

ABSTRACT OF THESIS

THE VALUE OF IMPROVED PRACTICES
IN SWINE PRODUCTION

Submitted by
Norman R. Rowe

In partial fulfillment of the requirements
for the Degree of Master of Science
Colorado State College
of
Agriculture and Mechanic Arts
Fort Collins, Colorado

July, 1

S-1-08A-18-01-056

LIBRARY
COLORADO STATE COLLEGE OF A. & M.
FORT COLLINS, COLORADO



U18400 9073694

S

378.788
A O
1943
92

THE VALUE OF IMPROVED PRACTICES IN SWINE PRODUCTION

To study the achievements made by 74 boys, who have conducted 185 swine sow-litter projects over a period of 16 years (1926-1942) of the West Salem (Wisconsin) High School, was one of the purposes of this study. Another purpose was to make various comparisons of the results attained by the boys conducting these sow-litter projects under two general types of management practices that were followed.

It has been a pleasure to the writer to have had the opportunity of working with these 74 boys at West Salem as their instructor in vocational agriculture. In addition to teaching these boys something about hog raising he has taken a great deal of interest in their swine projects and in supervising their work on their home farms.

These 74 boys completed 185 sow-litter projects. They averaged 2.26 litters per project. In these 185 projects 430 gilts and sows farrowed 3723 pigs of which 3297 were raised to market age.

From the very beginning of his teaching at West Salem, in 1926, the writer, through various incidents, became interested and encouraged his boys

to follow improved swine practices. These practices have been followed rather consistently, throughout the many years, by the boys at West Salem who have conducted sow-litter projects.

These improved swine practices are listed in Chapter III. Some of the practices are starred (*) and others are not. Those starred have been regarded by the writer as essential improved swine practices.

The 185 projects were classified into two groups: those in which all the essential practices were followed and those in which one or more of the essential practices were not followed.

There were 140 projects in which all the essential practices were followed and 45 in which they were not followed. In this study numerous comparisons are made of the results obtained by each of these two groups.

Boys conducting home projects in vocational agriculture are furnished with very complete record books. These books make it possible for the project workers to record in appropriate entry forms all necessary items, including a financial summary.

From these record books each instructor in vocational agriculture prepares annual reports of all completed projects, which are forwarded to his State Department of Vocational Education. It was from these

record books and from these annual reports that the writer secured and compiled all the data which were used in this study.

Table 3 in Chapter IV shows the number of pigs farrowed and the number of pigs saved under the two types of practices followed. In 140 projects in which all the essential improved practices were followed, involving 363 litters, an average of 8.65 pigs were farrowed and 7.94 pigs were saved per litter. In the 45 projects in which all the essential improved practices were not followed, involving 67 litters, 8.37 pigs were farrowed and 6.14 pigs were saved per litter. In the former case the percent of pigs lost was 8.1 and in the latter this percent was 29.1.

Table 4 in Chapter IV pertains to the days required for pigs to attain a market weight of 200 pounds under the two types of practices followed. In the 140 projects, involving 2885 pigs, in which all the essential practices were carried out, 186.07 days were required for the pigs to attain a weight of 200 pounds. In the other case, involving 44 projects and 412 pigs, it required 222.02 days.

Table 5 in Chapter IV pertains to the amount of grain consumed for each 100 pounds feed-lot gain by the pigs raised under the two types of practices. In the group of projects in which all the essential improved

practices were followed, 378.18 pounds of grain were consumed for each 100 pounds gain in weight. In the other group of projects 457.7 pounds of grain was consumed.

Table 6 in Chapter IV is concerned with the protein supplements consumed for each 100-pound feed-lot gain by pigs raised under the two types of practices. In this study the term "protein supplements" refers to commercial feeds high in protein. Such foods are tankage, meat scraps, soy bean and linseed meal, and "Trio Mixture".

In 22 projects involving 537 pigs, in the group in which all the essential improved practices were followed, the pigs consumed 61.48 pounds of protein supplements. In the other group involving 8 projects and 79 pigs, 81.62 pounds were consumed.

Protein supplements were fed in only 30 of the 185 projects because they were replaced by skimmilk in the rations.

The amount of skimmilk consumed for each 100-pound feed-lot gain by pigs under the two types of management is compared in Table 7 of Chapter IV. In the group of projects in which all the essential improved practices were followed, 1915 pigs consumed on an average of 580.28 pounds of skimmilk for each 100 pounds gain. In the other group, involving 260

pigs, 655.87 pounds of skimmilk was consumed for the same amount of gain in weight.

The last comparison made between the two groups of projects pertains to the net profit per pig. Where all the essential improved practices were followed, involving 140 projects and 2885 pigs, the net profit per pig was \$10.35. In the other group, involving 45 projects and 412 pigs, the net profit per pig was \$5.06.

The total net profit in the 185 projects amounted to \$31,958.92, or an average of \$172.75 per project. In these 185 projects 430 litters were raised and the net profit per litter was \$74.32.

Conclusions

From this study and as a result of the writer's supervision of the 74 boys that carried 185 successful swine sow-litter projects over a period of 16 years, he has reached the following conclusions:

1. Healthy pigs can be raised by following rigid sanitary practices.
2. It takes the pigs a shorter time to reach a weight of 200 pounds when all the improved practices are followed.
3. More pigs are farrowed and saved when all essential improved practices are followed.
4. Less grain, protein supplements, and skimmilk are consumed to attain a market weight of 200 pounds when all the essential improved practices are followed.

5. Greater net profits result when all essential practices are followed.
6. The only successful way to raise hogs efficiently is to follow as many of the improved swine practices as possible.

The improved swine practices which the writer has been recommending to his project workers are given below. He also recommends these to farmers of the West Salem, Wisconsin, community for efficient and profitable pork production.

IMPROVED SWINE PRACTICES

A. Practices pertaining to the selection of breeding stock.

- *1. Good pure bred boars of market type are used for breeding.
- *2. Breeding sows and gilts are selected from strains of large litters.
3. Breeding sows and gilts are of good type and desirable size.

B. Practices pertaining to rations and methods of feeding.

1. Sows and gilts are flushed before breeding time.
- *2. A laxative ration is fed before farrowing time.
- *3. Legume hay is fed during gestation period.
- *4. Mineral mixtures are available at all times.
- *5. The ration for growing pigs contains suitable animal protein.
6. Hogs are self fed to save feed and labor.

7. Clean water is available at all times.

8. Pigs are creep fed beginning at two weeks of age.

C. Practices pertaining to housing and sanitation.

*1. Comfortable dry winter quarters are provided.

*2. Farrowing pens are provided with guard rails.

*3. Artificial heat is available at farrowing time.

*4. Farrowing pens are scrubbed with boiling water and lye.

*5. Sows are scrubbed with soap and water prior to farrowing.

*6. Sows and young pigs are kept in clean dry pens until hauled to clean pasture.

7. Pigs are sprayed or dipped for mange or lice when necessary.

8. Shade is provided in hot weather.

D. Practices pertaining to care before and after farrowing.

1. Breeding dates are accurately recorded.

*2. Sows are attended at farrowing time.

3. Needle teeth are clipped at birth.

4. All litters are ear notched.

*5. Anemia preventive measures are followed.

6. All market pigs are castrated at three to four weeks of age.

NOTE: All practices starred are considered essential.

LIBRARY
 COLORADO STATE COLLEGE OF A. & M. A.
 FORT COLLINS, COLORADO

T H E S I S

THE VALUE OF IMPROVED PRACTICES
IN SWINE PRODUCTION

Submitted by

Norman R. Rowe

LIBRARY

COLORADO STATE COLLEGE OF A. & M. A.
FORT COLLINS, COLORADO

In partial fulfillment of the requirements
for the Degree of Master of Science
Colorado State College
of
Agriculture and Mechanic Arts
Fort Collins, Colorado

July, 1943

378.788

AD

1943

9

COLORADO STATE COLLEGE

OF

AGRICULTURE AND MECHANIC ARTS

=

JULY 2, 1943

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY NORMAN N. ROWE ENTITLED THE VALUE OF IMPROVED PRACTICES IN SWINE PRODUCTION

BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

MAJORING IN AGRICULTURAL EDUCATION

CREDITS 3

G.A. Schmidt
In Charge of Thesis

APPROVED *G.A. Schmidt*
Head of Department

Examination Satisfactory

Committee on Final Examination

H.H. Stonaker
G.A. Schmidt
J. Marshall

V.E. Johnson
Dean of the Graduate School

Permission to publish this thesis or any part of it must be obtained from the Dean of the Graduate School.

ACKNOWLEDGMENTS

The writer wishes to acknowledge his appreciation of the splendid cooperation given him by the 74 boys of the West Salem High School who conducted sow and litter projects that are the basis of this study. He is proud of their achievements and glad to have had the opportunity of working with them.

To Dr. G. A. Schmidt, of Colorado State College, special acknowledgment is due, for his untiring help and time given in solving the various problems that were encountered in conducting and completing this study.

Acknowledgment is also due Dr. Gilbert L. Betts, Supervisor of Graduate Research in Education, Colorado State College, for his help in the preparation of the outline for this thesis, and in the organization of many of the tables used to present data.

The writer, also, greatly appreciates the time, given him by many of the business men and farmers of West Salem, which was consumed in checking and clarifying entries made in the project books of the boys.

CONTENTS

	Page
CHAPTER I: INTRODUCTION - - - - -	6
CHAPTER II: A HISTORY OF THE PROBLEM AND A REVIEW OF THE LITERATURE - - - - -	14
CHAPTER III: METHODS AND PROCEDURE - - - - -	31
CHAPTER IV: PRESENTATION OF DATA AND DISCUSSION -	38
CHAPTER V: SUMMARY, CONCLUSIONS, AND RECOMMENDA- TIONS - - - - -	48
BIBLIOGRAPHY - - - - -	54

LIST OF TABLES

Table	Page
1. Summary of swine projects completed at the West Salem High School - - - - -	38
2. Classification of projects with reference to number of improved practices carried out - - - - -	39
3. Pigs farrowed and pigs saved under the two types of practices followed - - - - -	40
4. Days required to attain market weight of 200 pounds under the two types of practices followed - - - - -	41
5. Grain consumed for each 100-pound feed-lot gain by the pigs raised under the two types of practices - - - - -	42
6. Protein supplements consumed for each 100-pound feed-lot gain by pigs raised under the two types of practices - - - - -	43
7. Skimmilk consumed for each 100-pound feed-lot gain by pigs raised under the two types of practices - - - - -	44
8. Net profit per project and per litter under the two types of practices - - - - -	46
9. Net profit per pig under the two types of practices - - - - -	46

6

THE VALUE OF IMPROVED PRACTICES
IN SWINE PRODUCTION

Chapter I
INTRODUCTION

This study deals with swine projects that have been conducted by boys enrolled in the vocational agricultural course of the West Salem (Wisconsin) High School.

All boys taking the work in vocational agriculture in high schools which are conducted under the provisions of the Smith-Hughes Act must engage in supervised practice on a farm for at least six months each year. The major part of this supervised practice work of boys in vocational agricultural classes takes the form of one or more home projects involving the production and the marketing of some agricultural products, such as milk, pork, eggs, potatoes, corn, and the like.

Supervised farm practice work, including home projects, has been made a required part of the work in vocational agriculture in order that those enrolled in

7

the course will secure adequate supervised practice in the type of farming for which they are fitting themselves. The slogan, "Learning to do and doing to learn," characterizes the training given in vocational agriculture in high schools.

In all real project work in vocational agriculture the boys are expected to do the work involved, in a real business-like manner, conforming with the following generally accepted standards:

1. Accurate financial and production records are kept.
2. The boy assumes full responsibility for conducting the project.
3. Written plans are made by the boy for all important aspects of the work involved.
4. At the completion of each project the records are summarized, interpreted, and financial statements are made.
5. A new plan for the ensuing year is formulated, based on the interpretation of the previous year's work.

Since 1926 the writer has been teaching vocational agriculture at West Salem, Wisconsin. West Salem is a small town with a population of about 1100. It is located in the west central part of the state, near the city of LaCrosse. The farming area around West Salem is regarded as among the best in the state. Diversified farming is followed. Dairying and swine production predominate and excellent corn and small grains are produced in abundance. Alfalfa and clover,

8

both for hay and pasture, are found growing on most of the farms.

From the very beginning of the writer's teaching at West Salem the program in vocational agriculture was heartily endorsed and supported by the school authorities, the business men, and the farmers of the community. Excellent cooperation between parents, farmers, farm boys, and the writer have always existed throughout the many years he has taught vocational agriculture at West Salem.

Since 1926 the West Salem High School has offered a 4-year course in vocational agriculture, and the average number of boys enrolled in the work has been about 50. This number constitutes about four-fifths of the boys enrolled in the high school. Interest in vocational agriculture at West Salem has been continuous; and during the winter of 1942, 148 farmers, mostly former students of vocational agriculture, attended war production classes under the supervision of the writer.

Swine projects have always predominated at West Salem. Perhaps the main reason for this is the fact that most farmers in the community raised hogs. Then, too, the turn over in pork production is rapid, and the local setting is ideal for the enterprise. Perhaps another reason is the fact that swine projects,

as a whole, have been successful, and have made money for the project workers.

Starting in 1927 three boys in vocational agriculture at West Salem selected sow and litter projects. In 1928 there were five boys and in all the following years, up to and including 1942, the number was never less than eight. In two years, 1934 and 1935, 18 and 17 boys respectively had swine projects. During the 16-year period, 1927 to and including 1942, there were conducted by the boys enrolled in vocational agriculture at West Salem 185 swine projects, and during this same period these boys raised 3,297 hogs.

Every project worker in vocational agriculture, as has been indirectly referred to, is expected to keep very complete and accurate records on every project conducted. In Wisconsin the State Department of Vocational Education furnishes record books for this purpose. From the very beginning of his teaching at West Salem, in 1927, the writer has kept these record books or summaries made from them and this fact has enabled him to make accurate and reliable statements regarding the swine projects completed at West Salem during the last 16 years.

In 1938 Mr. E. R. McIntyre, associate editor of the Wisconsin Agriculturist and Farmer, was attracted to the West Salem community because of the outstanding

achievements in swine production made by the boys from this community. He was interested in getting first-hand facts about these boys in the vocational agricultural classes at the high school, because of their long and continuous showing of excellent breeding stock and winning of fat barrow championships at two state fairs and in numerous county fairs. In the September 1938 issue of the magazine Mr. McIntyre wrote an article entitled, "West Salem Boys Bring Home the Bacon." In the article he reviews the many laurels won by the boys with their swine. He also describes the splendid cooperation existing in the community between the vocational agriculture department of the local high school and the parents, the breeders, the boys, and their instructor. In this article Mr. McIntyre wrote as follows:

With Teddy Hulberg taking champion barrow in the open class for 1938 at the state fair, with the Labus boys winning all tops and champions in the junior feeding contest, and with Harrison Stornedt, 15 years, taking the best place in swine judging away from all the veterans of the state fair show ring--it still looks as though the laurels for pork production stay in LaCrosse County. Moreover, the students of this school hauled 110 head of porkers down to West Allis for entry in the amateur and professional classes, and toted home most of the premier ribbons.

Understand, this hasn't gone to their heads either, for each year new crackerjack feeders emerge to take the places of the graduates--just as in athletics. Besides, Mr. Rowe encourages the boys to forget fair exhibiting after they finish school and go in for swine breeding and marketing, letting the active classmen and Future Farmers go after the ribbons.

Mr. McIntyre closes the article with the following statement:

The roster of present and past masters among students and graduates of the West Salem High School who have raised show and breeding hogs is a long one. ... The only way to realize the preponderance of pork in the traditions of the West Salem High School is to take a ride with some of the boys through the rich undulating coulees made famous not alone by Hamlin Garland.

Swine raisers have different systems and use different methods in the production of pork. They follow certain practices according to their own standards of raising hogs. Some of them carry out improved practice to the fullest extent and others follow only a few. These facts came to the attention of the writer when he began his teaching at West Salem. An incident occurred in 1926 on a farm near West Salem in which a farmer lost all of his swine. The farmer's son, a student in the writer's first class in agriculture at West Salem, related this fact to him. The boy was interested in a swine project but was skeptical about the matter because of the losses sustained by his father. The writer visited the boy's home farm and got into a discussion of hog raising with the farmer. As he recalls this visit and the conversation, he impressed the farmer that if he followed the improved swine practices recommended by the University of Wisconsin he could raise swine successfully on his farm. This incident was the beginning of following improved swine practices

by the students in vocational agriculture at West Salem and this practice has been continuous throughout the past 17 years.

Because of the fact that the writer had records on 185 completed swine-litter projects conducted under his supervision he concluded that he had sufficient data for a thesis. He, therefore, chose for this thesis a problem involving a study of these projects.

The statement of this is:

What results have been attained in pork production projects in the West Salem (Wisconsin) High School by following varying kinds of improved swine practices?

The subordinate problems involved in this study were:

- A. What are the improved swine practices recommended by the Agricultural Experiment Station of the University of Wisconsin?
- B. What achievements have been accomplished by the boys at the West Salem High School in swine-litter projects?
- C. How many pigs were farrowed and saved per litter by the group of boys following all the essential improved swine practices and by the group not following all the essential improved swine practices?
- D. How many days were required for pigs to attain a market weight of 200 pounds in both groups of projects mentioned in "C"?
- E. How many pounds of grain were consumed per 100-pound gain in weight in both groups of projects mentioned in "C"?

- F. How many pounds of protein supplement were fed for each 100-pound gain in weight in both groups of projects mentioned in "C"?
- G. What amount of skimmilk was fed for each 100-pound gain in weight in both groups of projects mentioned in "C"?
- H. What is the net profit per project in both groups of projects mentioned in "C"?
- I. What improved practices in pork production should be recommended to the farmers of the West Salem community?

Chapter II

A HISTORY OF THE PROBLEM AND A REVIEW OF THE LITERATURE

Importance of pork production

The United States is known as the greatest swine producing nation of the world, having its principal seat in the Mississippi valley where corn, the great fat producing feed, grows in greatest abundance and at the least expense. This region is known as the corn belt of the world.

The United States has in round numbers about 60,000,000 head of swine (24) constituting over one-half the hogs in the world. One can judge the value of the swine industry to the United States by its exportation of pork products to other countries. In 1919 the value of this exportation amounted to \$828,673,934.00 (84).

In 1939 the United States exported 277,272,000 (25:375) pounds of lard valued at \$25,627,610.00 (1). These figures show to some extent the value and importance of swine to the United States.

The Literary Digest in 1913 (15) gives the importance of swine by the following facts, which were taken from the Wall Street Journal:

No account can be taken of the millions of animals prepared for local consumption by farmers and retail dealers. The census notes only those prepared in the large wholesale establishments and packing houses. Of these the census of 1910 shows that in the previous year 33,870,000 hogs were prepared, the cost of which was \$48,384,000.00. When these animals came in the packing market they made 3,428,000 tons of freight, while the finished product going out equalled 2,600,000 tons.

It is impossible to make anything like an accurate estimate of the ton-mile freight, but it can be readily seen these animals play no mean part in railway earnings. Forty-six percent of the salaries and wages paid by packing plants is derived from the slaughter of hogs. In 1912 swine added \$104,000,000 to the export balance (15).

To further show the importance of this enterprise, the ten leading states in swine production according to the U.S. Census report January 1, 1941, (24) follows:

Iowa - - - - -	9,214,000 head
Illinois - - - - -	5,175,000 head
Indiana - - - - -	3,896,000 head
Minnesota - - - - -	3,402,000 head
Missouri - - - - -	3,322,000 head
Ohio - - - - -	3,117,000 head
Texas - - - - -	1,926,000 head
Nebraska - - - - -	1,898,000 head
Wisconsin - - - - -	1,689,000 head
Georgia - - - - -	1,482,000 head

The armies, navies, and nations less fortunate than ours, are fed from this surplus swine producing area of the world. History has proved that food producing areas help to win wars, and pork has played its part in winning other wars; it will do its share in

this present emergency. President Roosevelt has called for more pork. The swine producers can cooperate by following practices that will lead to more pork per litter at the least cost per pound of pork.

Early experiments to im-
prove agricultural practices

About 1760 George Washington (23:5) began to study agricultural problems systematically, and to make experiments with a view as to what practices best suited his conditions. The first experiments were carried on with crops. These experimentations gradually prepared the way for agricultural research in the United States, and led up to the passage of the Experiment Station or Hatch Act.

The United States Department of Agriculture was organized by Isaac Newton (23:41) in July, 1862, for the purpose of developing improved practices in farming. The Hatch Act or the Experiment Station Act (23:66) was passed in 1887 providing for the establishment of Experiment Stations in connection with the land-grant colleges. The passage of the act was due to the early recognition of the value of experiments on the best ways and means of producing crops and livestock. Through this act experiment stations were set up throughout the United States (23:67-139). Each station experimented on new practices in farming and the ones that produced the highest returns at the least

expense were recommended to the public (23:153-7).

A great variety of experiments were made by the stations between 1887 and 1906 in the field of animal husbandry. For the most part, these experiments dealt with different kinds of animals, with testing various combinations of feeding stuffs, and with reference to growth or the production of meat or milk.

Feeding experiments with pigs were greatly expanded between 1888 and 1906 (23:155). About 40 stations did more or less work of this kind. The experiments involved a comparison of different rations to ascertain the relative economy of pork production. Many experiments using skim milk with or without corn meal and wheat, or some of its by-products, formed the basis of comparison.

The leading stations in this work were (23:156) those in Arkansas, Iowa, Kansas, Massachusetts, Minnesota, New York, Oregon, Utah, Vermont, and Wisconsin.

Breeds and breeding

According to Coburn (4), the domesticated swine traced their origin back to the wild or semi-wild hog of the Gulf States and Mexico, known as the Razor-Backs. These hogs were long of body and legs, carrying bulky shoulders and flat hams. Their food consisted mostly of pasture grass, roots, grubs,

angleworms, and nuts (25:436).

Dr. Stetson (21) reported on the breeds of swine in 1883; he brings out evidence that the American hog had its beginning in the wild boar.

Anthony (2) states that the modern pig has evolved from the rough, long-snouted, heavy-shouldered, wild hog, and a cross with the Chinese white pig, together with a black off-shoot of the latter known as the "Neapolitan" pig. Some wild boars are said to have existed in Staffordshire, Scotland, up to about 1683 and up to 1593 in Oxfordshire.

Realizing that meat from such animals carried nourishing food, men tried to improve the quality and type of hogs. Confinement and feeding experiments were tried first, followed by selection and breeding methods. The long-legged animal showed signs of fattening but its type was hard to change. About the year 1865 crossing stock were imported from Europe (3:7). The early settlers of the United States brought hogs with them from Europe (25:36). These imported animals wrought wonderful changes in the swine of America. Many breeds of hogs occurred later. Various crosses of these early stocks were made, and from various combinations of blood lines various American breeds of hogs originated.

Men then began to study the best practices to follow in selection, breeding, and feeding of swine.

The type was changed from the "race horse" type to a low set compact type. This type persisted for several years, but soon proved to be non-prolific. The cost per pound of pork offset the price paid for the live hog.

In the production of each breed, farmers had a type in mind that they wanted to produce. In order to reach their goals, practices were developed that led to improvements throughout the breeding program. Today these practices are all combined under a set of improvement practices that meet the needs of all breeds.

Vaughan (25) brings out the fact that careful selection, breeding, and the establishment of definite type of animals suitable to special purposes, cannot accomplish the desired end unaided. The feeding and care must receive as much attention as the breeding. No matter how well bred an animal may be, and no matter how great may be its tendency to conform to a given type, it must enjoy a favorable environment before its inherited good qualities can fully assert themselves and thereby enable the animal to fulfill its mission (25:365). Much then depends upon the breeder and the care and handling he gives the animal.

The hog of today is the product of many experiments. The present day type combines quality with an economical producer of pork. This hog is medium-set,

carrying a moderately long body, medium size bone, good depth, with a fullness of chest and middle. He should be smooth, free from coarseness in head and bone. He should be active, strong in feet, pasterns, and legs. He should be strong in back and loin, with a moderately arched top line. He should be uniform in width and symmetrical throughout.

Feeds and feeding

Early experiments.--Back in 1883 Gurler (11) found out that care and skill in the feeding of swine was much more important than the breed. He experimented with corn and skimmilk on weanling pigs. He found out that 60 pounds of corn would make 12 pounds of live pork, and 100 pounds of skimmilk would give $6\frac{3}{4}$ pounds of live pork. Therefore, 200 pounds of skimmilk would equal 60 pounds of corn. In 1888 he tried to find out at what age a litter of pigs made the greatest gain in weight.

Dean W. A. Henry wrote and published the first edition of Feeds and Feeding in 1898 (17). This publication received immediate and widespread favor by practical stockmen, college professors, and students of animal husbandry. Since that first edition, 19 editions have been published; each resulted from the demands of the above men. These editions have compiled

and analyzed the results of the numerous experiments on livestock feeding, conducted in this and other countries with a view in mind of correcting faulty swine practices.

Nutrient requirement of swine.--Without a proper understanding of the nutrient requirements of swine, one cannot produce pork economically. Swine are fed largely on grain and they eat little roughage, except on pasture. Moreover, they grow more rapidly than other kind of livestock and produce young when less mature. As a result, swine suffer much more frequently than these other classes of livestock from inadequate rations. Therefore, their nutrient requirements should be clearly understood (17).

The table below on the feeding of skimmilk and tankage shows how experimentations have been carried on for the benefit of stockmen (17).

SKIMMILK VS. TANKAGE AS SUPPLEMENT TO CORN FOR FATTENING PIGS

Average ration	Daily gain (lbs)	Feed for 100 lb. gain		
		Corn (lbs)	Skim milk (lbs)	Tankage (lbs)
Lot I, fed skimmilk Skimmilk, 7.1 lbs. Corn, 4.6 lbs. - - - -	1.36	346	535	-----
Lot II, fed tankage Tankage, 0.47 lbs. Corn, 4.9 lbs. - - - -	1.24	404	-----	39

Economy of gains.--Through feed experiments swine men found that as a hog grows to maturity it takes more and more feed to fatten it. Many farmers still believe that the cheapest gains are made by the hog during the last month of fattening, but according to Morrison (17), the cheapest gains are had during the early growing period. The following table gives the amount of feed required per head daily from birth to 500 pounds (17).

ECONOMY OF GAIN OF PIGS AT DIFFERENT STAGES OF GROWTH

Wt. of pig (lbs)	No. of pigs	Daily feed per		Daily gain (lbs)	Feed for 100 lbs gain (lbs)
		head (lbs)	100 lbs live wt (lbs)		
Birth to 100 -	37	2.2	4.2	0.81	304
100 to 200 - -	30	6.1	4.0	1.70	359
200 to 300 - -	23	7.6	3.0	1.83	415
300 to 400 - -	16	7.8	2.8	1.71	470
400 to 500 - -	7	8.0	1.6	1.58	510

This table proves that pigs from birth to 100 pounds require less feed per pound of gain than from 100 to 500 pounds. The amount of feed eaten per head daily increased as the pigs grow, while the amount of feed consumed per 100 pounds live weight decreased.

Gurler (11) proved this fact in 1878 by running experiments on litters of pigs to find out at what age a litter of pigs made the greatest gain in weight. He also brought out the fact that with proper food and care the first 100 pounds growth on a pig cost less than the second, and that each succeeding 100 pounds cost more than the preceding one, other influences being the same.

Care and management

The results of experimental feeding and management before and after farrowing by farmers of the past are discussed by many writers for the benefit of

the present day farmer (3 - 17).

E. F. Brown (3) found out in 1912 that hogs had quite a capacity for eating, and that unless certain kinds of food were arranged for, they would cost more than they would sell for. He also found out that one could not profitably raise hogs without keeping a set of records. By following recommended practices in swine production, his sows averaged eight pigs per litter. He said that if he wanted to raise money quickly the hog is a reliable source to depend on under the right practices (3).

Morrison (18) discusses breeding, feeding, and management of swine as essentials under the head of care, while the selection of breeding stock is considered separately. He advises swine men to talk over swine practices and to sift out the unnecessary jobs, but to stress the necessary jobs of swine production.

Harper (12) brings forth knowledge on the association of book study and actual field work on swine improvement practices.

The problems which face the swine feeder are numerous, according to Day (6). It is only through the correct interpretation of results that the farmer becomes efficient in swine production.

Anderson (1) says that practice in equipping, breeding, feeding, and controlling enemies calls for careful work on the part of swine men. Records must be

kept accurately and all jobs call for the best in the student. The latest station findings on all swine practices are analyzed.

Most farmers know that hogs are one of the main sources of farm income and are commonly known as "mortgage lifters". But swine growers should be able to judge the advantages and disadvantages of raising hogs; they should know the conditions which are required for success in this enterprise. Through a study of the perplexing problems of the swine raiser at the present time the profit per pig should be increased (1).

In the economic study of the hog enterprise in Humbolt County, Iowa (16), records were obtained from 233 swine herds during the period 1922-1925, which showed that 35 to 40 percent of the total farm income came from the swine enterprise. These records also showed that a wide range in costs and profits existed each year. This study attributed this condition to the high cost of pigs at weaning time, which was usually associated with inadequate rations, poor care of the breeding herd, and preventable losses after farrowing. It also brought out the point that pasture was necessary in the feeding program in order to lower the cost of producing a pound of pork.

The South Dakota Experiment Station in 1938 conducted a series of experiments on feeding milo to swine in order to find out which practice would result

in the most rapid gains per pig (20:18-19).

Gunning (10) brought out the following in 1913--that hogs will not develop into a paying product unless one carries out all the improved practices in swine production. He lists the practices as: pre-natal care, care of suckling pigs, care after weaning, and feeding mature hogs.

Peters (19), with a mind to proficiency in swine production, attempts to give answers to swine problems uppermost in the mind of the man who wants to know. He incorporates in the answers the fundamental principles of animal nutrition, and brings out the functions and importance of various available feeds, and the best methods of feeding to produce maximum results under stated conditions and with feed available. The rations prescribed are based upon the latest authoritative scientific standards. Peters has relied mostly on the results of his own personal experiments and contacts with conditions as they exist on the farm and among the large breeders.

The Swine Improvement Association of Austin, Minnesota, organized in 1938 (7), has developed a system of "sow testing" and improvement practices in swine for the purpose of encouraging farmers to produce pigs at a lower cost per pound of pork. To further the educational activities of the Austin swine enterprise, annual shows, tours, clinics, sow selection are

conducted in four towns. The Association also sponsors swine schools of the air. Results of improved swine practices are tabulated and sent out to farmers of the area.

Henderson (13) says that in spite of 10, 15, and 20 years of experience some hog growers say they find it almost impossible to raise hogs. Perhaps their system of handling differs from that of a neighbor who is quite successful. The question then is, Which practices are to be recommended and which are unprofitable? In order to show which practices are best in hog raising, Henderson collected information in 1931 from 91 farms in the main hog-producing section of Colorado. He studied 1638 sows and 8633 pigs, or 5.27 pigs per litter. Each farmer was interviewed and information as to his practices and results were recorded. He arranged the farmers in two groups, according to practices followed, and comparisons were made between the groups. The information collected and tabulated was very helpful in finding out what swine practices to recommend to farmers.

Sanitation and disease prevention

Sanitation and disease prevention is fully as important in pork production as is proper feeding. Stetson (31) thought the color of hair gave swine more

resistance to disease but his statement of eradication of diseases coincided with control measures of today.

The United States Department of Agriculture developed a system of disease control known as the McLean County System of Swine Sanitation for the benefit of the American farmer (5 - 17 - 1 - 8). This system was first tried out in McLean County, Illinois, and proved to be successful in the elimination of round worms. Further trials by farmers throughout the corn belt have proven that it not only keeps pigs away from worm infestation, but this system tends to eradicate many of the other common diseases of swine, such as necro, lice, flu, and mineral deficiencies.

Henderson (13) has tabulated the results of different sanitation practices on 71 farms in eastern Colorado. He analyzed the following practices as carried out by the farmers of Colorado:

- 1. Clean sow
- 2. Clean house
- 3. Clean grounds
- 4. Clean transportation
- 5. Clean pastures

Hitchcock (14) has tested the standard practices to follow in controlling diseases of swine, with the operations, decisions, and information necessary in order to get effective control measures. The following practices are recommended for the state of Wyoming:

1. Use of disinfectants
2. Bury or burn carcass
3. Isolate animals
4. Clean buildings and lot
5. Clean feed
6. Clean water
7. Protection in extreme weather
8. Call veterinarian for serious or contagious diseases

Fay (9), in recommending practices to study for agricultural students, states that millions of dollars a year are lost to American swine growers through diseases and parasites. He thinks lack of sanitary measures is the primary cause of swine losses. In order to help the boys in their control measures of swine disease, he has listed questions to be answered by the boys that should bring out the approved methods in swine disease control practices.

Truax (22) advocates the continued association with latest developments in swine disease research, nutrition, and parasitism, "for all are becoming more important in successful swine raising." He has carried on several experiments with swine to find out the best control measures for certain diseases. He brings out the fact that farmers cannot succeed without proper sanitation.

Early efforts in swine disease control and eradication practices consisted of disposing of dead animals and feeding live ones (6:434). According to Anthony (2) there is a great scarcity of books in

English dealing with the pig from a veterinary aspect. Under the present system of mass production of hogs, there is a need for further research on conditions that affect the pigs' health.

Through a study of swine disease control and eradication practices, hog diseases should be prevented. The need for this study cannot be over-emphasized for a successful swine production program (1).

From the study of the historical background of the modern pig, one can readily understand the need for further research on the question of swine improvement practices. Farmers are still trying out new ideas and following the "tonic" procedure in the production of swine. If the best known improvement practices can be shown and demonstrated to them through tried experiments in their own community, they should profit by such efforts. According to Coburn (4), the man who is careless or indolent may have as much or more ill "luck" in raising hogs as in any other similar undertaking. One of the greatest drawbacks in following improvement practices is the head-strong, pell-mell method of rushing into the swine enterprise, forgetful of quality in obtaining quantity (4:15).

Chapter III

METHODS AND PROCEDURE

This study is primarily concerned with achievements in raising swine that have been made by the boys in the vocational agricultural classes of the West Salem (Wisconsin) High School. The success of these boys is undoubtedly largely due to the fact that they have always followed many improved swine practices.

The beginning of the writer's interest in improved swine practices dates back to 1924, when as a student at the University of Minnesota he did some study relating to swine management problems and also had an opportunity to care for swine used in experimental work. From these contacts he acquired a fairly good conception of improved swine practices.

Besides the above experiences the writer was confronted with a condition of poor swine management systems, when he first took up his work as an agricultural instructor at the West Salem High School in 1926. The farmers at that time were having trouble with pig losses and some of the farmers lost their entire swine herds.

These severe losses prompted him to confer

with swine authorities at the University of Wisconsin. A representative of the institution immediately came to West Salem to look into the situation. During his stay at West Salem this person discussed swine practices that were recommended by the University. He was also interested in getting some ton-litter projects started in the community and two boys in the writer's classes entered a ton-litter contest. This was the beginning of following improved swine practices by the boys with swine projects at West Salem. With practically no changes these practices have been consistently followed during the past 17 years. These practices are listed on the following page.

IMPROVED SWINE PRACTICES

- A. Practices pertaining to the selection of breeding stock.
- *1. Good pure bred boars of market type are used for breeding.
 - *2. Breeding sows and gilts are selected from strains of large litters.
 3. Breeding sows and gilts are of good type and desirable size.
- B. Practices pertaining to rations and methods of feeding.
1. Sows and gilts are flushed before breeding time.
 - *2. A laxative ration is fed before farrowing time.
 - *3. Legume hay is fed during gestation period.
 - *4. Mineral mixtures are available at all times.
 - *5. The ration for growing pigs contains suitable animal protein.
 6. Hogs are self fed to save feed and labor.
 7. Clean water is available at all times.
 8. Pigs are creep fed beginning at two weeks of age.
- C. Practices pertaining to housing and sanitation.
- *1. Comfortable dry winter quarters are provided.
 - *2. Farrowing pens are provided with guard rails.
 - *3. Artificial heat is available at farrowing time.
 - *4. Farrowing pens are scrubbed with boiling water and lye.
 - *5. Sows are scrubbed with soap and water prior to farrowing.
 - *6. Sows and young pigs are kept in clean dry pens until hauled to clean pasture.
 7. Pigs are sprayed or dipped for mange or lice when necessary.
 8. Shade is provided in hot weather.
- D. Practices pertaining to care before and after farrowing.
1. Breeding dates are accurately recorded.
 - *2. Sows are attended at farrowing time.
 3. Needle teeth are clipped at birth.
 4. All litters are ear notched.
 - *5. Anemia preventive measures are followed.
 6. All market pigs are castrated at three to four weeks of age.

NOTE: All practices starred are considered essential.

As noted on the preceding page the improved swine practices are separated into four groups: A, B, C, and D. This was done merely for systematic arrangement.

Most of these practices are starred. A starred practice is one which the writer considered absolutely essential for best results.

On the master sheet, from which many of the tables in this study were compiled, each project was classified. If a boy followed all of the essential practices, his project was classified as "All"; if any of the starred practices were not followed, the project was classified "Not all".

In many of the tables in this study comparisons are made between the group in which "All Essential Practices Followed" and that in which "Not All Essential Practices Followed".

The data relative to all aspects of the swine projects considered in this study were secured from three sources. One reliable source was the duplicated copies of the annual reports sent in to the Wisconsin State Board of Vocational Education. The second was the annual project record books kept by the boys taking vocational agriculture and carrying agricultural projects. The third, the boys themselves.

The writer made 74 personal calls to the home

farms of the boys involved in this study to clarify points that were not very clear on the management of their swine projects. In addition to these visits, the writer many times had to resort to the feed slips secured from the feed stores where feed was purchased. Only seven of the 74 boys who conducted the 185 swine projects studied in this thesis have moved out of the community. This fact made it very convenient for securing additional information.

The project record books are a very reliable source of information because they contain the following data:

1. Inventories
2. Labor records
3. Feed records
4. Expenses
5. Receipts
6. Business statement

These items contained information that could be summarized and used in this study. The feed records kept by the boys gave the writer accurate data of the total amounts of grain, protein supplement, and skimmilk fed to the pigs. In the record books accurate accounts were kept of all expenses and of all receipts. Records were also kept of the number and weight of the animals that were sold. The receipts also included all of the premiums won at fairs. The business statement of each project showed the net profit that was made.

In addition to the above items the project

record book had one or two memorandum pages on which many of the boys recorded the date of breeding and of farrowing, the number of pigs farrowed and saved, also the weight of the litter when sold and the number of days on feed.

The annual reports of completed projects sent to the State Department of Vocational Education of Wisconsin contained the following information:

1. Scope of project
2. Total expense
3. Total receipts
4. Total yield
5. Net profit

The scope of the project in the annual reports gave the writer information on the number of pigs carried in the project. From this record and the project record books the number of pigs farrowed and saved were checked with the boy. The total charges helped to determine the amount of feed bought; while the total receipts gave information on the pigs sold. The total yield helped to determine the weight of each pig sold or the total weight per litter. Finally the net profit per project was shown.

From the various sources of data that have been described the writer prepared a master sheet giving the following information:

1. School year
2. Name of student
3. Improved swine practices followed
4. Pigs farrowed
5. Pigs saved
6. Age at 200 pounds
7. Grain consumed per 100-pound gain
8. Protein supplement consumed per 100-pound gain
9. Skimmilk consumed per 100-pound gain
10. Net profit

It was from this master sheet that the tables in this study were compiled.

Chapter IV

PRESENTATION OF DATA AND DISCUSSION

The data pertaining to the swine projects conducted by the boys of the West Salem High School over a period of 16 years are presented and discussed in this chapter.

Table 1.--SUMMARY OF SWINE PROJECTS COMPLETED AT THE WEST SALEM HIGH SCHOOL

Year	Number of completed projects	No. of gilts or sows farrowing	Number of pigs farrowed	Number of pigs saved
1927	3	3	30	23
1928	5	9	79	67
1929	10	16	146	128
1930	13	28	247	217
1931	16	43	366	329
1932	14	14	136	110
1933	14	37	299	244
1934	18	34	284	251
1935	17	32	287	264
1936	11	25	220	208
1937	14	29	252	220
1938	10	28	238	206
1939	10	25	220	197
1940	11	35	311	286
1941	8	33	277	243
1942	11	39	331	304
Totals	185	430	3723	3297

Table 1 shows a summary of the swine projects completed at the West Salem High School that are considered in the study. The 185 projects were conducted by 74 different boys over a period of 16 years. The table shows a complete picture of the extensiveness of the enterprise and achievements made by the boys. The table shows that 430 litters of pigs were raised and that the 430 gilts and sows farrowed 3723 pigs, or an average of 8.6 pigs per litter. This is a high average. Then, too, the average number of pigs saved in all these projects was 7.6.

Table 2.--CLASSIFICATION OF PROJECTS WITH REFERENCE TO NUMBER OF IMPROVED PRACTICES CARRIED OUT

No. of projects in which all essential practices were carried out	No. of projects in which not all essential practices were carried out	Total number of projects
140	45	185

Table 2 shows that in 45 of the 185 sow-litter projects, all the essential improved practices were not followed, due to circumstances largely out of the control of the project workers.

In the 140 projects in which all the essential improved practices were followed practically all the conditions on the home farms were favorable.

Table 3.--PIGS FARROWED AND PIGS SAVED UNDER THE TWO TYPES OF PRACTICES FOLLOWED

Practices followed	Number of projects	Number of sows farrowing	Av. no. of pigs farrowed per litter	Av. no. of pigs saved per litter	Percent of pigs lost
All essential - -	140	363	8.56	7.94	8.1
Not all essential	45	67	8.37	6.14	29.4

Table 3 shows that following all the essential swine practices saves pigs. There is a considerable difference in the percent of loss of pigs under the two types of practices followed. The table also shows that the number of pigs farrowed per litter varied little, but the percent of pigs lost under the two types of management practices differed greatly. This difference in loss may be attributed to the omission of some phase of the following essential improved swine practices:

1. Comfortable, dry winter quarters are provided.
2. Artificial heat is available at farrowing time.
3. Farrowing pens are scrubbed with boiling water and lye.
4. Sows are scrubbed with soap and water prior to farrowing.

5. Sows are attended at farrowing time .

6. Anemia preventive measures are followed.

Table 4.--DAYS REQUIRED TO ATTAIN MARKET WEIGHT OF 200 POUNDS UNDER THE TWO TYPES OF PRACTICES FOLLOWED

Practices followed	Number of projects	Number of pigs involved	Av. no. of days to reach 200 lbs
All essential - -	140	2885	186.07
Not all essential	<u>1</u> / 44	412	222.02

1/ In one project the sow lost all her pigs, thus accounting for 44 projects instead 45 in the type of practices followed.

Table 4 shows it took on an average of 36 more days of feeding to get pigs to reach 200 pounds when some of the essential practices were not followed. Such practices as preventing anemia, controlling worms, keeping pigs in dry quarters contribute much to rapid maturity.

To make steady, daily gains pigs should be kept thrifty all the time. Conditions on many of the home farms, where the 44 projects were conducted in which all the essential improved swine practices were not followed, showed old hog wallows, filth in the hog house, and lack of protein in the rations. Then, too, in these 44 projects the greatest care in the selection of breeding stock was not followed.

Table 5.--GRAIN CONSUMED FOR EACH 100-POUND FEED-LOT GAIN BY THE PIGS RAISED UNDER THE TWO TYPES OF PRACTICES

In each project the number of pounds of grain consumed was computed for the average 100 lbs. gain in weight.

Practices followed	Number of projects	Number of pigs involved	Grain consumed for each 100 lbs.gain in wt.
All essential - -	140	2885	378.18
Not all essential	44	412	457.70

The figures in Table 5 show that 79.52 pounds of feed were saved for each 100 pounds of gain in weight by the boys who followed all the essential improved swine practices in their projects.

In all these 184 projects corn, barley, and oats were the prevailing grains fed. In the majority of these swine projects self-feeders were used except for the time some of the animals were being fitted for shows and fairs. Corn was the "backbone" of the rations. The grain mixtures fed in these projects varied very little and the writer therefore made no calculations of the amounts of each grain that was fed. He was primarily interested in the total amount of grain that was fed under the two types of management.

In the great majority of cases the pigs in these projects were on pasture and in only a few were

the pigs fed in a dry lot.

The writer invariably observed that those boys who followed all the essential practices used much care in the handling and feeding of their pigs. Generally, sour feed was removed from the troughs and the self-feeders were frequently moved.

In many of the 44 projects, where all essential practices were not followed, legume pastures were not always available. Then, also, in the great majority of the above projects, the writer observed that clean water was not available at all times.

Table 6.--PROTEIN SUPPLEMENTS CONSUMED FOR EACH 100-POUND FEED-LOT GAIN BY PIGS RAISED UNDER THE TWO TYPES OF PRACTICES

In each project the number of pounds of protein supplement consumed was computed for the average 100-pound gain in weight.

Practices followed	Number of projects	Number of pigs involved	Protein supplement consumed for each 100 lbs gain in weight
All essential - -	22	537	61.48
Not all essential -	8	79	81.62

In Table 6 the term "protein supplement" refers to commercial feeds high in protein, such as tankage, meat scraps, soybean meal, linseed meal, and the "Trio Mixture for Swine". Trio Mixture is composed

of two parts of tankage, one part of linseed oil meal, and one part of alfalfa meal.

Skimmilk is also a protein supplement. In this study it has been kept separated from the commercial protein supplements.

In comparatively few of the 185 projects were commercial protein supplements fed. The reason for this was the fact that skimmilk was available on the majority of the home farms of the boys and they fed it in place of commercial protein supplements.

As shown in Table 6 the boys following all essential practices fed 20.14 pounds less protein supplement than the other boys. This was a factor in the cost of gains because of the high cost of these feeds.

Table 7.--SKIMMILK CONSUMED FOR EACH 100-POUND FEED-LOT GAIN BY PIGS RAISED UNDER THE TWO TYPES OF PRACTICES

In each project the number of pounds of skimmilk consumed was computed for the average 100 pounds of gain in weight.

Practices followed	Number of projects	Number of pigs involved	Skimmilk consumed for each 100 lbs. gain in weight
All essential - -	103	1915	580.28
Not all essential	31	260	655.87

The amount of skimmilk fed in these projects,

as shown in Table 7, may appear high. The reason for feeding so much was the fact that it was available and each boy tried to feed approximately one gallon of skim-milk per day to each pig. However, the amount fed is not excessive as is shown by the table on page 22 in Chapter II.

All of the 185 boys conducting swine projects considered in this study fed some form of feed high in protein. Those not feeding only skimmilk or only commercial protein supplements fed a combination of the two.

The group that did not follow all the essential practices fed more skimmilk than the other group, primarily because the pigs of this group were on feed 36 days longer.

It took 75.59 pounds more of skimmilk for 100 pounds of gain in the 31 projects in which all essential practices were not followed than it took in the 103 projects in which all the essential practices were followed.

Table 8 shows that the total net profit of the 185 projects involving 430 litters amounted to \$31,958.92 or an average of \$172.75 per project and \$74.32 per litter.

In the 140 projects in which all essential practices were followed the average net profit per

Table 8.--NET PROFIT PER PROJECT AND PER LITTER UNDER THE TWO TYPES OF PRACTICES

Practices followed	No. of projects	No. of litters	Total net profit	Total net profit	
				per project	per litter
All essential - -	140	363	\$29872.61	\$213.37	\$82.29
Not all essential	45	67	2086.31	46.34	31.32

project was \$213.37 and per litter was \$82.29. In the other 45 projects in which all the essential practices were not followed the net profit per project was \$46.36 and per litter was \$31.32.

The project incomes from which net profits were computed included premiums won at shows and fairs.

Table 9.--NET PROFIT PER PIG UNDER THE TWO TYPES OF PRACTICES

Practices followed	Number of projects	Number of pigs raised	Net profit <u>1/</u> per pig
All essential - -	140	2885	\$10.35
Not all essential	45	412	5.06

1/ The net profit included all market sales, sales of breeding stock, and show winnings.

Table 9 shows that in the 140 projects in which all essential improved swine practices were followed, involving 2,885 pigs, the average net profit per pig was \$10.35. In the other 45 projects involving 412 pigs the average net profit per pig was \$5.06.

The reason for the difference in the net profit per pig under the two types of management practices followed may be attributed to differences in the amounts of feed consumed. It should be mentioned that in the projects where all essential practices were not followed more time, labor, and feed was required to get the animals, selected for exhibition, into good show condition.

Another factor for the comparatively rather low net profit in the 45 projects in which all essential practices were not followed is the fact that the hogs in this group did not bring as high a price on the market as did the hogs in the other group. Also partly responsible for the difference in net profit in the two groups is the fact that the premiums won by the boys following all the essential practices was considerably higher than were the premiums won by the hogs raised by the other group of boys.

The premiums won from the showing of fat and breeding hogs at state and county fairs materially increased the profits which the boys made in these sow-litter projects.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

To study the achievements made by 74 boys, who have conducted 185 swine sow-litter projects over a period of 16 years (1926-1942) of the West Salem (Wisconsin) High School, was one of the purposes of this study. Another purpose was to make various comparisons of the results attained by the boys conducting these sow-litter projects under two general types of management practices that were followed.

Data for this study were obtained from the project record books of the boys who conducted these sow-litter projects and from the annual project reports that are submitted to the state supervisor of vocational agriculture.

These 74 boys completed 185 sow-litter projects. They averaged 2.26 litters per project. In these 185 projects 430 gilts and sows farrowed 3723 pigs of which 3297 were raised to market age.

The 185 projects were classified into two groups: those in which all the essential improved practices were followed and those in which one or more of the essential improved practices were not followed.

These improved swine practices are listed in Chapter III. Some of the practices are starred (*) and others are not. Those starred have been regarded by the writer as essential improved swine practices.

There were 140 projects in which all the essential improved practices were followed and 45 in which they were not followed. In this study numerous comparisons are made of the results obtained by each of these two groups.

Table 3 in Chapter IV shows the number of pigs farrowed and the number of pigs saved under the two types of practices followed. In 140 projects in which all the essential improved practices were followed, involving 363 litters, an average of 8.65 pigs were farrowed and 7.94 pigs were saved per litter. In the 45 projects in which all the essential improved practices were not followed, involving 67 litters, 8.37 pigs were farrowed and 6.14 pigs were saved per litter. In the former case the percent of pigs lost was 8.1 and in the latter this percent was 29.1.

Table 4 in Chapter IV pertains to the days required for pigs to attain a market weight of 200 pounds under the two types of practices followed. In the 140 projects, involving 2885 pigs, in which all the essential practices were carried out, 186.07 days were required for the pigs to attain a weight of 200 pounds.

In the other case, involving 44 projects and 412 pigs, it required 222.02 days.

Table 5 in Chapter IV pertains to the amount of grain consumed for each 100 pounds feed-lot gain by the pigs raised under the two types of practices. In the group of projects in which all the essential improved practices were followed, 378.18 pounds of grain were consumed for each 100 pounds gain in weight. In the other group of projects 457.7 pounds of grain was consumed.

Table 6 in Chapter IV is concerned with the commercial protein supplements consumed for each 100-pound feed-lot gain by pigs raised under the two types of practices. In this study the term "protein supplements" refers to commercial feeds high in protein. Such foods are tankage, meat scraps, soy bean and linseed meal, and "Trio Mixture".

In 22 projects involving 537 pigs, in the group in which all the essential improved practices were followed, the pigs consumed 61.48 pounds of commercial protein supplements. In the other group involving 8 projects and 79 pigs, 81.62 pounds were consumed.

Commercial protein supplements were fed in only 30 of the 185 projects because they were replaced by skimmilk in the rations.

Skimmilk is, also, a protein supplement. In this study it was kept separate from the commercial protein supplements in order to make comparison under the different types of management practices.

The amount of skimmilk consumed for each 100-pound feed-lot gain by pigs under the two types of management is compared in Table 7 of Chapter IV. In the group of projects in which all the essential improved practices were followed, 1915 pigs consumed on an average of 580.28 pounds of skimmilk for each 100 pounds gain. In the other group, involving 260 pigs, 655.87 pounds of skimmilk was consumed for the same amount of gain in weight.

Table 8 shows that the average net profit in the 140 projects in which all the essential improved practices were followed was \$213.37 and the average net profit per litter was \$82.29. In the other group, involving 45 projects, the average net profit per project was \$46.34 and the average net per litter was \$31.32.

Included in the total income of most of the projects involved in this study were the many premiums won at state and county fairs by the boys who conducted the projects.

The last comparison made between the two groups of projects pertains to the net profit per pig. Where all the essential improved practices were followed,

involving 140 projects and 2885 pigs, the net profit per pig was \$10.35. In the other group, involving 45 projects and 412 pigs, the net profit per pig was \$5.06.

The total net profit in the 185 projects amounted to \$31,958.92, or an average of \$172.75 per project. In these 185 projects 430 litters were raised and the net profit per litter was \$74.32.

Conclusions

From this study the following conclusions were reached:

1. Healthy pigs can be raised by following rigid sanitary practices.
2. It takes the pigs a shorter time to reach a weight of 200 pounds when all the improved practices are followed.
3. More pigs are farrowed and saved when all essential improved practices are followed.
4. Less grain, commercial protein supplements, and skimmilk are consumed to attain a market weight of 200 pounds when all the essential improved practices are followed.
5. Greater net profits result when all essential improved practices are followed.
6. The 140 projects in which all the essential improved practices were followed were more successful than were the 45 projects in which some of the essential improved practices were omitted.

Recommendation

The conclusions reached in this study show

that the essential improved swine practices produce excellent results and the writer recommends them to the farmers of the West Salem, Wisconsin, community for efficient and profitable pork production.

BIBLIOGRAPHY

1. Anderson, A.L. Swine enterprises. Chicago, J.B. Lippincott co., 1931. 458 p.
2. Anthony, D.J. Diseases of the pig and its husbandry. Baltimore, The Williams and Wilkins co., 1940. 272 p.
3. Brown, E.F. How I made money on hogs. Country life, 21:57-8, March 1, 1912.
4. Coburn, F.D. Swine in America. New York, Orange Judd publishing co., 1922. 583 p.
5. Coffey, J.S. and Jackson, L.E. Livestock management. Philadelphia, J.B. Lippincott co., 1940. 500 p.
6. Day, George E. Productive swine husbandry. Philadelphia, J.B. Lippincott co., 1913. 330 p.
7. Eugenic porkers. Business week, p. 68. March 8, 1941.
8. Ewing, P.V. ed. The mortgage lifter. Chicago, Hog breeders, inc., 1938. 287 p.
9. Fay I.G. A workbook in animal husbandry and poultry. Danville, Ill., The Interstate printer and publishers, 1940. 190 p.
10. Gunning, J.S. Paying points in pig production. Country life, 24:70, May 1913. 132 p.
11. Gurler, H.B. Experiments in swine breeding. (In U.S. Department of agriculture, Special report no. 2. Washington, Govt. print. off., 1883. pp. 155-159)
12. Harper, M.W. Animal husbandry for schools. New York, The Macmillan co., 1924. 615 p.
13. Henderson, George R. Methods of lowering pork production costs. Fort Collins, Colo., 1932. 14 p. (Colorado state college, Agriculture extension service bulletin, 324-A.)

14. Hitchcock, S. Animal production vocational agriculture teacher plan book. Cheyenne, Wyo., State of Wyoming department of education. (In Division of vocational education.) 1936. 180 p.
15. Hogs as lifter of farm mortgages. Literary digest, 46:436, February 22, 1913.
16. Hopkins, J.A. Jr. An economic study of the hog enterprise in Humbolt county. Ames, Iowa, 1928. 110 p. (Iowa. Agricultural experiment station. Bulletin no. 255.)
17. Morrison, F.B. Feeds and feeding. 20th ed. Ithaca, New York, Morrison publishing co., 1936. 1050 p.
18. Morrison, Robert. The individuality of the pig. New York, E.P. Dutton and co., 1928. 524 p.
19. Peters, W.H. Swine questions answered. St. Paul, Minn., Webb book publishing co., 1927. 141 p.
20. Sooner Milo equals corn in rapidity of gain for pigs. (In South Dakota. Agricultural experiment station. Farm research in South Dakota. Fifty-second annual report, 1938-39. Brookings, S.D., 1939. p. 18-19.)
21. Stetson, Dr. Ezra. Swine breeding. (In U.S. Department of agriculture. Special report no. 2. Washington, Govt. print. off., 1883. p. 106-162.)
22. Truax, E.R. Swine practices. Veterinary medicine, 36:206-15, April 1941.
23. True, A.C. A history of agricultural experimentation and research in the United States, 1607-1925. Washington, U.S. Govt. print. off., 1937. 321 p. (U.S. Department of agriculture. Miscellaneous publication no. 251.)
24. U.S. Department of agriculture. Agricultural statistics, 1941. Washington, U.S. Govt. print. off., 1941. 731 p.
25. Vaughan, Henry W. Types and market classes of livestock, Fourth revision, Twenty-first edition, Columbus, Ohio, College book company, 1941. 607 p.