin, fat, lean, and bone, and weights of each taken. The area of the total skin sample was measured to determine surface area of the animal. The weights of the anatomical parts of the skeleton were obtained. In all the cutting, trimming, and separating, all parts were kept in closed containers except when actually being worked upon. All this work was done as rapidly as possible to keep down the loss from evaporation.

The trimmed cuts from the left side--shoulder, bacon, and ham--were cured for later comparison.

From a study of Table No. 21 of the weights of the internal organs is seen the large increase in weight of reproductive organs during pregnancy. Comparing the pregnant animals with the check, there is a suggestion that there may be an increase in the weight of intestines and liver due to pregnancy.

Table No. 22 gives weights of parts with the percentages of parts referred to the ''empty weight'' of the animal. It was desired to use as the empty weight the weight of the live animal less the weight of the contents of the stomach and intestines and the contents of the uterus. Since it was impossible to control the loss of urine and feces in scalding, this weight could not be ascertained by subtracting the weight of the con-

Table No. 21

Weights of Internal Organs of Gilts, pounds.

	No. 4 Check 7 mo. 29 days	No. 7 88 days in Pregnancy	No. 1 Before Farrowing 12 mo.16 da.	No. 3 After Farrowing 12 mo.2 da.	No. 10 Check 12 mo. 2 da.	No. 8 After Farrowing 12 mo. 24 da.
Tongue	0.70	0.63	0.68	0.63	0.60	0.58
Gullet	0.15	0.19	0.17	0.22	0.17	0.20
Stomach	0.90	1.44	1.33	1.63	1.38	1.38
Pancreas	0.30	0.28	0.41		0.29	0.41
Spleen	0.20	0.38	0.46	0.28	0.26	0.34
Small Intestines	1.70	1.94	2.22	2.00	1.85	1.89
Large Intestines	2.15	2.63	2.79	3.63	2.35	3.19
Heart	0.40	0.59	0.58	0.59	0.57	0.61
Lungs	0.65	1.06	0.80	0.91	1.11	0.90
Liver	2.40	3.97	4.00	3.78	3.05	3.72
Gall Bladder (and gall)	0.25	0.64	0.04	0.09	0.04	0.03
Kidneys	0.35	0.67	0.53	0.67	0.62	0.45
Urinary Bladder	0.10	0.14	0.11		0.11	0.16
Uterus, Vagina, Ovaries	0.35	2.69	4.29	3.91	1.08	3.28
Brain	0.27	0.26	0.23	0.28	0.21	0.24
Spinal Cord	0.10	0.11	0.13	0.16	0.11	0.11
Eyes and attend. tissue	0.12	0.14	0.14	0.16	0.14	0.16

Table No. 22.

Weight of Parts of Gilts and Percentages of Parts referred to the Empty Weight.

Pounds.

	No. 4	No. 7	No. 1	No. 3	No. 8	No. 10
Live Weight at Slaughtering	163.500	256.000	257.000	248.000	245.000	224.000
Weight Hung Up	151.950	239.500	243.000	234.500	233.450	214.250
Weight Hair and Scurf	2.440	5.170	4.030	4.100	5.000	3.620
Weight of Blood	5.650	9.450	9.240	9.300	7.550	6.630
Total Weight	160.040	254.120	256.270	247.900	246.000	224.500
Weight Contents Digestive Tract	14.600	22.270	18.730	24.700	13.450	20.120
Weight Contents of Uterus		7.950	23.68	1.25	1.45	
Empty Weight	145.440	223.900	213.860	221.950	231.100	204.380
Per cent Empty Weight to Live Weight	88.950	87.460	83.210	89.500	94.330	91.240
Per cent Blood to Empty Weight	3.885	4.221	4.321	4.190	3.267	3.244
Weight Internal Organs	11.990	18.740	19.950	19.720	17.170	15.190
Per Cent Internal Organs to Empty Weight	8.244	8.370	9.329	8.885	7.430	7.432
Weight Lean	68.860	103.180	94.560	93.180	99.760	89.320
Per cent Lean to Empty Weight	47.346	46.083	44.216	41.982	43.167	43.703
Weight Fat	25.360	52.760	49.720	61.380	64.180	53.740
Per cent Fat to Empty Weight	17.437	23.564	23.249	27.655	27.772	26.294
Weight Skin	9.740	11.320	11.780	10.340	10.120	11.740
Per cent Skin to Empty Weight	6.697	5.056	5.508	4.659	4.379	5.744
Weight Bone	15.060	18.880	18.400	19.880	19.640	19.320
Per cent Bone to Empty Weight	10.355	8.432	8.604	8.957	8.498	9.453

tents found when the animal was opened from the weight before slaughtering. This "empty weight" was determined as follows: to the weight of the animal after scalding and scraping was added the weight of the blood, hair and scurf, and toe's or hoofs, if they had been removed. In the table this sum is called the total weight, and from this total weight the weight of the contents of stomach, intestines, and uterus was subtracted. In no one of the ten animals slaughtered was any urine found in the urinary bladder. The empty weight found in this way is greater than the true empty weight by whatever weight of water has been added to the hair and scurf, but this weight is not large.

In percentage of blood to empty weight three of the producing gilts, Nos. 7, 1, and 3, show a decidedly higher figure than do either of the checks, No. 4 or No. 10. In percentage of fat (adipose tissue), they are considerably higher than No. 4, slaughtered about 4 months earlier, and but little below No. 10, slaughtered at the same age. So difference in fatness does not account for this difference in percentage of blood. We should be inclined to think that perhaps in pregnancy a gilt increases the amount of her blood were it not for the fact that No. 8, another producing gilt, had about the same percentage as the older check, No. 10.

It may be remarked here that the litter of No. 8 was delivered prematurely. The pigs were alive but did not live two days. Postmortem showed they had not reached normal development.

In table No. 23 a calculation was made of the weights of parts of the gilts at time of slaughtering the first check. This calculation was based on the assumption that at this time all animals were alike except in size. For instance, the slaughterhouse data showed that in the check animal the empty weight was 88.95 per cent of the live weight. Then if we assume that this percentage holds for each animal, the empty weight may be found by taking 88.95 per cent of its live weight. Unquestionably these results do not represent the actual condition for there are individual differences in the animals that this method disregards.

For table No. 24 these calculated weights were compared with the actual weights of the animals at slaughtering to determine the gains made. The inaccuracy of such a method of calculation has already been admitted, but if the results all point in the same direction there would appear to be some significance. While it is recognized that results that appear to be shown by such a calculation in the study of a few animals must be confirmed by wider studies, it does not seem reasonable to try to explain differences that appear to be consistent on the score of differences in the individuals, (without very positive evidence that such differences exist,) until a more extended study fails to confirm the results under consideration.

A comparison of the gain in weight of bone shows the gain by the open gilt was more than 30 per cent greater

Table No. 23.

Weights of Parts of Gilts, Oct. 29, 1914

Calculated from Data on Gilt No. 4, Slaughtered Oct. 29, 1914.

Pounds

	No. 4	No. 7	No. 1	No. 3	No. 8	No.10
Live Weight Oct. 29, 1914	163.500	162.000	145.000	174.000	138.000	137.000
Per cent Empty Weight to Live Weight	88.95	88.95	88.95	88.95	88.95	88.95
Empty Weight	145.440	144.090	128.980	154.770	122.750	121.860
Per cent Blood to Empty Weight	3.885	3.885	3.885	3.885	3.885	3.885
Weight of Blood	5.650	5.600	5.010	6.010	4.770	4.730
Per cent Internal Organs to Empty Weight	8.244	8.244	8.244	8.244	8.244	8.244
Weight of Internal Organs	11.990	11.880	10.630	12.760	10.120	10.050
Per cent Lean Flesh to Empty Weight	47.346	47.346	47.346	47.346	47.346	47.346
Weight of Lean Flesh	68.860	68.220	61.070	73.280	58.120	57.700
Per cent Fat to Empty Weight	17.437	17.437	17.437	17.437	17.437	17.437
Weight of Fat	25.360	25.120	22.490	26.99	21.4000	21.250
Per cent Skin to Empty Weight	6.697	6.697	6.697	6.697	6.697	6.697
Weight of Skin	9.740	9.650	8.640	10.360	8.220	8.160
Per cent Bone to Empty Weight	10.355	10.355	10.355	10.355	10.355	10.355
Weight of Bone	15.060	14.920	13.360	16.030	12.710	12.620

Table no. 24

Actual Weights at Slaughtering, with Gains over Calculated Weights, pounds.

	No. 7 88 days in Pregnancy	No. 1 Before Farrowing 12 mo. 16 da.	No. 3 After Farrowing 12 mo. 2 da.	No. 8 After Farrowing 12 mo. 24 da.	No. 10 Check 12 mo. 2 da.
Live Weight	256.00	257.00	248.00	245.00	224.00
Gain in Live Weight	94.00	112.00	74.00	107.00	87.00
Empty Weight	223.90	213.86	221.95	231.10	204.38
Gain in Empty Weight	79.81	84.88	67.18	108.35	82.52
Weight of Blood	9.45	9.24	9.30	7.55	6.63
Gain in Weight of Blood	3.85	4.23	3.29	2.78	1.90
Weight of Internal Organs	18.74	19.95	19.72	17.17	15.19
Gain in Weight of Internal Organs	6.86	9.32	6.96	7.05	5.14
Weight of Lean Flesh	103.18	94.56	93.18	99.76	89.32
Gain in Weight of Lean Flesh	34.96	33.49	19.90	41.64	31.62
Weight of Fat Flesh	52.76	49.72	61.38	64.18	53.74
Gain in Weight of Fat Flesh	27.64	27.23	34.39	42.78	32.49
Weight of Skin	11.32	11.78	10.34	10.12	11.74
Gain in Weight of Skin	1.67	3.14	-0.02	1.90	3.58
Weight of Bone	18.88	18.40	19.88	19.64	19.32
Gain in Weight of Bone	3.96	5.04	3.85	6.93	6.70

than any producing gilt except Gilt No. 8 which, on account of late breeding, had about 30 per cent more time than any of the others. This appears to indicate that with the conditions under which these animals were kept, the increase in weight of skeleton of a gilt is retarded by gestation. While it cannot be proved that this apparent difference does not come from crediting Gilt No. 10 with less weight of skeleton than she actually had at the beginning of the period, yet she has never been judged to have a noticeably heavier bone than the others.

The greater gain in weight of internal organs of the producing gilts is what would naturally be expected because of the great increase in weight of uterus. The greater gain in weight of blood of the same animals is in line with the greater per cent of blood to empty weight.

The gains in live weight do not occur in the same order as the gains mentioned above, the check animal making a smaller gain than any producing gilt except No. 3.

Chemical Analysis

The Samples Analyzed

The samples for analysis were blood, hair and scurf, skin and toes, internal organs, lean, fat, and bone. The skin, lean, fat, and bone were from the right side of the animal. From the left side were taken the following special samples: lean loin from just back of last rib, subdermal fat from back at withers, and a sample of the kidney fat. Analysis was made of the placenta and amniotic fluid of the

two slaughtered before parturition; also of the pigs of these two animals, as well as two pigs born alive and killed before they had received any nourishment.

Obtaining the Samples

Blood: While the animal was bleeding, blood was caught in a beaker and poured at once into tared receptacles provided with tight covers. These were at once taken to the laboratory and weighed to obtain an accurate weight of the fresh samples.

Hair and scurf: This sample consists of all the hair and scurf, collected from the scalding barrel and from the table and floor where the scraping was done. The water was drained from the scalding barrel and the hair and scurf collected; all excess water was squeezed out. The moist weight obtained, tho, for this sample is too high, but it was not possible to determine the exact weight on the animal. Since the amount of the constituents is computed from the percentage composition on the basis of this moist weight no error is introduced. There is in the hair more or less dirt which increases the ash in this sample.

Internal organs: This term is used for the sample made up, except as noted, of the following: tongue, oesophagus, stomach, intestines, liver, gall bladder and gall, spleen, pancreas, kidneys, ovaries, uterus, vagina, urinary bladder, heart, pericardium and large arteries, diaphragm, lungs, brain, spinal cord, and eyes.

Skin and toes: This sample consists of the skin from the entire right side of the animal, and the toes or hoofs from the right side. The right ear, entire, was included.

Lean: the lean sample consists of all the hand separated lean from the right side. This necessarily contains some fat. The rule is for no lean to be left with the fat.

Fat: This sample consists of all the hand separated fat (adipose tissue) from the head, shoulder, side, and ham of the right side, together with one-half the internal fat.

Bone: This sample consists of all the bones from the right side of the animal, including half the tail and half the larynx, trachea, and tongue bones. Also the teeth from the right half of the head. No attempt was made to remove the tendons from the bones. A very little flesh was also left on the bones because its complete removal would require so much time that the error from increased evaporation would exceed that introduced by leaving this very small amount on the bones,

Grinding Samples.

Each sample except the blood and the bone was ground thru a coarse knife of an electric Enterprise meat grinder, thoroly mixed, ground thru a finer knife, mixed and quartered down, and mixing and grinding continued,

using finer knives, until the material was ground very fine and made as nearly uniform thruout as possible. The bones were ground thru a Mann's poultry bone cutter and mixed as thoroly as possible. Large samples of bone were taken for moisture and preliminary fat determination, after which the samples were finely ground for complete analysis.

Thruout the separating, grinding and mixing all cuts, samples, and parts of samples were kept in closed containers as much as possible to reduce the loss from evaporation. The samples were kept in a cold room until weighed for analysis. A composite of all parts of the animal was made for ash analysis.

Analyses

The analyses were made in triplicate according to methods adopted by the American Association of Official Agricultural Chemists. Determinations of moisture, nitrogen, fat, ash, and phosphorus were made on all the regular samples, except that no fat determinations were made on the blood. Analyses at the Missouri Experiment Station of many samples of blood of cattle have shown the amount of fat too small to be determined by the ordinary method of ether extraction. It was assumed that the same is true of the blood of swine. The determinations of ash and phosphorus were not made on the special samples of lean and fat.

Nos 25 to 34.

In the following pages are the analytical tables for five gilts, one slaughtered as a check at the beginning of the experiment, one that was 88 days in pregnancy when slaughtered, one slaughtered the day before she was due to farrow, one just after farrowing, and a second check slaughtered at the same age as those farrowing. In these tables are given the weights of the samples, blood, hair and scurf, internal organs, fat flesh or adipose tissue, lean flesh, skin, and bone; the percentage composition of each sample as determined by chemical analysis; the weights of the constituents in each sample; and the percentage composition and weights of constituents of the total animal. In one gilt, No. 1, a separate analysis was made of the uterus and vagina. The analysis of the litters, afterbirth, and amniotic fluid have not been completed.

Table No. 35 gives a comparison of the percentage composition of parts of the different animals. For the total animal the per cent of fat is higher in the older animals and the per cent of water lower. There is no evidence that this condition is due to pregnancy. On the contrary, the highest per cent of fat and the lowest per cent of water is found in the older check. The difference here is not great enough, however, to seem to be significant. The ash per cent is lower for older gilts, but somewhat higher for the older check than for the producing gilts. The per cent of nitrogen does not vary significantly.

Table No. 25

Percentage Composition, Gilt No. 4,

Slaughtered as check, age 7 mo., 29 days.

Designation of part	Weight grams	Moisture Per cent	Nitrogen Per cent	Fat (Ether sol.) Per cent	Ash Per cent	Phosphorus Per cent
Blood	2563	77.850	3.511	*	0.682	0.060
Hair and Scurf	1107	58.111	6.512	0.604	1.668	0.080
Internal Organs	5439	66.975	2.599	13.438	1.125	0.188
Skin and Toes	4509	45.829	4.517	27.144	0.513	0.049
Skeleton	6831	40.517	3.201	15.418	22.982	4.167
Adipose Tissue	11503	13.930	0.654	81.632	0.200	0.035
Lean	31234	69.378	2.920	13.796	0.960	0.168
Total Animal	63186	54.422	2.487	26.452	3.180	0.563

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

Table No. 26

Weight of Constituents in grams---Gilt No. 4,
Slaughtered as check, age 7 mo., 29 days.

Designation of Part	Dry Substance	Nitrogen	Crude Fat (Ether sol.)	Ash	Phosphorus
Blood	567.7	90.0	*	17.5	1.54
Hair and Scurf	463.6	72.1	6.7	18.5	0.89
Internal Organs	1796.1	141.4	730.8	61.2	10.22
Skin and Toes	3442.4	203.7	1223.8	23.1	2.21
Skeleton	4063.3	218.7	1053.2	1566.1	284.65
Adipose Tissue	9900.7	75.2	9390.2	23.0	4.03
Lean	9564.5	912.0	4309.1	299.9	52.47
Total Animal	28798.3	1713.1	16713.8	2009.3	356.01

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

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Table No 27

Percentage Composition, Gilt No. 7,

88 days in pregnancy, age 11 mo., 26 days.

Designation of Part	Weight grams	Moisture Per cent	Nitrogen Per cent	Fat (Ether sol.) Per cent	Ash Per cent	Phosphorus Per cent
Blood	4286	78.054	3.708	*	0.794	0.079
Hair and Scurf	2345	60.033	6.298	0.646	2.207	0.061
Internal Organs	8500	72.491	2.547	8.285	1.112	0.195
Skin and Toes	5135	40.144	4.353	32.377	0.505	0.052
Skeleton	8564	42.182	2.943	20.200	17.803	3.397
Adipose Tissue	23931	12.778	0.498	84.649	0.188	0.033
Lean	46801	64.148	3.035	15.355	0.970	0.175
Total Animal	99562	49.887	2.549	31.694	2.240	0.407

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

Table No. 28

Weight of Constituents in grams---Gilt No. 7,

88 days in pregnancy, age 11 mo., 26 days.

Designation of Part	Dry Substance	Nitrogen	Crude Fat (Ether sol.)	Ash	Phosphorus
Blood	940.7	158.9	*	34.0	3.39
Hair and Scurf	937.3	147.7	15.3	51.8	1.43
Internal Organs	2338.3	216.5	704.2	94.5	16.57
Skin and Toes	3073.4	223.5	1662.4	25.9	2.67
Skeleton	4951.4	252.0	1729.9	1524.6	290.91
Adipose Tissue	20873.5	119.2	20257.7	45.0	7.90
Lean	16779.2	1420.4	7186.3	454.0	81.90
Total Animal	49893.8	2538.2	31555.7	2229.8	404.77

*Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

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Table No. 29

Percentage Composition, Gilt No. 1,

Slaughtered just before farrowing, age 12 mo., 16 days.

Designation Of Part	Weight grams	Moisture Per cent	Nitrogen Per cent	Fat (Ether sol.) Per cent	Ash Per cent	Phosphorus Per cent
Blood	4191	78.968	3.377	*	0.744	0.078
Hair and Scurf	1828	56.584	7.012	0.674	1.096	0.072
Internal organs (less uterus and vagina)	7103	70.406	2.585	9.524	1.103	0.236
Skin and Toes	5343	39.357	4.756	30.773	0.534	0.058
Skeleton	8346	38.000	2.961	23.591	19.074	3.541
Adipose Tissue	22552	9.547	0.589	70.502	0.143	0.029
Lean	42891	59.794	2.856	20.957	0.837	0.163
Uterus and Vagina	1946	84.601	2.077	5.828	0.814	0.117
Total Animal	94200	52.632	2.498	31.006	2.290	0.423

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

Table No. 30

Weight of Constituents in grams,----Gilt No. 1,

Slaughtered just before farrowing, age 12 mo., 16 days.

Designation of Part	Dry Substance	Nitrogen	Crude Fat (Ether sol.)	Ash	Phosphorus
Blood	881.5	141.5	*	31.2	3.27
Hair and Scurf	793.6	128.2	12.3	20.0	1.32
Internal Organs (less Uterus and Vagina)	2102.1	183.6	676.5	78.4	16.76
Skin and Toes	3240.3	254.1	1644.3	28.5	3.10
Skeleton	5174.6	247.1	1968.9	1591.9	295.53
Adipose Tissue	20399.4	132.8	15900.0	32.3	6.54
Lean	17244.9	1225.0	8988.7	359.0	69.91
Uterus and Vagina	299.7	40.4	17.5	15.8	2.28
Total Animal	50136.1	2352.7	29208.2	2157.1	398.71

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

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Table No. ~~25~~ 31

Percentage Composition, Gilt No. 3,

Slaughtered just after farrowing, age 12 mo., 2 days.

Designation of Part	Weight grams	Moisture Per cent	Nitrogen Per cent	Fat (Ether sol.) Per cent	Ash Per cent	Phosphorus Per cent
Blood	4218	80.776	3.935	*	0.823	0.074
Hair and Scurf	1960	60.606	6.582	0.627	1.318	0.063
Internal Organs	8945	73.814	2.474	8.425	1.179	0.181
Skin and Toes	4690	39.333	5.093	29.913	0.542	0.062
Skeleton	9017	36.262	2.934	23.675	20.902	3.863
Adipose Tissue	27841	11.915	0.526	84.724	0.200	0.041
Lean	42266	64.001	2.974	16.881	0.888	0.149
Total Animal	98937	47.181	2.450	35.403	2.534	0.451

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

Table No. 32

Weight of Constituents in grams, Gilt No. 3,

Slaughtered just after farrowing, age 12 mo., 2 days.

Designation of Part	Dry Substance	Nitrogen	Crude Fat (Ether sol.)	Ash	Phosphorus
Blood	810.9	166.0	*	34.7	3.12
Hair and Scurf	771.9	129.0	12.3	25.8	1.23
Internal Organs	2342.3	221.3	716.8	105.5	16.19
Skin and Toes	2845.4	238.9	1403.0	25.4	2.91
Skeleton	5747.5	264.6	2134.9	1884.8	348.34
Adipose Tissue	24524.1	146.5	23588.3	55.7	11.41
Lean	15315.2	1257.4	7134.8	375.3	62.98
Total Animal	52257.3	2423.7	34990.1	2507.2	482.18

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

Table No. 33

Percentage Composition, Gilt No. 10,

Slaughtered as check, age 12 mo., 2 days.

Designation of Part	Weight grams	Moisture Per cent	Nitrogen Per cent	Fat (Ether sol.) Per cent	Ash Per cent	Phosphorus Per cent
Blood	3007	78.123	3.601	*	0.838	0.072
Hair and Scurf	1642	61.987	5.970	1.076	1.428	0.045
Internal Organs	6891	71.880	2.600	8.653	1.207	0.189
Skin and Toes	5325	51.201	4.282	23.833	0.509	0.056
Skeleton	8763	34.402	3.598	20.234	22.115	4.061
Adipose Tissue	24376	10.827	0.447	88.712	0.193	0.054
Lean	40515	63.151	2.963	18.032	0.961	0.188
Total Animal	90518	46.715	2.473	35.999	2.799	0.513

*Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

Table No. 34

Weight of Constituents in grams, Gilt No. 10,
Slaughtered as check, age 12 mo., 2 days.

Designation of Part	Dry Substance	Nitrogen	Crude Fat (Ether sol.)	Ash	Phosphorus
Blood	657.9	108.3	*	25.2	2.17
Hair and Scurf	624.2	98.0	17.7	23.5	0.74
Internal Organs	1937.5	179.1	596.2	83.2	13.02
Skin and Toes	2598.6	228.0	1269.1	27.1	2.98
Skeleton	5648.6	315.3	1773.2	1938.0	355.88
Adipose Tissue	21736.8	109.0	21624.4	47.1	13.16
Lean	14929.3	1200.5	7305.6	389.4	76.17
Total Animal	48132.9	2238.2	32586.2	2533.5	464.12

* Not determined. Analyses of many samples of blood of cattle show the amount of fat too small to be determined by ordinary method of ether extraction.

Table No. 33

Comparison of Percentage Composition of Parts of Different Animals.

		No. 4 Check 7 mo. 29 da.	No. 7 88 days in Pregnancy	No. 1 Before Farrowing 12 mo.16 da.	No. 3 After Farrowing 12 mo.2 da.	No. 10 Check 12 mo. 2 da.
Bone	Water	40.517	42.182	38.000	36.262	34.402
Bone	Fat	15.418	20.200	23.951	23.675	20.234
Bone	Ash	22.982	17.803	19.074	20.902	22.115
Bone	Nitrogen	3.201	2.943	2.961	2.934	3.598
Internal Organs	Water	66.975	72.491	70.406	73.814	71.880
Internal Organs	Fat	13.483	8.285	9.524	8.425	8.653
Internal Organs	Ash	1.125	1.112	1.103	1.179	1.207
Internal Organs	Nitrogen	2.599	2.547	2.585	2.474	2.600
Lean Flesh	Water	69.378	64.148	59.794	64.001	63.151
Lean Flesh	Fat	13.796	15.355	20.957	16.881	18.032
Lean Flesh	Ash	0.960	0.970	0.837	0.888	0.961
Lean Flesh	Nitrogen	2.920	3.035	2.856	2.974	2.963
Total Animal	Water	54.422	49.887	52.632	47.181	46.715
Total Animal	Fat	26.452	31.694	31.006	35.403	35.999
Total Animal	Ash	3.180	2.240	2.290	2.534	2.799
Total Animal	Nitrogen	2.487	2.549	2.498	2.450	2.473

The high per cent of fat in the internal organs of the first check is perhaps due to more fat being left on the organs than was the case with the other animals.

The greatest differences are found in the bone. The per cent of nitrogen is lower in the bone of the three producing gilts than in either of the checks. The percentage of fat in the bone is higher in two of the producing animals, while for water the per cent is not consistent for the groups. The most striking difference, however, is found in the per cent of ash in the bone. The younger check has the highest per cent and all three producers fall below the older check. This would seem to indicate that pregnancy hinders the ossification of the skeleton. A comparison of the two checks would also indicate that older animals have less ash in the bones. This is not ordinarily the case. Analyses of bones of many cattle at the Missouri Experiment Station show that the older cattle have a higher per cent of ash in the bone than do the younger ones.

The analysis of the pigs is not completed; so that it is impossible to say with certainty, but a careful approximation of what may be expected leaves so wide a margin that it seems sure the weight of ash in the young added to that of the mother's bone will still leave the percentage lower than that of the checks.

This lower ash in the producing animals and in the older check may be due to insufficient ash in the feed. Prior to the beginning of the experiment the gilts had had a ration much higher in ash than the one used here. The lower ash ration might be responsible for the animals' failing to put

the same ratio of ash into the developing skeleton.

Table No. 36, giving a comparison of the percentage composition of the internal organs, lean flesh, and total animal on the moisture- and fat-free basis, shows a higher percentage of phosphorus in the internal organs of the producing gilts, and lower in the lean flesh than is found in the flesh of the others. This suggests that a producing animal may concentrate phosphorus in the internal organs at the expense of her flesh.

On this basis of comparison the ash is again markedly lower for the producing than for the non-producing gilts.

Table No. 36

Percentage Composition of Internal Organs, Lean Flesh, and Total Animal on Moisture- and Fat-Free Basis.

		No. 4 Check 7 mo. 29 da.	No. 7 88 days in Pregnancy	No. 1 Before Farrowing 12 mo. 16 da.	No. 3 After Farrowing 12 mo. 3 da.	No. 10 Check 12 mo. 2 da.
Internal Organs	Nitrogen	13.269	13.249	12.880	13.929	13.356
Internal Organs	Ash	5.744	5.784	5.496	6.639	6.200
Internal Organs	Phosphorus	0.960	1.014	1.176	1.019	0.971
Lean Flesh	Nitrogen	17.354	14.807	14.837	15.556	15.746
Lean Flesh	Ash	5.705	4.731	4.348	4.645	5.107
Lean Flesh	Phosphorus	0.998	0.854	0.847	0.779	0.999
Total Animal	Nitrogen	13.003	13.838	15.267	14.068	14.306
Total Animal	Ash	16.627	12.161	13.996	14.550	16.192
Total Animal	Phosphorus	2.944	2.210	2.585	2.589	2.968

Discussion of Tables and Results of Lactation Period

Since chemical analyses have not yet been made for the lactation period, the tables and discussions are based upon the records of feed consumed, live weights, measurements, and upon the slaughter house records.

A careful study of the feed record reveals the fact that in spite of the attempt to feed No. 5 more than any of the others, she actually ate less for the whole lactation period than any other one. The amounts comsumed by each animal, deducting for all feed refused, follow:

No. 6, 391.3 pounds; No. 9, 382.0 pounds; No. 2, 393.5 pounds; No. 5, 368 pounds.

(When feed was refused the wet feed was taken to the laboratory, alcohol poured over it to prevent fermentation, and dried to air dry condition.)

Refusal of feed is responsible for different amounts received by Nos. 6, 9, and 2.

Digestion Trial of Suckling and Non-Suckling Gilts.

April 27th a ten-day digestion trial was begun with the following animals: No. 5, suckling a litter of six pigs; No. 6, a check that had never been bred, and No. 9 that had produced a litter but suckled for only eight days. (Nos. 5 and 9 were the pregnant gilts of the first digestion trial, and No. 6 was one of the open ones.) This trial began 53 days after No. 9 had farrowed, and 48 days after the farrowing of No. 5. The pigs were allowed to suck six time every

twenty four hours. There was a noticeable difference in the behavior of the animals. No. 5 had been the most quiet animal in the first digestion trial, but this time she was the most restless; while No. 6, which had been decidedly the most restless in the first trial was the quietest this time, The restlessness of No. 5 was due in part at first to uneasiness on account of her pigs. After the first day or two, however, she seemed satisfied about them, but still was more restless than either of the others. Thru this trial No. 5 received 6.2 pounds of feed daily; each of the others, 6.0 pounds. All the gilts gave indication of lack of mineral in their ration--trying when out of the crates to eat plaster from the wall.

Table No. 37

Weights of Animals at Beginning and Close of Digestion Trial.

pounds, weights three day average.

	No. 5 Suckling 6 pigs	No. 9 Without Lactation	No. 6 Check
Weight at Beginning	198	264	248
Weight at Close	195	279	261
Gain	-3	15	13

The analytical work from this trial has not been completed.

Table No. 38 gives a comparison of the gains shown by the measurements. These gains indicate that the check animal, No. 6, grew slightly more than did the gilt, No. 9, that had produced a litter but did not suckle the pigs. It should be remembered, however, that parturition came in this period and that she did suckle her pigs for eight days.

All except two of the measurements show a loss for No. 5. These two are only 0.5 centimeter gain, and such an apparent gain or loss is insignificant. No. 2 appears to have made but little if any growth.

The table of weights, No. 39, shows about the same gain for the check and No. 9. No. 2 just about maintained her weight thru the whole period, while No. 5 lost 60 pounds.

Table No. 40 shows the length of intestines, ~~and~~ the surface areas of the animals, and weights of internal fat.

Table No. 41 seems to indicate that the heart and lungs of the suckling animals are somewhat smaller than the others. The actual difference is small, 0.2 pound, but on a percentage basis the difference is worthy of note. It may be due wholly to individuality. The smaller amount of fat of the suckling gilts may account for the entire difference.

It does not seem possible, however, that either or both those causes can be responsible for the great difference in weight of the uterus and vagina in the different animals. This appears to be a shrinkage of the uterus due to lactation.

Table No. 38

Growth in Centimeters during the Lactation Period

as shown by Measurements, Feb. 28 to May 11.

	No. 6 Check	No. 9 With no Lactation Period	No. 2 Suckled on Limi-ited Ration	No. 5 Suckled on Full Ration
Height at Withers	7.0	4.0	3.0	-5.0
Height at Croup	6.0	4.0	0.0	-2.0
Length of Body	6.0	7.0	1.0	-3.0
Distance from Elbow to Ground	4.0	3.0	0.0	0.5
Distance from Shoulder Point to Ground	5.0	2.0	1.0	-1.0
Depth of Chest	5.0	3.0	2.0	-4.0
Circumference of front Cannon	1.0	0.0	0.5	0.5
Circumference of rear Cannon	1.0	0.0	0.5	-0.5
Width of Head	1.0	1.0	-1.0	-0.5
Width of Shoulder Points	2.0	1.0	0.0	-1.0
Width of Shoulders	5.0	0.0	-2.0	-5.0
Width of Hams	2.0	0.0	0.0	-4.0
Width of Ham Points	3.0	1.0	-1.0	-4.0
Heart Girth	9.0	2.0	-9.0	-22.0
Gain in Weight, pounds	3.0	-5.0	-4.0	-18.0
		Live Weight, pounds, in Lactation		
At Beginning	223	240	255	248
At Close	268	283	254	188
Gains	45	43	-1	-60

Table No. 39

Live Weight, in pounds, of Gilts thru Lactation.

	No. 6 Check	No. 9 Without Lactation Period	No. 2 Suckled on Limited Ration	No. 5 Suckled on Full Ration
Weight at Beginning	223	240	255	248
Weight at Close	268	283	254	188
Gains	45	43	-1	-60

Table No. 40

Length of Intestines, Weight of Internal Fat, and Surface Area of Animals.

	No. 6	No. 9	No. 2	No. 5
Length of Small Intestines c.m.	1,512	1,641	1,621	1,575
Length of Large Intestines c.m.	540	641	742	621
Weight of Internal Fat, Pounds	7.01	11.56	6.69	3.67
Surface Area, sq. c.m.	16,528	17,384	16,460	14,576

Table No. 41

Weight of Internal Organs of Gilts in Pounds

at Slaughtering.

	No. 6 Check	No. 9 Without Lacatation Period	No. 2 Suckled on limited Ration	No. 5 Suckled on Full Ration
Age at Slaughtering	13 mo. 23 da.	14 mo. 5 da.	14 mo. 23 da.	14 mo. 17 da.
Weight at Slaughtering	266.00	284.00	250.00	188.00
Tongue	0.66	0.82	0.69	0.72
Gullet	0.19	0.22	0.17	0.16
Stomach	1.34	1.73	1.67	1.45
Pancreas	0.47	0.60	0.54	0.41
Spleen	0.36	0.39	0.24	0.25
Small Intestines	2.14	1.85	2.60	2.11
Large Intestines	2.69	3.28	3.81	3.00
Heart	0.63	0.57	0.55	0.50
Lungs	0.91	0.96	0.77	0.73
Liver	4.04	4.16	4.29	3.16
Gall Bladder and Gall	0.06	0.05	0.05	0.03
Kidneys	0.67	0.56	0.55	0.52
Urinary Bladder	0.13	0.14	0.13	0.13
Uterus, Vagina, and Ovaries	1.44	1.69	0.36	0.34
Brain	0.25	0.23	0.27	0.27
Spinal Cord	0.17	0.11	0.16	0.15
Eyes and attend. tissue	0.10	0.06	0.07	0.07

The question arises as to the condition when a lactating animal becomes pregnant. Does the great increase in size of uterus check milk production, does milk production retard this increase of uterus, is another ''reserve capacity for assimilation'' aroused, or is this great increase in weight of uterus chiefly water and of little consequence so far as nutrition is concerned? We wait for the chemical analysis to answer the last part of this question.

Table No. 42 with the weights of parts and their percentages referred to the empty weight shows the reduction in fat due to lactation. The per cent of fat running as low as 14.311 in the case of No. 5, the per cent of fat in No. 2, the other lactating gilt, is 24.05, only about one per cent lower than in No. 9 which was not producing milk. This seems to confirm our opinion that No. 2 was not producing much milk.

The higher per cent of internal organs observed in No. 5 is perhaps due entirely to the smaller amount of fat.

Perhaps the most striking thing in this table is the small amount of intestinal fat in the lactating gilts.

Tables No. , , and , give a comparison of the lactating gilts with two gilts, Nos. 3 and 8, slaughtered after farrowing, and with Gilt No. 1, slaughtered just before farrowing. In the calculations for this table it is assumed that all these animals were just alike except in size at the time of farrowing, then the use of a factor determines the weight of any part of the live animal. The difference be-

Table No. 42

Weights of Parts of Gilts and Percentages of Parts Referred to the Empty Weight, pounds.

	No. 6 Check	No. 9 Without Lactation Period	No. 2 Suckled on Limited Ration	No. 5 Suckled on Full Ration
Age at Slaughtering	13 mo. 23 da.	14. mo. 5 da.	14 mo. 20 da.	14 mo. 17 da.
Live weight at slaughtering	266.00	284.00	250.00	188.00
Weight Hung up	256.00	270.00	240.00	179.00
Wt. Hair, Scurf, and Toes	3.12	3.40	3.10	3.80
Weight of Blood	9.05	10.67	7.60	7.34
Total Weight	268.17	284.07	240.70	190.14
Weight of contents of Digestive Tract	29.70	24.88	32.22	35.50
Empty Weight	238.47	259.19	208.48	154.64
Per cent Empty Weight to Live Weight	89.650	91.264	83.392	82.255
Per cent Blood to Empty Weight	3.795	4.117	3.645	4.747
Weight Internal Organs	17.63	18.86	18.65	15.14
Per cent Internal Organs to Empty Weight	7.393	7.277	8.946	9.790
Weight of Lean	112.16	119.15	98.22	83.63
Per cent Lean to Empty Wt.	47.033	45.970	47.112	54.080
Weight of Fat	62.91	65.31	50.14	22.13
Per cent Fat to Empty Wt.	26.381	25.198	24.050	14.311
Weight Internal Fat	7.01	11.57	4.87	3.44
Per cent Internal Fat to Empty Weight	2.940	4.461	2.336	2.226
Weight of Skin	11.70	13.40	11.65	9.87
Per cent Skin to Empty Weight	4.906	5.170	5.588	6.324
Weight of Bone	20.58	22.26	22.42	21.44
Per cent Bone to Empty Weight	8.630	8.588	10.754	13.864

Tables No.'s 43, 44, and 45

Weights in Pounds of Parts of Lactating Gilts, as calculated from Data on Gilts Slaughtered at Farrowing, and Gains over Calculated Weights.

	At Farrowing			After Lactation			
	Actual Weights	Calculated Weights		Actual Weights		Calculated Gains	
	No. 3	No. 2	No. 5	No. 2	No. 5	No. 2	No. 5
Live Weight*	248.00	255.00	248.00	250.00	188.00	-5.00	-60.00
Factor used in calculations		1.03	1.00				
Weight of Blood	9.30	9.58	9.30	7.60	7.34	-1.98	-1.96
Weight of Internal Organs	19.72	20.31	19.72	18.65	15.14	-1.66	-3.58
Weight of Lean	93.18	95.98	93.18	98.22	83.63	+2.24	-9.55
Weight of Fat	61.38	63.22	61.38	50.14	22.13	-13.08	-39.25
Weight of Bone	19.88	20.48	19.88	22.42	21.44	+1.94	+1.56
	No. 8	No. 2	No. 5	No. 2	No. 5	No. 2	No. 5
Live Weight	245.00	255.00	248.00	250.00	188.00	-5.00	-60.0
Factor used in calculations		1.04	1.01				
Weight of Blood	7.55	7.85	7.63	7.60	7.34	-0.25	-0.29
Weight of Internal Organs	17.17	17.86	17.34	18.65	15.14	+0.79	-2.20
Weight of Lean	99.76	103.75	100.76	98.22	83.63	-5.53	-17.13
Weight of Fat	64.18	66.75	64.82	50.14	22.13	-16.61	-42.69
Weight of Bone	19.64	20.43	19.84	22.42	21.44	+1.99	+1.60
	No. 1	No. 2	No. 5	No. 2	No. 5	No. 2	No. 5
Live Weight	257.00	255.00	248.00	250.00	188.00	-5.00	-60.00
Factor used in calculations		0.99	0.96				
Weight of Blood	9.24	9.15	8.87	7.60	7.34	-1.55	-1.53
Weight of Internal Organs	19.95	19.75	19.15	18.65	15.14	-1.10	-4.01
Weight of Lean	94.56	93.61	90.78	98.22	83.66	+4.61	-7.12
Weight of Fat	49.72	49.22	47.73	50.14	22.13	+0.92	-25.60
Weight of Bone	18.40	18.22	17.66	22.42	21.44	+4.20	+3.78

*Actual weight in all cases, used to obtain factor for calculation. Nos. 3 and 8 slaughtered just after farrowing, No. 1, just before farrowing.

tween this calculated weight and the weight actually found in the animal at slaughter is considered gain or loss.

The results in this table, in so far as results thus obtained can be depended upon, indicate that No. 2 grew very little, if at all, and that No. 5 actually lost during lactation in weight of blood, internal organs, lean flesh, and fat flesh, showing gain in the skeleton only.

Is all this decrease in weight due to loss of fat, or is there an actual loss of protein? Studies at the Missouri Experiment Station of cattle on submaintenance rations show that when the animal is losing fat it draws very heavily on all other tissues before any fat is taken from the skeleton. This fact may help to explain the apparent gain in weight of skeleton in the case of this gilt even when she was losing weight.

Summary

The Experiment

The experiment was started with ten similar gilts about seven months old, to study the effect of gestation and lactation on their growth and composition. One was slaughtered for analysis as a check at the beginning of the experiment. Seven were bred and two left open as checks. One pregnant gilt was slaughtered 88 days after conception, one just before farrowing, and two just after farrowing. One open gilt was slaughtered at this time. Two gilts suckled litters, one produced a litter but did not suckle it. Each of these was slaughtered 68 days after she farrowed and the last open gilt was slaughtered about the same time.

All animals were kept under as nearly the same conditions as possible till after farrowing when an attempt was made to give one suckling gilt a large ration, but as a matter of fact all did consume very nearly the same amount of feed.

Records were kept of daily weights, feed, measurements. At slaughtering the weights of organs and parts were recorded.

One digestion trial was run in each period for comparison of digestion coefficient of open, pregnant, and suckling gilts.

The Results

Weights show no particular difference in the growth of the open and pregnant groups.

Measurements seem to favor a greater growth of open group, but this is not decided and may all be due to individuality. The digestion trial indicates that the digestion coefficient of the pregnant gilts is enough higher than the open to provide nutrients for the development of the litter.

The slaughterhouse data indicates that possibly pregnancy may have caused an increase in the amount of blood and a retardation of skeletal growth.

The percentage composition indicates that pregnancy lowered the per cent of ash in the skeleton more than is accounted for by the ash in the litter.

Lactation greatly retarded growth and in case of one animal seems to have stopped it entirely except, possibly, in the skeleton.

Conclusions

In work with animals individuality is so large a factor that conclusions must be formed with caution except where large numbers are used. Then too, animals are so much affected by slight changes in environment and nutrition that all the conditions must be carefully considered. It frequently happens that there are conditions whose influence cannot be measured.

In this experiment only ten animals were studied, and this number allows but few checks or repeats for any one condition. On this account we can say little more than that certain tendencies appear to be shown. Then, too, there is yet a large amount of the work unfinished, and the interpretation of the results already found may be changed when the work is completed.

At present the following conclusions seem tenable:

Pregnant gilts make about as much growth as open gilts receiving the same feed.

Perhaps, with gilts running together, pregnancy promotes growth.

Lactation greatly retards growth and may possibly stop it altogether.

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