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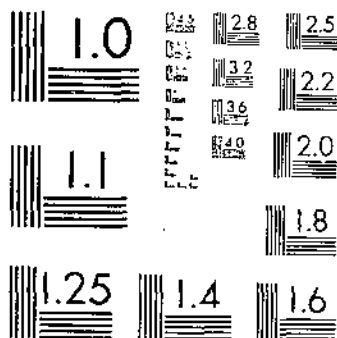
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EFFECTIVENESS OF THE SWINE SANITATION SYSTEM IN THE SOUTH

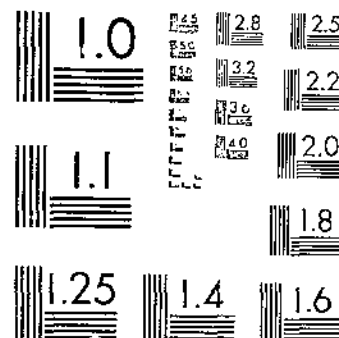
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UNITED STATES DEPARTMENT OF AGRICULTURE  
WASHINGTON, D.C.

# EFFECTIVENESS OF THE SWINE SANITATION SYSTEM IN THE SOUTH

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## PURPOSE OF INVESTIGATION

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In the control of internal parasites, the system of swine sanitation developed in McLean County, Ill.,<sup>1</sup> has come into common use in the Middle West and has attracted the attention of swine growers in other regions. Through this system many farmers have prevented much of the heavy loss due to the ascarid, or common intestinal roundworm, *Ascaris suum*. Some producers have raised about 50 percent more pigs with the same number of sows than they had raised under the usual hog-lot conditions. In the Corn Belt, farmers have also been able to get pigs ready for market from 4 to 8 weeks earlier with a saving of both feed and labor, and the pigs in each litter have been of uniform size. Litters raised under the sanitary system contain practically no runts.

This method seemed to be applicable to other regions. In order to test the swine sanitation system under farm conditions in the South, the Bureau of Animal Industry accepted, from among numerous offers of cooperation, the opportunity to conduct a series of trials in Colquitt County, Ga. This county, in southwestern Georgia, was favorably situated in regard to marketing and slaughtering facilities. The additional fact that the bureau was conducting meat inspection at an establishment in Moultrie afforded an opportunity for post-mortem examination of pigs involved in this investigation. Many of the farmers in the county were interested in reducing the losses that had caused discouragement in raising pigs for market. The prospect of cooperation from farmers, as well as the other favorable circum-

<sup>1</sup> RAFFENSPERGER, H. B., and CONNELLY, J. W. THE SWINE SANITATION SYSTEM AS DEVELOPED BY THE BUREAU OF ANIMAL INDUSTRY IN MCLEAN COUNTY, ILL. U.S. Dept. Agr. Tech. Bul. 44, 20 p. 1927.

stances, led to the establishment of a temporary field station in Moultrie for the study of this problem.

At the outset of the experiment, which began in 1926 and continued through 1930, it was realized that between the Middle West and the South there were material differences in climate, types of soil, parasite infestation, and other conditions affecting the production of hogs.

The sanitary system of handling sows and their litters is primarily a control measure for preventing injury to young pigs by the swine ascarid and is based on the life cycle of this parasite. However, this experiment with the sanitation system was carried further to include a consideration of the effectiveness of the system against kidney worms, nodular worms, thornhead worms, lungworms, hookworms, and whipworms.

### PRELIMINARY OBSERVATIONS

#### SOIL AND CLIMATE OF COLQUITT COUNTY, GA.

Colquitt County, Ga., is located in the higher portion of the Coastal Plain area of the State. The soil is of the gray and yellow sandy loam type. The land is undulating and fairly well drained. The upland is usually tilled, but the low, well-shaded, moist land is used for permanent pasture.

According to reports of the United States Weather Bureau, which maintains a station at Thomasville, nearby, the average date of the last killing frost in this vicinity in the spring is March 14, and the average date of the first killing frost in the fall is November 15. There is, therefore, a growing season of 246 days. The district is well below the snow line; the annual, normal rainfall is about 52 inches, and the annual mean temperature is about 67° F.

It is generally recognized that conditions such as are found in this part of Georgia—particularly warmth and abundant moisture—are favorable to the development of most parasites in swine and other farm animals. However, these conditions are offset to a considerable degree, as regards the ascarid of swine, by the fact that pastures are larger and less densely stocked than those in the Middle West. It is well known that with light stocking there tend to be fewer parasites.

#### CUSTOMARY METHOD OF RAISING PIGS

The customary practice of raising pigs in southern Georgia involves the use of native pasture, commonly a piece of low, moist ground. A fenced lane usually connects the pasture, which may or may not be fenced, with an enclosure convenient enough to the farmhouse to allow feeding during the winter and other seasons when there is a shortage of pasturage. Small enclosures and lanes of this type used by hogs year after year tend to become heavily infested (fig. 1).

Swine growers in the South, as a rule, do not provide hog houses but sometimes use improvised shelters set up in fields or against sheds or barns (fig. 2). Shortly before farrowing, sows are placed in pastures where they will get some protection and shelter from timber or undergrowth while farrowing their pigs. When the pigs are several weeks old they are allowed to run in the pasture with the sows and other hogs, and so become exposed to worm infestation. Under such conditions pigs suckle the sows for long periods. Although the practices described are commonly followed in Colquitt County, much of which is free range, some hog producers keep their stock in fenced pastures

in order that herd improvement may be carried on more conveniently. It is a common practice to raise both spring and fall litters.



FIGURE 1.—Feeding hogs in a lane leading to low-lying wet pasture. This practice, common in the South, tends toward heavy infestation with worm parasites.

The main crops used for finishing hogs in southern Georgia are corn, peanuts, and sweetpotatoes, which are fed by allowing the hogs to harvest the crops in the fall and winter. In some cases these feeds



FIGURE 2.—A typical herd resulting from indiscriminate breeding and little attention to sanitation. Note the improvised farrowing shelter in the background.

are supplemented with a concentrate such as tankage. The practice commonly brings the hogs to market finish during the fall and winter months, and it also leaves a long period of light feeding for pigs farrowed in the spring.

The grazing crops used for pigs are permanent native pastures, winter oats, and rye. The temporary crops are sown early in the fall and pastured in late fall, winter, and spring.

The feeding methods necessarily influence the age at which hogs are slaughtered. In order to determine the approximate age of hogs when sold for market, the writers examined the incisor teeth of 8,308 hogs as they were slaughtered at one of the local slaughtering establishments. The ages of these hogs ranged from 12 to 18 months, the average being about 14 months.

#### FARM SURVEY

Before the experimental work was begun the writers conducted a survey of all farms offering to cooperate in the work. Through the cooperation of the county extension agent and the local chamber of commerce a series of farm visits was conducted in order to make a careful study of worm infestation of herds, customary losses from such infestations, and the cause of runty conditions in young pigs. The general management of hogs on farms, particularly of sows and their litters, was also noted during the survey. Moreover, before undertaking the actual work of the project, it was necessary to consider the kind of crops that could be grown.

Most of the farmers believed that worm infestation was the principal obstacle to the swine industry in this area. Practically all herds inspected showed evidence of worm infestation, either in runty pigs or poorly developed animals. On the other hand, there were few filth-borne diseases such as bull nose, sore mouth, scours, and mange. The absence of these conditions was due largely to the fact that, in general, pigs in this county have relatively large fields or pastures in which to forage. Filthy hog lots and mud wallows were exceptions to the general rule partly because the sandy loam soil drains readily after rains. This factor may have had a bearing on the results of the project.

During the course of the survey the writers interviewed 28 farmers who were considered to be successful hog raisers. Of these, 21, or three fourths of the number, said that hog raising was profitable, whereas the remaining 7 believed it did not pay. On the basis of these statements it is probable that growing hogs in this locality is usually profitable in greater or less degree.

The survey also showed the presence of rickets and associated deficiency ailments that could be corrected by feeding a properly balanced ration and some simple mineral mixture.

One of the details of the survey was the collection of fresh droppings from pigs. These were taken both as composite samples and as specimens from individual animals and examined microscopically for worm eggs. All specimens collected in the survey showed indications of ascarids and other kinds of worms. Furthermore, subsequent post-mortem examinations, which were made at every opportunity, either in the field or laboratory, usually showed the presence of ascarids and other intestinal worms. In some cases there were sufficient numbers of worm parasites to cause serious injury to the host animals. Ascarids, nodular worms, lungworms, stomach worms, and kidney worms were found in every herd from which pigs were examined, and there was sufficient evidence to indicate that these parasites were causing injury and interfering with the growth and development of the animals. This evidence of worm infestation justified

the statements of the farmers that this was a drawback to hog raising in Colquitt County.

### EXPERIMENTAL PROCEDURE

#### MODIFIED SYSTEM OF SWINE SANITATION USED

After a consideration of all the factors involved in the production of swine under local conditions, a modified system of swine sanitation was presented to the farmers who orally agreed to the following procedure:

(1) That they would provide suitable temporary grazing crops for sows and pigs, both for spring and fall litters.

(2) That such grazing crops would be planted in fields that had been plowed and not used by hogs during the previous year, these fields to be as far away as possible from premises long used by hogs.

(3) That the sows would be placed in the clean fields 3 or 4 days before farrowing, and that shelter—preferably a portable farrowing house—and watering facilities would be provided.

(4) That the pigs would be kept in the original clean field or some other clean field until they were at least 4 months old, the sows to be removed when the pigs were from 60 to 70 days old.

(5) That a reliable record would be kept of the date and number of pigs farrowed, including the number of losses and the cause of losses, if obtainable.

In addition, the writers urged growers to use the most practical methods of improving and handling hogs. Purebred boars of good type were recommended for all farms where financial conditions permitted their use. It was further urged that the breeding herds be given good attention and sufficient feed of the proper kind to insure litters of strong pigs.

The swine owners were urged to breed their sows according to a schedule in order that the litters might be farrowed on the same dates as far as possible, thus utilizing the clean fields for the litters to the best advantage because of the more uniform age of the pigs.

As the sandy soil of the Coastal Plain is of a type that does not easily adhere to the sows, washing the animals before placing them in clean fields was usually unnecessary. Washing was necessary only in a few cases when sows had had access to muddy soil. The use of a crate on runners or other conveyance, for transferring each sow and her litter to a clean field, was also omitted in this modified system as there was no indication of any sow's carrying worm infection of any consequence on her udder, feet, or other part of the body.

The basic modifications of the original swine sanitation system consisted in farrowing both spring and fall litters on pasture in temporary shelters, instead of farrowing the spring litters in a permanent farrowing house. Thus the growers omitted most of the procedure associated with the use of permanent farrowing houses in the McLean County system. The modifications are based, for the most part, on the principles outlined by Ransom<sup>2</sup> for fall farrowing in the Corn Belt in connection with swine sanitation.

In carrying out the details of the swine sanitation system, 32 farmers cooperated to some degree in the experimental study on their farms. A number of others began the work but failed to continue

<sup>2</sup> RANSOM, B. H. THE PREVENTION OF ROUNDWORMS IN PIGS. U.S. Dept. Agr. Leaflet 5, 8 p., illus. 1927.



until the pigs were raised, and they were therefore dropped from the experiment.

The writers kept in close touch with these farms by visiting the premises frequently and recorded data on number of pigs farrowed, losses at farrowing time and on pasture, and the number of pigs marketed, kept, or sold for breeding. The writers also made post-mortem examinations at time of slaughter, as all pigs were marketed at one packing plant, where cordial cooperation was given by the packing company.

In addition to the 32 farmers just mentioned, 8 others agreed to allow their herds to be studied as controls. These farmers were to use their customary method of raising, feeding, and marketing hogs without giving any attention to the sanitation system. The owners of these control herds were classed as better than average hog producers in this locality, a fact which had a bearing on the results of the investigation. Visits were made also to these farms at frequent intervals in order to obtain information similar to that obtained for the pigs raised under the sanitation system.

#### GRAZING CROPS USED IN EXPERIMENTS

The possibility of having continuous grazing crops available for the sows and growing pigs was favorable to the successful operation of the modified system of swine sanitation. The climate of Colquitt County is such that crops may be sown for both summer and winter grazing. The crops used for summer grazing were field peas, sorghum, velvet-beans, and millet, whereas the principal crops used for pasture in the fall and winter were oats, rye, and Austrian winter peas. The oat crop was especially well suited for grazing, the sows being allowed to farrow in a field of growing oats, where the pigs in some instances remained until the mature crop was "hogged off." By this method the pigs were kept on clean ground away from premises contaminated with worm eggs and larvae until ready for finishing on early corn. In case no grazing crop was available for a sow and her litter, a field that had been cropped during the year was utilized, provided, of course, that no other hogs had grazed the field since the ground was plowed.

The pigs on pasture had access to a mixture of ground limestone and common salt, equal parts by bulk, with enough tankage added to provide flavor. This mixture was kept before most of the sows and pigs at all times as an aid in stimulating rapid, normal development.

#### EQUIPMENT FOR SOWS AND THEIR LITTERS

Permanent farrowing pens and houses are not in general use in the South and, therefore, are not considered in the sanitation method as modified for this region. An individual, portable farrowing house (figs. 3 and 4), designed by the investigators to meet conditions of the district, was used to some extent in protecting litters during chilly nights and cold rains. This type of farrowing house can be constructed at small cost.

### RESULTS OF EXPERIMENTS AND DISCUSSION

#### PIGS RAISED AND MARKETED

As to the degree of cooperation in carrying out the swine sanitation system on their farms, the cooperators were classified as being in three groups: "Excellent", "good", and "fair." By "excellent" is meant

those who carried out all the essential details of the swine sanitation system and applied the methods as completely as possible under farm conditions. By "good" is meant those who were interested in swine sanitation and for a time observed the more important details but

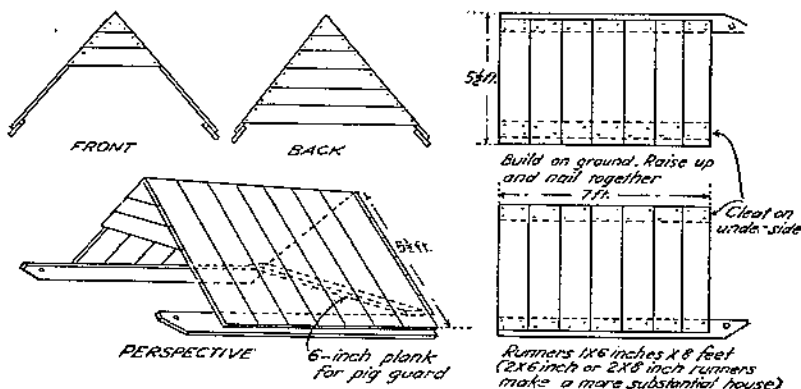


FIGURE 3.—Individual, portable farrowing house suitable for the Coastal Plain area of the Southern States.

later carried them out only partly. By "fair" is meant those who showed interest at the outset but neglected many of the details of the work during the time the pigs were being raised. One of the cooperators was classed as "excellent", 6 as "good", and 25 as "fair." The

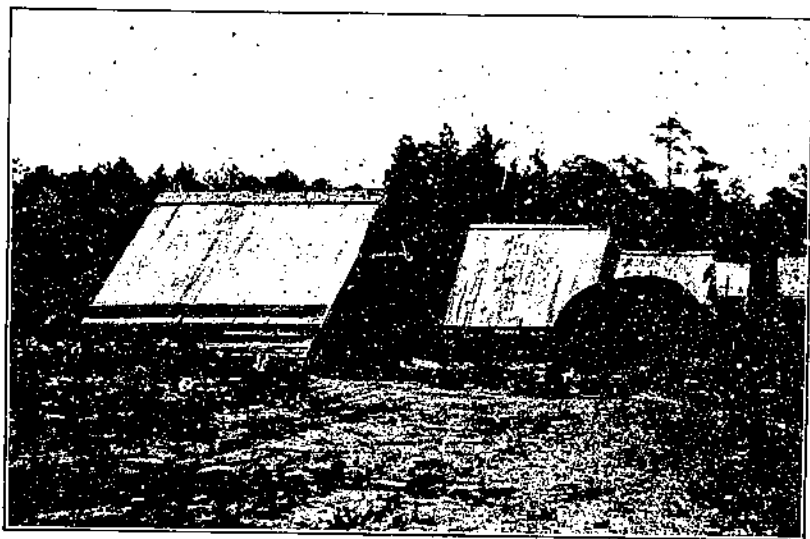


FIGURE 4.—Group of portable farrowing houses used on the premises of a cooperator.

predominance of "fair" cooperators and the fact that owners of control pigs were farmers of more than average ability largely accounts for some of the cases in which the sanitation pigs had more parasites than the others. It was obviously impossible to foresee the character of cooperation.

Tables 1 to 4 show the principal results obtained by the cooperators during the 5-year period. Since it was not practicable for the writers to make an actual count of the pigs at time of farrowing, it was necessary to accept the owners' figures. However, the systematic and regular visits to each farm showed that the count was so nearly correct that any error in the figures given had but slight, if any, bearing on the results. It was impracticable also, under the conditions of the work, to obtain birth weights of the pigs for use in computations of individual gains. However, in proportion to total gains—commonly exceeding 150 pounds—the fairly uniform birth weight of pigs—usually between 2 and 3 pounds—is too small a factor to have a significant effect on results of the kind here presented.

TABLE 1.—Results of raising pigs under the system of swine sanitation and without attention to sanitation, 1926-30

Year and class of pigs	Farms in experiment	Brood sows	Pigs farrowed	Pigs to pasture	Pigs lost at farrowing time		Pigs lost on pasture—			
					Number	Per cent	From disease	From accident	Total	
	Number	Number	Number	Number	Number	Per cent	Number	Number	Number	Per cent
1926										
Sanitation pigs.....	9	46	330	252	78	23.6	3	7	10	4.0
Control pigs.....	3	16	97	88	9	9.3	27	6	33	37.5
1927										
Sanitation pigs.....	20	303	2,297	1,929	368	16.0	112	111	223	11.6
Control pigs.....	3	65	383	351	32	8.3	104	17	121	34.5
1928										
Sanitation pigs.....	20	181	1,329	1,084	245	18.4	104	58	162	14.9
Control pigs.....	6	40	281	251	30	10.7	73	13	86	34.3
1929										
Sanitation pigs.....	19	164	1,392	1,175	217	15.6	40	48	88	7.5
Control pigs.....	6	36	433	358	76	17.3	9	9	18	5.0
1930										
Sanitation pigs.....	15	78	700	566	134	19.1	14	14	28	4.9
Control pigs.....	5	20	170	136	34	20.0	0	0	0	0
Total or average:										
Sanitation pigs.....		772	6,048	5,006	1,042	17.2	273	233	511	10.2
Control pigs.....		197	1,364	1,184	180	13.2	213	45	258	21.8

Year and class of pigs	Pigs held on farms or sold for breeding	Pigs marketed	Average weight of pigs when marketed	Average daily gain of pigs (birth to market)	Pigs to pasture, saved or marketed	
					Number	Per cent
	Number	Number	Pounds	Pound	Number	Per cent
1926						
Sanitation pigs.....	45	197	190	0.70	242	96.0
Control pigs.....	14	41	187	.56	55	62.5
1927						
Sanitation pigs.....	246	1,460	160	.61	1,706	83.4
Control pigs.....	0	230	187	.56	230	65.5
1928						
Sanitation pigs.....	75	847	151.5	.58	922	85.1
Control pigs.....	0	105	186	.54	105	65.7
1929						
Sanitation pigs.....	187	900	151.6	.76	1,087	92.5
Control pigs.....	165	175	171	.53	340	95.0
1930						
Sanitation pigs.....	538	0			538	95.1
Control pigs.....	136	0			136	100.0
Total or average:						
Sanitation pigs.....	1,091	3,404	159.9	.63	4,495	89.8
Control pigs.....	315	611	182.1	.57	926	78.2

The data in table 1 include results, such as losses at farrowing time and losses from accident on pasture, that obviously do not concern the swine sanitation system. The data for the various years also show considerable irregularity resulting from many variable local factors. The entire absence of losses among the control pigs on pasture in 1930 is especially noteworthy; as hog men are well aware, this is an unusual record in which the element of chance happened to be highly favorable. However, the 5-year record of "pigs to pasture" that were saved or marketed showed that the swine sanitation system gave an 89.8 percent result as compared with 78.2 percent for the controls.

A study of the causes of loss showed that in most cases deaths at farrowing time were from overlying, exposure, drowning, and similar causes. Losses from accident were the result of injuries by other hogs or the effects of a wide range of miscellaneous causes. Losses from disease were due to hog cholera, pneumonia, malnutrition, poisoning by plants, and similar causes. Cholera, of course, may be prevented by immunizing the pigs while young. Pneumonia was not observed in pigs less than 4 weeks old, but there were cases of pigs ranging from 4 to 6 months of age, especially in dry seasons, when there was considerable dust in the hog lots. This disease was most common among underfed herds, in which the pigs were probably more susceptible to bacterial infection. Losses from poisoning may be lowered by keeping the pigs away from fields where young cocklebur and other poisonous plants are growing. Losses from diseases were noticeably greater in herds kept by farmers who were lax in their methods of management.

In order to make a comparison of the market weights of the pigs from the two groups, the writers kept records of the weights and ages of all pigs marketed during the first 4 years of the experiment. None had been marketed in 1930 by the time the experiment closed (table 2).

TABLE 2.—Comparison of market weights and ages of sanitation and control pigs, 1926-29

Year	Sanitation pigs				Control pigs			
	Pigs slaughtered	Average weight	Average age	Average daily gain	Pigs slaughtered	Average weight	Average age	Average daily gain
1926.....	Number	Pounds	Days	Pound	Number	Pounds	Days	Pound
1927.....	107	190	270	0.70	41	187	335	0.56
1928.....	1,460	166	272	.61	230	187	318	.69
1928.....	847	151.5	276	.55	165	186	347	.54
1929.....	930	151.5	200	.70	175	171	296	.58
Total or average.....	3,404	159.0	251	.63	611	182	321	.57

Since the control pigs, by reason of their slower growth, were more than 2 months older when marketed, the final weights are not comparable as a basis of judging the effectiveness of the system. The average daily gains, however, provide comparable figures which for each year were higher for the sanitation pigs.

The value of the sanitation system is judged primarily in terms of thrift, as indicated by gains in weight per day and number of sanita-

tion pigs raised and marketed as compared with similar data for the controls. Figures 5, 6, and 7 show typical lots of pigs in both the sanitation and control groups.



FIGURE 5.—A control lot of pigs, ranging in age from 10 weeks to 7 months.



FIGURE 6.—A lot of sanitation pigs ranging in age from 10 weeks to 4 months.

#### POST-MORTEM OBSERVATIONS

Further data bearing on the infestations of the experimental pigs were provided by post-mortem observations for the first 4 years during which pigs were marketed. As previously stated, the post-mortem examinations were made at a local packing plant.

In the conduct of these examinations the viscera of at least one fourth of each group of pigs slaughtered each year were examined in order to determine the number and percentages of viscera infested

with ascarids and other internal parasites and also to obtain data on the number of the different parasites present so far as they could be counted.

In addition to examining the viscera of 592 pigs (table 3), the writers inspected the carcasses of the same animals and 1,600 others. Careful observation was also made of the livers of all the pigs, since previous reports indicated that the livers of a large proportion of pigs slaughtered in the South were parasitized by kidney worms. It is impracticable to count kidney worms, but table 4 shows the

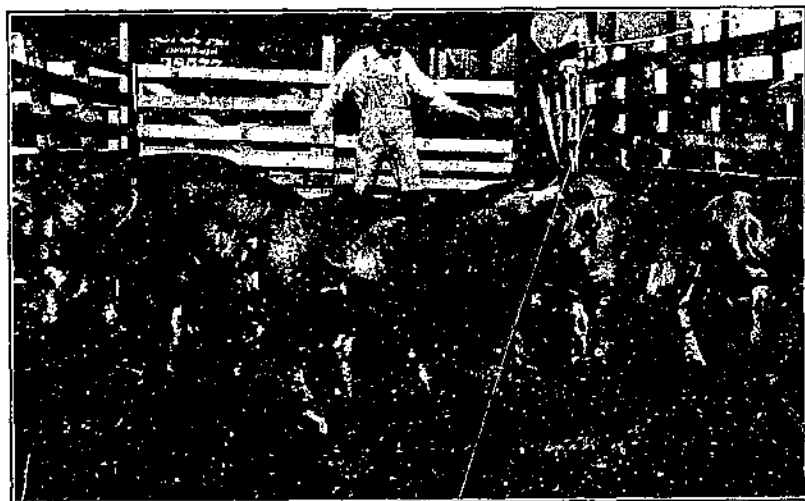


FIGURE 2.—Sanitation pigs marketed when 6 months old, averaging 200 pounds.

general results of post-mortem examination of carcasses and livers for the presence of these parasites.

TABLE 3.—Results of examinations of viscera of sanitation and control pigs, 1926-1929

Year and class	Examinations	Viscera infested with parasites <sup>1</sup>		Parasites, per pig, found in viscera <sup>2</sup>					
				Ascarids	Hook-worms	Nodular worms	Thorn-head worms	Whip-worms	
1926		<i>Number</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
Sanitation pigs.....	52	45	86.5	5.40	0.01	4.53	0.19	1.02	
Control pigs.....	11	5	45.5	3.36	0	41.09	3.90	0	
1927									
Sanitation pigs.....	241	183	75.9	4.04	0	3.15	.71	.02	
Control pigs.....	53	47	88.7	1.74	.04	4.55	0.23	0	
1928									
Sanitation pigs.....	68	40	72.1	4.98	1.56	10.12	.38	0	
Control pigs.....	16	15	93.8	4.13	0	0	3.44	.39	
1929									
Sanitation pigs.....	120	90	75.0	5.50	.99	0	.60	.64	
Control pigs.....	31	25	80.6	5.09	.03	0	.52	0	
Total or average:									
Sanitation pigs.....	481	367	76.3	5.01	.65	5.03	.34	.42	
Control pigs.....	111	92	82.9	3.17	.03	15.21	4.27	.10	

<sup>1</sup> For data on kidney-worm infestation of carcasses and livers, see table 4.

<sup>2</sup> It was not practicable, under field conditions, to count lungworms, but for the pigs examined during years observations on the effects of this parasite were as follows: Sanitation pigs, 60 free, 421 slight to extensive infestation; control pigs, 0 free, 111 slight to extensive infestation. "Slight" signifies 1 area of infestation in lung; "extensive" signifies several areas of infestation in lung.

TABLE 4.—Results of post-mortem examinations for kidney-worm infestation of carcasses and livers of sanitation and control pigs, 1926-29

Year and class of pigs	Carcasses examined	Carcasses parasitized		Livers parasitized	
		Number	Percent	Number	Percent
1926					
Sanitation pigs.....	150	9	6.0	78	50.7
Control pigs.....	44	15	34.1	35	79.5
1927					
Sanitation pigs.....	892	308	34.5	676	75.1
Control pigs.....	183	67	36.6	163	91.8
1928					
Sanitation pigs.....	204	120	45.5	248	93.2
Control pigs.....	110	84	76.4	110	100.0
1929					
Sanitation pigs.....	441	118	26.8	322	73.0
Control pigs.....	108	35	30.9	103	95.4
Total or average:					
Sanitation pigs.....	1,747	555	31.8	1,314	75.2
Control pigs.....	445	221	49.7	416	93.5

NOTE.—Percentages are based on total number examined.

<sup>1</sup> Identity of 4 livers lost.

<sup>2</sup> Identity of 7 carcasses lost.

By "livers parasitized" is meant either that kidney worms were present in the livers or that the organs had been infested with the parasite leaving scars or abscesses which caused the condemnation of the livers for use as food. By "carcasses parasitized" is meant that kidney worms were present in the kidneys, kidney fat, and frequently in the loin meat, causing these otherwise edible products to be unsuitable for use as food. As inspected, the hog carcasses contained the kidneys and attached fat.

The number of parasites in both classes of pigs at the time of slaughter was, in general, small. The most significant figures in tables 3 and 4 are the relative percentages of parasitized viscera, livers, and carcasses for the 4-year period. The percentages for the sanitation lots are materially smaller than for the control lots. These data are of interest in connection with previous figures on gains per pig. Both sets of data show the superior condition of the sanitation pigs. Evidently the small numbers of intestinal parasites present did little damage through mechanical obstruction. The injury probably consisted in some disturbance of digestive and body functions through invasion of tissues. In these invasions even small numbers of parasites seemed to have a retarding effect on growth and development.

#### RESULTS OF SYSTEM AS USED BY THE "EXCELLENT" COOPERATOR

The results obtained by the one cooperator classed as "excellent" are of interest, also, in showing the effectiveness of the system when all details were closely carried out. On the farm of this cooperator 58 sows farrowed during the 5 years, turned to pasture 420 pigs, an average of 7.2 pigs per litter. The losses on pasture from accident and disease were 30, or 7.1 percent. The losses from disease alone were 18, or 4.3 percent. Hence on this farm the system was 95.7 percent effective in protecting against loss by death from disease on pasture.

This cooperator marketed his pigs at an average age of 183 days and an average live weight of 185.7 pounds. This was a saving of 68 days as compared with the average for all the sanitation pigs (table 2), and a saving of 138 days as compared with the average for the control pigs. Furthermore, the pigs raised by this cooperator weighed 3.7 pounds per head more than the control pigs, in spite of the fact that the latter were about 4½ months older. The post-mortem examination of the excellent cooperator's herd revealed only 7 percent of parasitized carcasses.

### CONCLUSIONS AND SUMMARY

The experimental study of swine sanitation on 40 farms in Colquitt County, Ga., during the period 1926-30 indicates that this system as modified for southern conditions is effective in reducing materially the customary losses in growing pigs. The modification consists in having the sows farrow on pasture rather than in permanent farrowing houses; also, the sows need not be washed before farrowing in sections where the soil is sandy and well drained.

Though originally designed to control ascarids of young pigs, the system is also moderately effective against other worm parasites including kidney worms, which infest livers, kidneys, and loin tissues. The infestations are the cause of considerable loss as a result of condemnations, by inspectors, when the hogs are slaughtered.

Pigs raised under the sanitation system make more rapid daily gains than pigs raised with no attention to sanitation.

The sanitation system of raising pigs enables the farmer to raise more and better pigs from the same number of sows.

The value of the system is greatest when the hog grower follows every detail.

A study of the records of all classes of cooperators using the swine sanitation system showed that on their farms there occurred a total of 772 farrowings, resulting in 5,006 pigs going to pasture, an average of 6.5 pigs per litter. Barring deaths from accident on pasture, only 273 pigs, or 5.5 percent, were lost, indicating that the system was 94.5 percent effective in protecting against losses of the kind the system was designed to prevent.

On the farms of control-herd owners 197 farrowings occurred during the 4 years, resulting in 1,184 pigs turned to pasture, or an average of 6 pigs per litter. The losses on pasture from disease were 213, or 18 percent. Hence, on farms on which no attention was given to sanitation in raising pigs, only 82 percent of the pigs that were turned to pasture and that escaped accident were raised for market or kept for breeding.

When losses from accident were included, the percentage of pigs saved or marketed, based on the number placed on pasture, was 90.0 percent for the sanitation pigs and 78.2 percent for the controls.

The average daily gains of the experimental pigs were 0.63 pound for the sanitation lots and 0.57 pound for the controls.

Post-mortem examination of the sanitation pigs slaughtered during the experiment showed that 75.2 percent of the livers were parasitized, whereas of the livers of control pigs 93.5 percent were parasitized.

Kidney-worm infestation of the sanitation-pig carcasses was 31.8 percent, as compared with 49.7 percent in the controls. Examina-



tion of the viscera from the sanitary pigs showed 76.3 percent ascarid infestation, whereas in the control pigs there was 82.9 percent infestation.

The numbers of different parasitic worms present in the experimental lots, each year, as indicated by post-mortem examination, varied considerably. However, the number was small as compared with typical infestations of pigs kept in old hog lots.

The effectiveness of the system when followed in detail is illustrated by the results obtained by the "excellent" cooperator. During the 5 years his losses of pigs from disease alone were only 4.3 percent, as compared with 5.5 percent for all sanitation lots and 18 percent for the controls.

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**END**