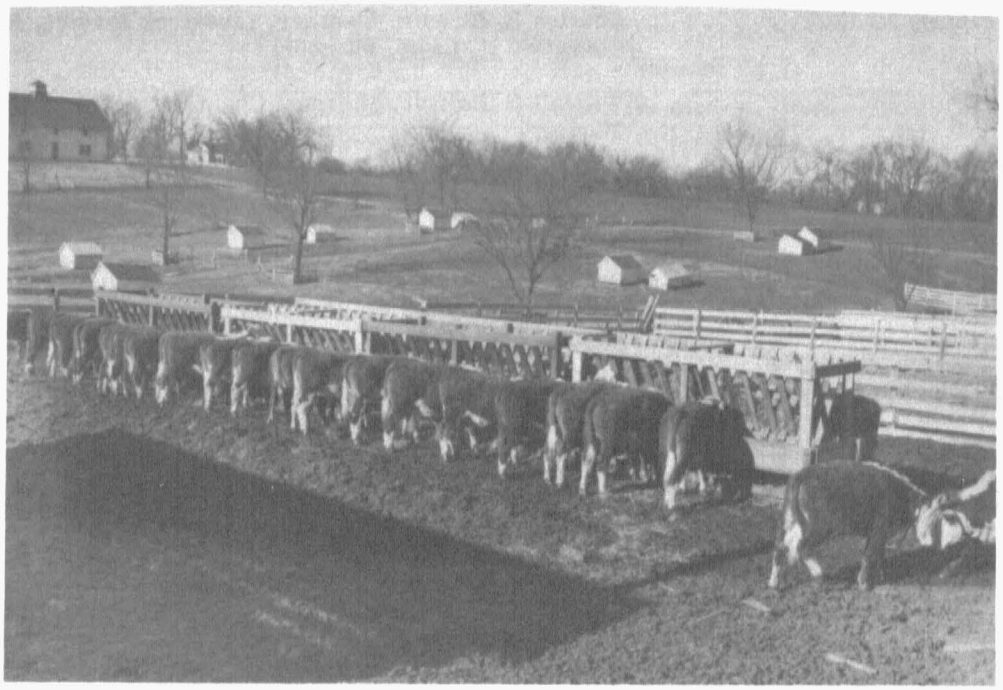
Third Annual

FALL LIVESTOCK DAY

October 28, 1949



UNIVERSITY of MISSOURI COLLEGE of AGRICULTURE

AGRICULTURAL EXPERIMENT STATION

J. H. Longwell, Director

Progress Report 8 Columbia, Missouri October, 1949

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE

AGRICULTURAL EXPERIMENT STATION
Department of Animal Husbandry
ANNUAL FALL LIVESTOCK DAY
Friday, October 28, 1949
Livestock Pavilion

MORNING - 10:00 o'clock

Meeting, Missouri Livestock Association

Opening Remarks. . . . . Theodore Anderson, President, Missouri Livestock Association, Montreal, Missouri

Welcome . . . . . Dr. J. H. Longwell, Dean, Missouri College of Agriculture

Looking Forward With Livestock Farmers. L. H. Simerl, Associate Professor, Agricultural Economics Extension, University of Illinois, Urbana, Illinois

Panel Discussion--Current Problems of the Industry Representing:. . . . . Wilbur H. Coultas, Livestock Department, American Meat Institute, Chicago, Illinois

The Producer . . . . . Theodore Anderson, Montreal, Missouri

The Packer. . . . . Charles H. Dickson, Manager, Livestock Service, Krey Packing Company, St. Louis, Missouri

The Retailer. . . . . Wendell H. Holman, Missouri Chain Store Council, Columbia, Missouri

Summary . . . . . J. W. Burch, Director, Agricultural Extension Service, University of Missouri, Columbia, Missouri

NOON - 12:00

Lunch . . . . . Beef Barbecue served by Block & Bridle Club -.Supervised by Meat Section of Animal Husbandry Department

AFTERNOON - 1:00 o'clock

Marketing Hogs on Merit Basis . . . . . Fred J. Beard, Chief, Standardization and Grading Division, Livestock-Production and Marketing Administration, Washington, D. C.

Selection of Desirable Breeding Hogs (a judging demonstration). . . . . E. S. Matteson, Extension Professor of Animal Husbandry

Current Missouri Experiment Station Projects
L. A. Weaver, Chairman
Animal Husbandry Department

Reports

Swine

G. E. Dickerson. . . . . How Inbred Strains May Be Used to Improve Pork Production

C. D. Squiers . . . . . Factors Affecting Fertility of Boars and Fertility of Sows

G. C. Anderson . . . . . New Facts About Vitamin B_{12} in Swine Rations

Sheep

A. J. Dyer. . . . . Early Vs. Late Lamb Production in Utilization of Pasture and Roughage*

Cattle

A. J. Dyer. . . . . Using Roughage and Pasture in Producing Fat Yearling Cattle*
Paul Guyer Heifers Vs. Steers - Effect of Winter Rations on Summer Gains. Amount of Corn Required to Finish Yearlings Grazed Through the Summer on Good Pasture.

* Animals will be used to illustrate

ADJOURNMENT - 3:30 o'clock

USE OF INBRED STRAINS FOR IMPROVING SWINE PRODUCTION

Gordon Dickerson

The general objective of the swine breeding experiment is to develop new breeding methods for improving efficiency of production and quality of carcass. The Missouri Station has cooperated with other midwestern Experiment Stations since 1937 in developing inbred strains of swine through mild inbreeding and careful selection for sow productivity, growth rate and conformation. These strains are being tested in crosses to determine (1) which strains are most useful for market hog production and (2) which strain-cross combinations are most promising for this purpose.

Hybrid Vigor Important in Hogs

Inbreeding and crossbreeding both have a strong influence on livability and growth rate of pigs, as shown in Table 1. Mating a boar to his full sister results in progeny that are 25% inbred. Strains in which both dams and litters are 25% inbred average nearly one-third lower than non-inbred purebreds in size of litters raised and about six per cent lower in rate of gain. Crossbreeding increases viability and growth rate to such an extent that the average increase in total weight of litters marketed amounts to at least ten per cent. Feed costs per pound of gain after weaning are increased little by inbreeding and decreased only slightly by crossbreeding. Carcass desirability likewise is affected only slightly by inbreeding or crossbreeding. Crossbreeding results, of course, vary with the quality of the purebreds used.

Table 1. - Average Effects of Inbreeding and Crossbreeding on Production Characters of Swine

Production Factors	% Increase or Decrease from Average for Purebreds		
	Inbreeding of 25% for Dams and Litters ‡	Crossbreeding*	
		No. Exps.	Effect
Number farrowed/litter	-11%	12	-3%
% Survival to 56 days	-18%	15	+5%
Number raised/litter	-32%	--	---
Pig Weight at			
Farrowing	- 3%	6	+1%
Weaning	+ 2%	15	+2%
5 months	- 6%	--	---
Litter Weight at			
Farrowing	-13%	--	---
Weaning	-25%	13	+8%
5 months	-36%	--	+10%
Daily gain after Weaning	- 7%	9	+4%
Gain/100 lbs. Feed	- 2%	6	+2%
Carcass Desirability	Slightly Inferior	--	Slightly Superior

‡ Based on comparisons of inbred lines with the crosses between lines of the same breed at four Experiment Stations cooperating in the Regional Swine Breeding Laboratory. Data on 538 litters of 31 inbred lines and 375 litters of 99 cross-combinations among Durocs and Poland Chinas were used.

* Based on summary of many different experiments in which data were obtained for purebreds of both parent breeds as well as for the crossbreds.

The major influence of inbreeding and crossbreeding on viability and growth in pigs is quite similar to results obtained with corn. Also, best results generally have been obtained in crosses between the most unrelated strains and breeds. It is quite clear that "hybrid vigor"--the extra vigor obtained by crossing strains which differ in their inherited constitution--is potentially as important in pigs as it is in corn. The next step is to perfect methods of deliberately developing particular strain-crosses that will consistently out-produce average crossbreds.

The chief advantages which reasonably may be expected from use of inbred strains for market hog production are: (1) Increased size of litters raised and earlier marketing of hogs, resulting in lower costs per pig marketed; (2) Greater certainty in predicting results of given matings, through use of inbred strains whose hereditary composition is more uniform from pig to pig and from generation to generation.

Probable Application in Market Hog Production

Methods of using inbred strains which seem most likely to be practical are as follows: (1) Rotation in commercial herds of boars of inbred strains known to cross well. For example, if strains A and B both cross well with strains C and D the rotation would be:

1st Cross	2nd Cross	3rd Cross	4th Cross	5th Cross
Boar A	Boar C	Boar B	Boar D	Boar A
1/2 A 1/2 O	1/2 C 1/4 A 1/4 O	1/2 B 1/4 C 1/8 A 1/8 O	1/2 D 1/4 B 1/8 C 1/16 A 1/16 O	17/32 A 1/4 D 1/8 B 1/16 C 1/32 O
Original Sows (O)				

This plan involves purchase only of boars by the market hog producer, in contrast with the 4-strain cross illustrated below, where both boars and sows are purchased. (2) Four strain cross:

Strain	Breeder		Market Hog Producer 1st Cross	Market Hog Producer 2nd Cross
Boar A Sows B	1/2 A 1/2 B	1/2 A 1/2 B	1/4 A 1/4 B 1/4 C 1/4 D	Repeat 1st cross with same animals or others of same breeding.
Boar C Sows D	1/2 C 1/2 D	1/2 C 1/2 D		

Other plans also may prove practical. The inbred boars, or the strain-cross boars and gilts, would need to be produced by large numbers of breeders in cooperation with the Experiment Stations which developed and tested the strains. Also, commercial breeding concerns are already and will continue developing, testing, and producing their own inbred strains and crosses.

In any plan of crossing strains for market hog production, the widest possible cross should be made to produce the market hogs, not the breeding stock. Such market hogs correspond to the corn grown from hybrid seed, while the breeding stock purchased by the market-hog producer corresponds to the seed planted and grown by the hybrid seed corn producer. The boars used to sire the market hogs should not be "hybrids" themselves, but rather inbred boars from a cross of two strains of the same breed.

Inbreeding, in itself, does not make a strain any better for market hog production than non-inbred stock. Only the best strains and strain-crosses can be expected to show marked improvement over average crossbreds. The chief advantages in using inbreds are to increase the chances of finding superior crosses and the certainty of predicting results.

Table 2. - Amount of Selection Practiced Per Year in Developing Inbred Strains

		Average Superiority of Selected Breeding Animals Over Herd Average						
		In Dams Litter						
		Number Pigs		Weaning Wt.-Lbs.		Individual Weight-Lbs.		Total
Line	Period	Farrowed	Weaned	Litter	Per Pig	Weaning	5 Months	Score
II	1940-'49	+ .3	+1.0	+44	+2.4	+3.7	+14	+24
Poland	(1949)	+ .6	+1.8	+56	+ .8	+5.4	+18	+34
VI	1944-'49	+ .8	+1.0	+41	+2.3	+4.4	+20	+31
Poland	(1949)	+1.1	+2.0	+92	+4.5	+7.9	+22	+44
V	1949-'49	+ .7	+1.0	+28	+1.1	+3.2	+14	+23
Hamp.	(1949)	+ .5	+1.0	+46	+3.2	+3.8	+17	+29
All	All	+ .7	+1.0	+36	+2.2	+4.9	+21	+31
Sires	(1949)	+ .8	+1.1	+57	+4.5	+8.6	+30	+43
All	All	+ .5	+1.0	+39	+1.7	+2.6	+11	+22
Dams	(1949)	+ .7	+2.1	+71	+1.2	+2.8	+ 9	+28
All	All	+ .6	+1.0	+38	+2.0.	+3.8	+16	+26
Parents	(1949)	+ .8	+1.6	+64	+2.9	+5.7	+19	+36

Careful Selection in Development of Missouri Strains

In developing inbred strains, breeding boars and sows are carefully selected for maximum sow productivity, growth rate and conformation. The superiority of animals selected for breeding over the average of all litters produced is shown in Table 2. Compared with the average, breeding stock has been selected

from litters that were 1 pig larger and 40 pounds heavier, and in which the pigs averaged 2 pounds heavier, at weaning. Individual weights of breeding animals were greater than average by 4 pounds at weaning and by 16 pounds at 5 months. Parents of the 1949 litters were even further above the average of the lines, particularly in size of litters and pigs at weaning. Only about 1/6 of all boar pigs and 1/3 of all gilt pigs were kept for breeding. Boars used were more than twice as much above average in growth rate as were the gilts selected, but sires and dams were selected from litters similar in size and weight at weaning. Maximum selection can be practiced when the sow herd is made up of about 3/4 of gilts, and 1/4 of older sows selected on the basis of earlier litters. Also, the best 2/3 of the boar pigs weaned should be left uncastrated until about 4 months of age, if maximum selection for growth rate is desired.

Performance of Inbred Litters of Three Missouri Strains

The usefulness of an inbred strain depends on the performance of the inbred pigs as well as on the performance of crosses with other strains. Averages for inbred litters during the past four years and in 1949 are given in Table 3. Line II Polands have been inbred for 11 years and are now nearly as highly in-

Table 3. - Performance of Inbred Litters of Three Missouri Strains of Swine
(Almost entirely from gilt dams)

Strain	Period	No. Litters	Inbreeding %		Litter Size		Pig Weight - Lbs.		
			Dam	Litters	Born	Weaned	Birth	Weaning	5 Months
Line II	4 yr. Av.	69	35	40	7.1	4.9	3.3	27	121
Poland	1949	17	39	42	8.4	6.2	3.1	26	118
Line VI	4 yr. Av.	90	14	23	8.0	6.0	3.1	31	139
Poland	1949	22	24	22	6.6	5.2	3.3	34	152
Line V	4 yr. Av.	88	15	23	9.6	6.1	2.5	28	112
Hampshire	1949	21	25	35	10.1	4.9	2.4	27	103

bred (42%) as progeny from three generations of full brother-sister mating. Line VI Polands and Line V Hampshires have been inbred for only 5 years and are little more highly inbred than progeny from one generation of full brother-sister mating. Most of the litters are from gilt dams, so the average of 5 to 6 pigs weaned is not too discouraging. The two Poland lines are below the Hampshire line in size of litters farrowed, but the Poland pigs are heavier at birth and a larger proportion survive to weaning. Growth rate of inbreds is superior in the Poland strains, particularly in the less highly inbred line VI.

Performance of Missouri Strains in Crosses

For several years, test-crosses have been farrowed in the fall to determine which are the better lines and strain-crosses. Results obtained are shown in Table 4. All factors considered, there is little

Table 4. - Performance of Strain Crosses, Topcrosses on Duroc Sows, and Purebred Durocs

Cross	Year	No. Litters	Litter Size		Pig Weight - Lbs.			Daily Gain-Lbs.	Feed (100) Gain Lbs.	Carcass Index		
			Born	Weaned	Birth	Weaning	5 Months			** % Yield	Score	*** Total
II x VI Poland	'47	4	7.8	5.8	3.6	36.6	184	1.70	332			
	'48	6	9.0	7.0	3.7	37.1	158	1.35	346	45.8	1.04	47.5
II x V Poland-Hamp.	'47	4	11.0	6.3	3.4	30.2	179	1.60	358			
	'48	6	6.7	4.8	3.0	33.6	165	1.39	347	45.5	1.03	46.9
VI x V Poland-Hamp.	'47	4	9.0	3.5	3.3	31.6	179	1.60	362			
	'48	5	6.6	6.4	3.5	38.8	176	1.48	342	45.5	1.06	48.1
II P.C. x Duroc	'48	4	8.5*	6.8*	3.2	33.6	164	1.52	339	45.6	1.03	47.0
VI P.C. x Duroc	'48	4	9.5*	7.9*	3.6	36.3	179	1.50	330	45.6	1.02	46.6
V H. x Duroc	'48	4	8.5*	6.3*	3.1	30.9	162	1.43	329	45.8	1.01	46.2
Duroc	'48	6	9.4*	8.2*	3.0	28.6	152	1.47	328	43.9	.92	40.4

* Adjusted to 2nd litter basis

** Yield of all cuts expressed as equivalent yield of trimmed loin, using relative values of 1.0 for trimmed loin, .9 for skinned ham, .8 for skinned shoulder and trimmed belly, .7 for lean trimmings, .2 for fat-back, leaf-fat, and fat trimmings, and .1 for spare ribs, neck bones, feet and kidneys.

*** Total - % Yield, in loin equivalent x Score for desirability of cuts.

difference between the three strain-cross combinations. The litters are all from 1 1/2 year old inbred dams and average about 6 pigs raised and weight 170-180 pounds per pig at 5 months of age, with gains from wean-

ing to 200 pounds of 1.5 pounds per day, requiring 340 to 350 pounds of feed per 100 pounds of gain. Compared with purbred Duroc litters, the strain-crosses (from inbred dams) produced smaller litters and required about 5% more feed after weaning, but grew more rapidly and produced much more desirable carcasses. Mating strain-cross dams to boars of the third strain would increase size of litters raised without affecting the advantage of the strain-crossed pigs in other respects. Topcrosses of inbred boars on Duroc sows produced larger litters requiring slightly less feed after weaning, compared with strain-crosses, but the two were similar in other respects.

Carcass yields and quality of wholesale cuts were distinctly better for the Poland and Hampshire strain-crosses than for the Purebred Durocs. Carcasses from topcrosses of inbred Poland and Hampshire boars on Duroc sows were nearly as good as from the Poland and Hampshire strain-crosses. In Table 4, yields of all cuts are converted to the yield of trimmed loin equivalent in sale value. Cuts were scored for desirability to the consumer. As shown in Table 5, the Duroc carcasses were at a disadvantage in having small loin and ham muscles and thicker backfat than carcasses from the Poland and Hampshire strain-crosses or topcrosses on Duroc sows. The 1948 test-crosses were repeated this fall and similar information is being obtained.

Table 5. - Carcass Characteristics of Strain Crosses, Topcrosses on Durocs and of Purebred Durocs

Breeding	No. Pigs	Slaughter Wt. - Lbs.	Length of Carcass Ins.	Length of Leg Ins.	Avg. Back-Fat Thickness Ins.	Area of Lean in cross-section of Loin Sq. Ins.	Area of Lean in cross-section of Ham Sq. Ins.
II x VI Poland	7	205	28.7	21.8	1.6	4.9	10.4
II x V Pol.-Hamp.	8	204	28.5	21.8	1.6	4.6	9.0
VI x V Pol.-Hamp.	5	212	28.8	21.8	1.6	4.9	9.3
II Pol. x Duroc	8	202	27.9	21.5	1.7	4.4	9.3
VI Pol. x Duroc	6	206	28.3	21.5	1.8	4.6	9.6
V Hamp. x Duroc	7	204	27.6	21.6	1.7	4.4	8.8
Duroc	8	201	27.6	20.9	1.9	3.6	7.1

Future Plans

In the spring farrow of 1950, the Poland lines II and VI are being crossed with strains of Hampshires, Durocs, Polands, Yorkshires, and Landrace to learn which of these breeds are most promising for development of strains that will give maximum performance in crosses with the Poland strains II and VI. Gilts from these crosses will be available to farmers willing to cooperate in obtaining information on their productivity in comparison with other purebred or crossbred gilts.

FACTORS INFLUENCING FERTILITY OF SOWS

C. D. Squiers

Factors which affect the number of pigs farrowed and saved are of great economic importance. Five pigs per litter must be weaned and raised if we are to "break even" in a swine enterprise. Available records indicate that 30% of the pigs farrowed alive are dead before weaning. This means that seven pigs must be farrowed if 5 are to be weaned. Clearly then, one of our goals in the improvement of swine must be to increase through breeding and management, the average number of pigs farrowed per litter.

The study reported here, is now in its third year. It is designed to single out and study the more important factors involved in swine fertility. So far, the following factors have been studied: the influence of the boar upon litter size, ovulation rate (average number of eggs shed per estrus or heat) in gilts and sows, efficiency of fertilization, importance of early and late foetal mortality and incidence of gross abnormalities in the structure of the genital organs. The animals studied came from the two inbred Poland China and the inbred Hampshire strains used currently in the Station breeding project, from the College Duroc herd and from crosses of these strains. The more important results will be briefly summarized here.

Boar Influence

Data gathered in this study indicates that aside from complete sterility the boar has little influence on litter size. Forty-six sows were bred to fertile boars and slaughtered 24 hours after the end of the heat. 93% of the eggs recovered from the oviducts had been fertilized, as evidenced by cell division. This means that for every 100 eggs shed, 7 or less were lost through failure to be fertilized by the male sperm cells. Thus it would seem that the boar could influence litter size noticeably only through his influence on the inherited ability of the pigs to live.

Ovulation Rate

The average number of eggs shed per heat period varied significantly among breeding groups.

If Tables 1 and 2 are compared it will be noted that sows consistantly ovulated more eggs per heat period than did gilts. This difference is probably a function of reproductive maturity as well as of age, since all sows had borne one or more previous litters.

Table 1. - Ovulation Rate (Gilts)

Breeding Group	No. of Gilts	Average Age (days)	Avg. Number Eggs/Heat.
Line V (Hamp) x D. J.	8	208	13.0
Line V (Hamp)	35	241	12.2
Line II (P.C.) x Line V (Hamp)	24	206	12.0
Duroc	43	228	11.9
Line II (P.C.) x D. J.	6	197	11.8
Line II (P.C.) x Line VI (P.C.)	20	219	11.5
Line VI (P.C.)	35	228	10.8
Line VI (P.C.) x D. J.	9	191	10.7
Line V (Hamp) x Line VI (P.C.)	13	202	10.6
Line II (P.C.)	14	239	10.4

It will also be noted from Table 1, that there is a slight tendency for the line cross and crossbred gilts to excel the parent lines in ovulation rate. This tendency would be more marked if age corrections were made, since data gathered in this study showed that an increase of 10 days in age among gilts studied (ranging from 5 1/2 to 9 months in age) led to an increase of 0.2 of an egg ovulated.

Table 2. - Ovulation Rate (Sows)

Breeding Group	No. of Sows	Avg. Number Eggs/Heat
Line VI (P.C.)	12	16.2
Line V (Hamp)	13	15.0
Line II (P.C.)	10	13.8
Duroc	10	17.1

Foetal Mortality

The average number of eggs ovulated by Line VI sows was 16.1 as determined by slaughter data, and theoretically about that number of pigs could have been farrowed. Yet the average litter size of sows of that line in corresponding seasons was only 7.9. Similarly, the average ovulation rate for the Durocs was 17.1, but the average number of pigs farrowed was only 8.60. Thus in these two groups approximately 50% of the potential pig crop was not farrowed. What is the explanation for this loss? Sperm from the boar's semen apparently fertilized all but 7% of the eggs ovulated. It seems, therefore, that a very heavy loss of the developing embryos must occur at some time during gestation. Data showing foetal mortality during early and late pregnancy are supplied in Table 3.

Table 3. - Foetal Mortality Estimated (Average of all Groups)

	Number of Animals	Avg. % Mortality 25-30 da.	Avg. No. Pigs Lost/ Litter to 25-30 days	Avg. % Mortality 30 days to term	Avg. No. Pigs lost/litter 30 days to term
Gilts	84	40.8	5.4	---	---
Sows	45	35.6	6.6	7.6	1.2

No statistically significant differences in foetal mortality have thus far been demonstrated among breeding groups, because of the extreme variability within each group. However, early foetal mortality is related to age among gilts, an increase of 10 days in age at breeding leading to a 5% decrease in early foetal mortality. The gilts used in making this estimate ranged in age from 5 1/2 to 9 months.

Further Work

The study is being continued with the view of obtaining more complete information on some breeding groups and in the hope of seeking out factors responsible for the strikingly high early foetal mortality found in so many sows. In addition, data are being analyzed which should shed some light upon the causes of the reduction in fertility occasioned by inbreeding.

THE VALUE OF VITAMIN B_{12} FOR BROOD SOWS AND WEANLING PIGS

G. C. Anderson

High mortality in pigs and poor performance in the feedlot have been a source of loss in pork production for many years. Experiments conducted at Missouri and at other stations have shown that the addition to rations, composed of commonly used feedstuffs, of all the vitamins formerly available, did not materially improve the performance of brood sows or pigs. However, when such supplements as fish meal, liver meal, and dried skim milk were added to these rations, sows and pigs performed satisfactorily and it was believed that these supplements contain unknown vitamins that are required by swine. One of these factors was commonly known as the "animal protein factor" and a little over a year ago a part of it was isolated in pure form and named vitamin B_{12}.

In order to further determine the value of vitamin B_{12} in swine feeding, the preliminary trial reported at the last Livestock Feeders Day was followed by two similar feeding trials and a brood sow experiment.

In the sow experiment, Duroc gilts weighing 150 pounds were divided into three equal groups of six animals each. All gilts received a corn-soybean ration, No. 347, until they weighed approximately 200 pounds at which time the gilts were bred. One group was continued on the corn-soybean ration, which is believed to contain only small amounts of vitamin B_{12}. A second group received this basal ration plus 0.5% of a vitamin B_{12} concentrate, Ration No. 348, and the last group received a ration containing fish meal, Ration No. 349, which is believed to contain adequate amounts of vitamin B_{12} as well as unknown factors that may be required for efficient production. In addition, this group received a daily feeding of red clover forage. However, since this forage was of poor quality and only small amounts of it were consumed, it is probable that it contributed little if any to the nutrition of the animals. The composition of the experimental rations is shown in Table 1.

Table 1. - Composition of Experimental Rations

EXPERIMENT	Sow			Weanling Pig [1]		
RATION NO.	347	348	349	350	351	352
DESCRIPTION	Basal	B12 Concentrate	Fish Meal	Fish Meal	Basal	B12 Concentrate
INGREDIENT	%	%	%	%	%	%
Ground Yellow Corn	70.0	69.5	60.0	59.5	44.0	43.5
Digester Tankage 60%	5.0	5.0	--	15.0	5.0	5.0
Soybean Oil Meal 43%	20.0	20.0	--	--	43.0	43.0
Fish Meal 63%	--	--	15.0	12.5	--	--
Alfalfa Meal 20%	2.5	2.5	15.0	5.0	2.5	2.5
Brewer's Dried Yeast	--	--	5.0	5.0	--	--
Fish Solubles	--	--	2.0	2.0	--	--
B_{12} Concentrate	--	0.5	--	--	--	0.5
Cod Liver Oil	0.5	0.5	0.5	0.5	0.5	0.5
Iodized Salt	0.5	0.5	0.5	0.5	0.5	0.5
Steamed Bone Meal	1.0	1.0	2.0	--	2.5	2.5
Ground Limestone	0.5	0.5	--	--	--	--
Iron Sulfate	0.02	0.02	--	--	--	--
Manganese Sulfate	0.01	0.01	--	--	--	--
Cobalt Chloride	0.01	0.01	--	--	--	--

[1] in trials 1 and 2 the fish solubles in ration 350 were replaced with liver and glandular meal and the following vitamins were added to each ton of rations 351 and 352: Thiamine, 4 gms., Nicotinic Acid, 18 gms., Pantothenic Acid, 20 gms.

The results from this trial are summarized in Table 2. These date show that the gilts which received the corn-soybean ration farrowed more and larger pigs than did the gilts in the other two groups. The gilts

Table 2. - The Value of Vitamin B_{12} For Sows(1)

(Drylot - Concrete Floors)

RATION NO. AND DESCRIPTION	NUMBER OF LITTERS FARROWED:	AVG. NO. PIGS PER LITTER	AVERAGE WEEKLY WEIGHTS OF PIGS									NO. OF PIGS WEANED PER LITTER
			0 wk.	1 wk.	2 wks.	3 wks.	4 wks.	5 wks.	6 wks.	7 wks.	8 wks.	
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
349 (2) Fish Meal	2	5.5	2.6	3.3	7.3	9.9	12.5	16.9	20.4	25.5	32.5	5.5
348 (2) B_{12} Concentrate	3	8.0	2.5	4.9	8.0	10.8	14.1	17.6	22.4	28.7	36.2	8.0
347 Basal	6	8.3	2.7	5.0	7.1	9.3	11.7	15.8	17.9	23.1	28.0	7.2

(1) Three sows in each group were bred to a Chester White boar and three to a Poland China boar.

(2) Four sows in the fish meal group failed to conceive, two sows in the B_{12} Concentrate group died early in the experiment and a third farrowed one living pig. The records of this last sow are not included in the data.

in the vitamin B_{12} and fish meal groups, however, lost fewer pigs and their litters were heavier at weaning. The figures in this table do not show some of the more important observations. Pigs farrowed by sows on the corn-soybean ration suffered from severe diarrhea during the first four weeks and they were uneven in size and thriftiness. Most pigs farrowed by sows on the basal ration were markedly less thrifty than the pigs in the vitamin B_{12} and fish meal groups, Figures 1 and 2.

In the feeding trials with weanling pigs, the largest and most thrifty pigs available were selected for feeding out on the basal corn-soybean ration, No. 351. On the other hand, the smallest and least thrifty pigs received the corn-soybean ration plus 0.5% of a vitamin B_{12} concentrate, Ration No. 352. A third group contained pigs which were intermediate between the other two in size and thrift and received the fish meal ration, No. 350. If vitamin B_{12} was supplied to the pigs that were least thrifty at the beginning and if these pigs grew as fast, or faster, than those that did not receive the vitamin, it would seem evident that the basal

ration was deficient in vitamin B_{12} and unsatisfactory for economical pork production. The rations are described in Table 1.

Fig. 1 - A typical litter weaned from a sow on the vitamin B_{12} ration No. 348. Observe uniformity and thriftiness of litter. Average weight at 56 days, 37 lbs. All litters, averaged 8 pigs, 36.2 lbs.

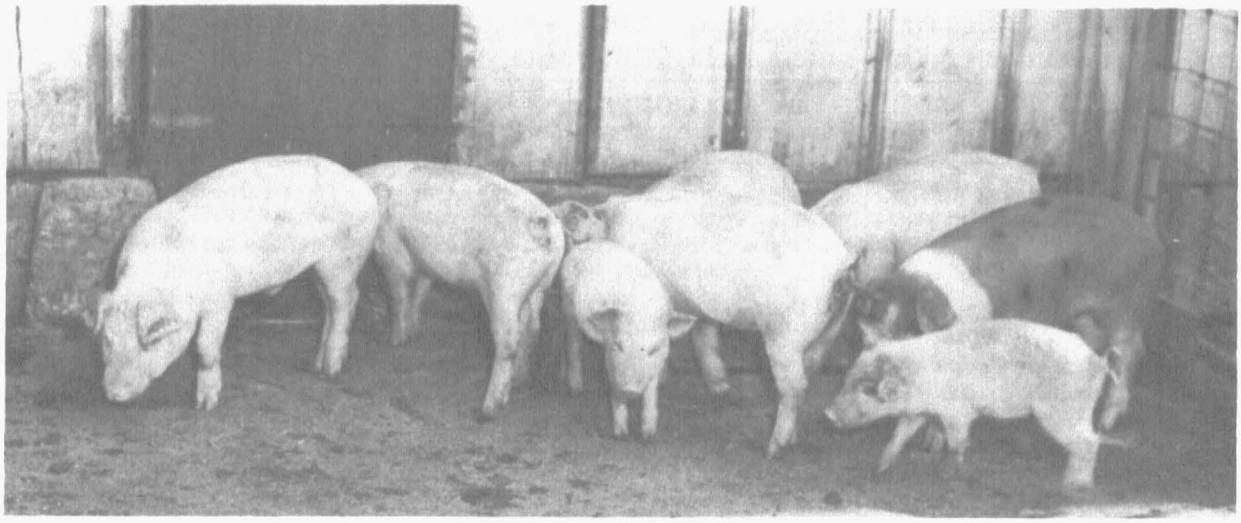


Fig. 2 - A typical litter weaned from a sow on the corn-soybean oil meal ration, No. 347. Notice variation in size and thrift. Average weight at 56 days 26 lbs. All litters, averaged 7.2 pigs, 28.0 lbs.

The pigs in the first weanling pig trial were farrowed by sows which had been kept in drylot and had recieved a ration which contained accepted amounts of animal protein (tankage) and alfalfa Meal. The results of this trial are summarized in Table 3. These data show that all groups grew at about the same rate until the end of the first six weeks. During the remaining four weeks the two lots of pigs that received the vitamin B_{12} concentrate and fish meal ate more feed, grew faster, and required less feed per pound of gain than did the pigs that received no supplement of the vitamin.

In Trial 2 the pigs were farrowed by sows which had been on pasture. Rye pasture and a supplement containing small amounts of fish meal was available to the pigs from three weeks of age until they were placed on experiment.

A summary of this trial is found in Table 3. There the data show that there was little difference in the rate of gain of the three groups during the first eight weeks or the last four weeks of the trial. It is interesting to note, however, that during both periods the vitamin B_{12} group made the most efficient gains.

Pigs in Trial 3 were farrowed by the sows in the corn-soybean oil meal group previously discussed (Table 2), and the results are summarized in Table 3. The difference in rate of gain noted in this table became evident at the end of the first week and continued to the end of the experimental period.

Some of the more important observations are not contained in these tables. In all three trials the pigs in the corn-soybean oil meal group suffered from scours. This was also true of the pigs in the other groups although this condition disappeared after the fourth or fifth week and was at no time as serious as that in the basal group. In addition, the pigs which received the fish meal and vitamin B_{12} rations were markedly superior in thrift and general appearance.

Table 3. - Value of Vitamin B_{12} for Weanling Pigs
(All pigs approximately 11 weeks old at beginning of trial)
(Drylot - concrete floors)

WEEK	WEIGHT			AVERAGE DAILY GAIN			AVERAGE DAILY FEED			FEED/100 LBS. GAIN		
	350 Fish M. lbs.	351 Basal lbs.	352 B-12 lbs.	350 Fish M. lbs.	351 Basal lbs.	352 B-12 lbs.	350 Fish M. lbs.	351 Basal lbs.	352 B-12 lbs.	350 Fish M. lbs.	351 Basal lbs.	352 B-12 lbs.
TRIAL I - FARROWED BY SOWS IN DRY LOT												
No. Pigs	7	8	8									
0	32	39	29									
0-6	59	64	54	0.64	0.60	0.60	2.46	2.43	2.15	383	404	361
6-10	97	88	86	1.36	0.86	1.14	5.60	3.44	4.20	414	401	370
0-10	97	88	86	0.92	0.70	0.82	3.73	2.84	2.97	405	406	364
TRIAL II - SOWS AND PIGS ON PASTURE												
No. Pigs	7	8	7									
0	31.8	35.8	24.6									
0-8	90.6	92.3	89.9	1.05	1.01	1.01	3.39	3.37	2.65	323.1	333.9	262.7
8-12	126.7	130.4	119.6	1.29	1.36	1.38	4.65	5.13	4.65	360.7	337.5	330.5
0-12	126.7	130.4	119.6	1.13	1.12	1.13	3.81	3.83	3.29	337.4	342.0	291.5
TRIAL III - DRY LOT PIGS FROM CORN-SOYBEAN SOWS												
No. Pigs	8-	9	9									
0	51.5	53.9	48.4									
0-10	164.0	148.8	154.6	1.61	1.36	1.52	6.17	5.48	4.96	383.2	402.9	326.3

Conclusions

The results of these tests show that:

(1) Soybean oil meal and corn are deficient in vitamin B_{12} for swine feeding and tankage, on the other hand, is a fair source of the vitamin.

(2) Vitamin B_{12} is definitely required in brood sows and pig rations for satisfactory production.

(3) Pigs on palatable, succulent pasture receiving at least some animal protein such as fish meal, will obtain sufficient amounts of vitamin B_{12} for satisfactory performance.

SHEEP

EARLY LAMB PRODUCTION

A. J. Dyer

Although at a low ebb in numbers, sheep hold high rank compared with other classes of livestock from the standpoint of return per dollar invested. They, with cattle, are fine converters of roughage and pasture into meat. The production of early lambs has been emphasized by many. The proper way to winter the ewes and whether or not grain feeding of lambs is advisable are two things of importance to this group of producers. Both have been studied at this station. In preceding tests, winter pasture (wheat and bluegrass in this case) was superior to feeding legume hay in drylot; feeding of grain in a creep to lambs suckling their dams on pasture was profitable. Using either roughage or pasture only prior to lambing does not make a ewe very fleshy. The question was raised as to whether grain feeding of ewes six weeks prior to lambing would prove beneficial. This point was studied and is reported herein. Animals in this project were the same ones that had been used in preceding feeding tests. They were 4-year-old Northwestern ewes bred to a Hampshire ram for early lambs, thus dropping lambs when 5 years of age.

Observations

(1) From the data contained in Table 2 it is obvious that there was no advantage from feeding grain to ewes during the last 6 weeks of pregnancy.

(2) The group of ewes which were not fed grain had a lower feed cost and slightly greater return from lambs. Grain feeding did not pay in this test.

(3) The ewes in Lot 1A or those fed grain were not actually very fleshy when they lambed. To have made them fleshy would have required either the feeding of grain over a longer period of time or a larger

allowance of grain over the same interval used.

(4) The test will be repeated this winter.

(5) The lambing season was of long duration, January 14 to March 10. This is a normal occurance in flocks devoted to the production of early lambs.

Table 1. - The Plan of the Experiment; Early and Late Lamb Production

Early Lamb Production Jan., Feb., and Early March Lambs		Late Lamb Production Late March and April Lambs	
Rations fed to ewes:			
LOT 1A	LOT 1B	LOT 2A	LOT 2B
A. During pregnancy- *Bluegrass Pasture; Grain mixture last six weeks. B. During lactation- Mixture of grasses Grain mixture until April 18, 1949	A. During Pregnancy- Same as for Lot 1A except no grain during the last six weeks. B. During lactation- Same as for Lot 1A	A. During pregnancy- *Bluegrass Pasture; Grain mixture last six weeks. B. During lactation- Mixture of grasses.	A. During pregnancy- Same as 2A except no grain during the last six weeks of pregnancy. B. During lactation- Same as Lot 2A
Rations fed to lambs:			
Shelled corn in creep; mixed pasture until **July 4, then fed grain and hay in dry lot.	2. Same as for Lot 1A lambs.	2. Rations fed to lambs Mixed pasture all summer.	2. Same as for lambs in Lot 2A.

* Bluegrass pasture was supplemented with legume hay when inclement weather prevented grazing.
** All lambs not fat enough to grade good by that date were removed from pasture to dry lot and fattened.

Table 2. - Early Lamb Production; Preliminary Data

A Comparison Between Ewes Fed Grain During the Last Six Weeks of Pregnancy and Ewes That Were Not Fed Grain; Both Groups Fed Grain During Early Lactation.

Total Feed for Ewes - Gestation and Lactation Combined (Avg. Per Head)	LOT I-A	LOT I-B
Lespedeza Hay (lbs.)	386	293
*Grain Mixture (lbs.)	155(2.8 bu.)	128(2.5 bu.)
Total Feed for Lambs (Avg. Per Head)	**LOT I-A**	**LOT I-B**
(Suckling dams on pasture and fed grain to July 4)		
Shelled Corn (lbs.)	89(1.6 bu.)	88(1.6 bu.)
(Full fed grain mixture and hay in dry lot after July 4)		
Shelled Corn (lbs.)	50(.9 bu.)	47(.8 bu.)
Soybean Oil Meal (lbs.)	5	4.7
Alfalfa Hay (lbs.)	78	72
Returns From Ewes and Lambs	**LOT I-A**	**LOT I-B**
Fleece weight per ewe (lbs.)	9.6	9.9
Avg. weight of lambs marketed on July 4	91.0	88.0
% of lambs marketed by July 4	26.0	38.0
Sale price per cwt.	$25.50, top price	$25.50, top price
Avg. weight of lambs marketed on August 8	98.0	98.0
% of lambs marketed by August 8	89.5	100.0
Lambing percentage	164.0	166.0

* By weight: Shelled Corn 6 parts
Bran 3 parts
Soybean Oil Meal 1 part

LATE LAMB PRODUCTION

About 25% of the spring lamb crop is marketed by July 1. Many farmers prefer to raise late lambs and gear their feeding and management practices toward their production.

In order to study the economical production of late lambs, a new phase was added last fall to our Sheep Production project. In August, the band of 4 year old Northwestern ewes was divided into two equal groups. One group was alloted to the early lamb production project discussed above and the other to the

Table 3. - Late Lamb Production

A Comparison Between Ewes Fed Grain During The Last Six Weeks of Pregnancy and Ewes That Were Not Fed Grain; Neither Group Was Fed Grain During Lactation.

Feed Record for Ewes	(Avg. Per Head)	LOT II-A	LOT II-B
Lespedeza Hay (lbs.)		197	173
*Grain Mixture (lbs.)		42	None
Feed Record For Lambs		LOT II-A	LOT II-B
		pasture only	pasture only
Returns	(Lambs Will Be Sold Later)	LOT II-A	LOT II-B
Fleece weight per ewe (lbs.)		10.2	10.6
Avg. weight of lambs on September 12 (lbs.)		81.0	78.0
Avg. weight of lambs on October 22 (lbs.)			
Lambing Percentage		155.0	162.0

* By weight: Shelled corn 6 parts
Bran 3 parts
Soybean Oil Meal 1 part

late lamb production project. Both groups were bred to the same Hampshire ram, thus eliminating the sire as a cause for any differences that might arise. All of the group in the late lamb project were grazed together in the fall and none were bred until November 1. Ninety-three per cent of all the ewes settled to service during the first heat period after November 1 and the remaining 7 per cent to service during the second heat period. This resulted in lambs of uniform age and a short lambing season both of which are to be commended. Pertinent Data are presented in Table 3.

Observations

(1) Feeding grain to ewes during the last six weeks of pregnancy has not been advantageous.

(2) Very economical production has thus far been secured. Nearly all th feed required has been furnished by pasture.

(3) Fleece weights of late lambing ewes were heavier than from ewes raising early lambs.

(4) This test is not complete so that no conclusions can be drawn. The experiment will be repeated, beginning this fall.

Table 4. - Influence That Feeding Grain to Ewes During Late Pregnancy Has Upon Birth Weight of Their Lambs

Early Lambs:	Singles	Twins	Triplets
	lbs.	lbs.	lbs.
Lot 1A (grain fed)	10.7	10.5	8.9
Lot 1B (no grain)	10.2	8.5	none
Late Lambs:			
Lot 2A (grain fed)	11.8	9.2	none
Lot 2B (no grain)	9.9	8.3	7.3

The weight of singles was affected very little thru feeding grain to ewes during the last six weeks of pregnancy. Lambs from multiple births were heavier when ewes were fed grain during late pregnancy.

SHEARED VS. NON SHEARED LAMBS

Shearing lambs before the onset of hot weather appears to be a very good practice. It is believed that there will be sufficient length of staple to the fleece when the lambs are sold to avoid the usual discount on sheared lambs.

Table 5. - A Comparison of Gains Made on Pasture by Sheared and Non Sheared Late Lambs

July 11 to September 12, 1949

RESULTS	SHEARED	NON SHEARED
Total* Gain (lbs.)	18.9	16.9
Avg. Daily Gain (lbs.)	.30	.27
Avg. Weight of Fleece (lbs.)	1.5	
Total Gains to October 22		

* Does not include the weight of the fleece.

CATTLE

FATTENING YEARLINGS WITH LESS CORN; STEERS VS. HEIFERS

P. Q. Guyer

The present outlook is that wide margins in cattle feeding cannot be expected, thus leaving economical production as the major means of profit in cattle operations. Economical production these days requires the use of roughage and pasture. Consideration should also be given to weight and sex of the feeder cattle.

In previous tests, yearling steers produced by feeding roughage in winter, grazing the entire summer, and finishing in dry lot required twenty bushels of corn per head and were marketed in January or February when the prices for cattle of this grade are normally low. Developing a system whereby the grain required is reduced and the sale date is moved forward to a period of more favorable prices is our goal.

The use of medium weight heifer calves and large steer calves to accomplish the objective is now being explored. Heifers fatten at younger ages and lighter weights than steers. Large steer calves are more mature, will fatten more quickly and will possibly make more efficient use of roughages than smaller steers.

One trial has been completed. Data for the second trial are presented in Table 1 of this report.

Table 1. - Producing Fat Yearlings With Less Corn
Steers Vs. Heifers
(Preliminary Data)

Periods	Rations	Feed Consumed (lbs. per head)		Average Weight (lbs.)				Average Gain (lbs.)			
				Steers		Heifers		Steers		Heifers	
		Steers	Heifers	Init.	Final	Init.	Final	Total	Daily	Total	Daily
Winter (120 da) Dec. 14, 1948 to Apr. 12, 1949	Corn Silage	2261	2022	544	719	476	629	174	1.45	153	1.28
	Red Clover Hay	787	717								
	Soybean Oil Meal	120	120								
Summer (170 da) Apr. 12, 1949 to Sept. 30, 1949	Small Grain, Bluegrass, & Lespedeza - S. Clover Pasture	5 2/3 mo.	5 2/3 mo.	719	933	622*	820	214	1.26	198	1.16

* One heifer removed from experiment at the close of winter period.

These cattle were wintered on a ration consisting of corn silage, Legume Hay, (1 pound daily per cwt. liveweight), and Soybean oil meal, (1 pound per head daily), were pastured all summer and are now being fattened on corn in dry lot.

Observations

(1) During the winter period steers ate more feed and gained faster than heifers.

(2) Steers also gained faster on pasture than heifers.

(3) Winter gains were rapid and efficient for a ration composed largely of roughage.

(4) Pasture gains were smaller than usual. This can be attributed largely to the small gains made on bluegrass pasture during June and early July. Gains from bluegrass were large during the month of May.

These cattle will be fed in dry lot until fat enough to grade good on foot.

Results of the first trial showed that steers returned more profit per head than heifers, but that the return per dollar invested was about the same for both steers and heifers. Results of the winter and summer periods are similar for both trials. It should be realized, however, that in this trial the lot which gives best results cannot be determined until after they are fat enough to grade "good" and have been sold on the market.

EFFICIENT PRODUCTION OF FAT YEARLING CATTLE

A. J. Dyer

The importance of low cost beef production seems to be increasing. Rather high prices have been paid for feeder cattle this fall and most of the cattle that will be sold within the next twelve months are already in the feed lots. Many livestock men inquire as to whether profit can be made if their cattle sell at prices lower per hundred than the purchase price or at a minus margin. Many already know the answer to that inquiry because they have had experience along that line--especially during the past year. Some have made a profit on a minus margin of selling and others have lost a great deal, depending upon the weight and

condition of the cattle and the method of management. Management involves the ration. We must use low cost feeds and make very efficient use of them. Roughage and pasture both are low cost feeds and one of our objectives has been to find out to what extent they can be used to produce fat two year old and fat yearling cattle. One of the problems with yearlings has been to discover the best winter treatment of calves to obtain maximum use of pasture the following summer and yet sell them on a strong market for such cattle.

Beginning with choice feeder steer calves last fall, we fed the following rations in winter:

Ration I (standard) (Lot I)
- Corn silage--all they would eat
- Legume hay--1 pound daily per 100 pounds live weight of cattle

Ration II (Lot 2)
- Soybean oil meal--1 pound per head daily
- Corn silage--all they would eat
- Legume hay--1 pound daily per 100 pounds live weight of cattle

Ration III (Lot 3)
- Soybean oil meal--1 pound per head daily
- Corn silage--all they would eat
- Legume hay--2 pounds daily per 100 pounds live weight of cattle

Ration IV (Lot 4)
- Legume hay--all they would eat

Ration V (Lot 5)
- Shelled corn and soybean oil mixture--10 pounds to 1 pound respectively--fed at the rate of 4 pounds per head daily
- Corn silage--all they would eat
- Legume hay--1 pound daily per 100 pounds live weight of cattle

The results obtained for the winter period and summer grazing period are tabulated in Table 1.

Table 1. - Efficient Production of Fat Yearling Cattle - Preliminary Data

A Comparison of Winter Rations for Steer Calves That Were Grazed Together All Summer

(All figures represent pounds unless otherwise stated)

		Lot I	Lot II	Lot III	Lot IV	Lot V
1948-49 Winter A	Avg. Wt. Dec. 14, 1948	476	476	475	477	475
	Avg. Total Gain in Winter	136	175	163	137	191
	Avg. Wt. April 13, 1949	612	651	638	614	666
	Avg. Daily Gain	1.1	1.5	1.4	1.1	1.6
B	Avg. Total Feed Consumed (per head)					
	Corn Silage	2694	2427	1375	none	2088
	Clover Hay	730	750	1305	2006	767
	Soybean Oil Meal	none	120	120	none	44
	Shelled Corn	none	none	none	none	436 (7.8 bu.)
1949 Summer C	Avg. Wt. April 13, 1949 when turned to pasture	612	651	638	614	666
	Avg. Wt. Sept. 30, 1949	848	866	862	869	897
	Avg. Total Gain in Summer	236	215	224	255	231
	Avg. Daily Gain in Summer	1.4	1.3	1.3	1.5	1.4
D	Feed Consumed	Wheat Lesp. Pasture	Wheat Lesp. Pasture	Wheat Lesp. Pasture	Wheat Lesp. Pasture	Wheat Lesp. Pasture
E	Gain in Winter	136	175	163	137	191
	Gain in Summer	236	215	224	255	231
	TOTAL GAIN	372	390	387	392	422

The winter, summer, and total gains (Section E, Table 1) are shown graphically in Figure 1.

Observations

(1) Steers in Lot I fed corn silage and clover hay and those in Lot IV fed clover hay only made the least winter gain (1.1 pounds daily) and the most summer gain. Of these two, the steers fed clover hay were superior in total gain.

(2) Steers in Lot V fed both grain (7.8 bushels corn) and roughage last winter made the greatest winter gain (1.6 pound daily) and nearly as much gain from grass as Lot IV and Lot I, 231 pounds compared

with 255 for Lot IV and 236 for Lot I. Their total gain is the greatest of all and they have readily eaten their grain allowance this fall. There has been no hesitation on their part to eat corn whereas those that did not receive grain last fall were slower to go on feed. The feed consumed and consequently the cost was greater for this lot, but they have about a 30 pound weight advantage over Lots II, III, and IV and 50 pounds over Lot I and seem to be fleshier.

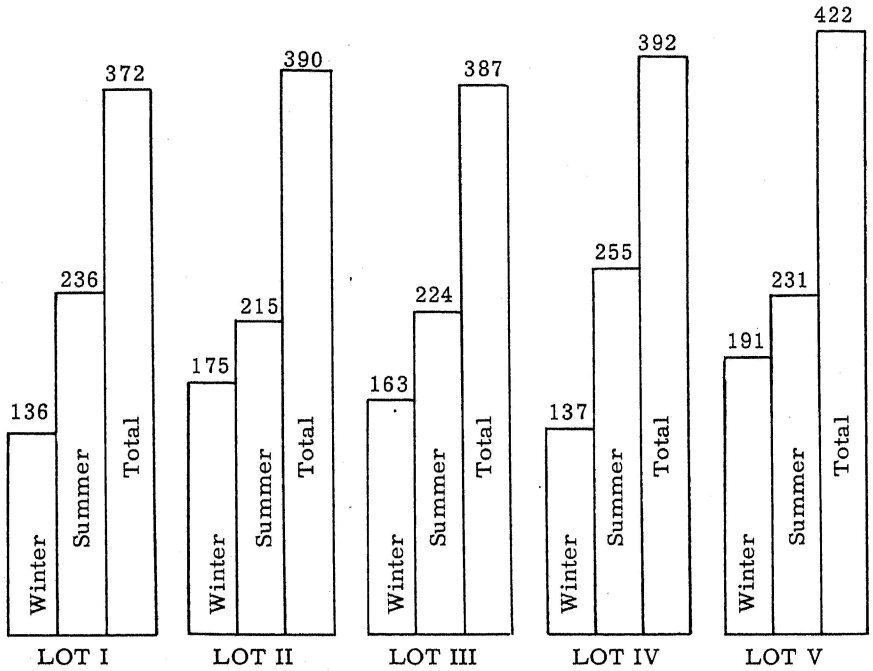


Figure 1. - Winter, Summer, and Total Gains (in pounds) Made by Steers in Lots 1 to 5 inclusive, Table 1. (All figures represent pounds.)

(3) Lots II and III were fed the same ration except for the amount of hay in winter and made almost the same winter gain and summer gain. Their summer gains are least for the group but not appreciably lower. Under the conditions of this test, the advisability of feeding soybean oil meal is questioned. Under some other conditions it might be very strongly urged.

(4) What counts most in a test of this sort is the total cost of production per unit of product sold and the price that the finished steer brings. These will not be known until after the test is finished.

(5) With 20 or fewer bushels of grain per head these steers will probably be finished to a grade of good. From 60 to 75 days of full feeding will probably be required.

(6) The final report on this test will be presented at the spring feeder's day. The test will be repeated beginning this fall.

Table 2. - The Effect That Fertilizer and Lime Application Has on Total Gain Per Acre and Average Daily Gain Made by Yearling Steers

	1948	1949	
	Total Gain	Total Gain	Avg. Daily
Wheat-lespedeza on limed and fertilized ground	288 lbs.	216 lbs.	1.48 lbs.
Wheat-lespedeza on untreated ground	169 lbs.	175 lbs.	1.39 lbs.

From the data above it is obvious that the fertilizer and lime application did not affect the rate of gain but did have a large effect on total gain per acre--23.5% greater in 1949 and 67% greater in 1948.

The fertilized and limed field produced more feed, but not of higher nutritional value.