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EC62-219 Nebraska Swine Production Report

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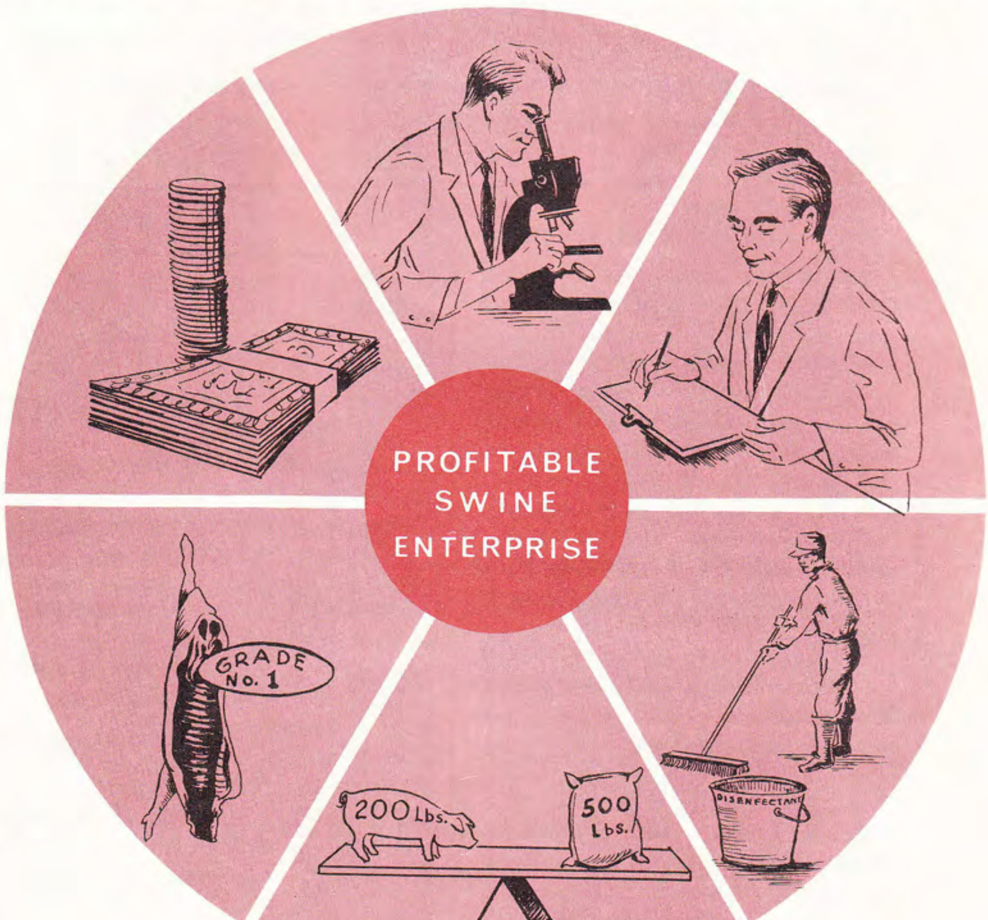
1962

Nebraska Swine

PRODUCTION REPORT



- BREEDING
- FEEDING
- ECONOMICS
- DISEASE CONTROL
- MECHANIZATION
- HOUSING AND EQUIPMENT

UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
THE AGRICULTURAL EXPERIMENT STATION
E. F. FROLIK, DEAN; H. H. KRAMER, DIRECTOR

ANIMAL HUSBANDRY DEPARTMENT
SWINE PROGRESS REPORT 373

Contents

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Opportunities

. . . . in Hog Production

Philip A. Henderson

One of the principal problems of many farmers in Nebraska is the lack of volume in their farming operations. In many instances, there is no additional land immediately available either for rent or purchase.

It is possible, however, to intensify the operation by enlarging present livestock enterprises or adding new ones. Currently, much of the feed grain grown in Nebraska is not fed on Nebraska farms. Increased production of feed grains, more stable production from year to year, and a growing market in western United States offer real opportunities to capable, livestock-minded farmers.

Feed Grains Available

Approximately 55 percent more feed grain was produced in 1960 than ten years earlier. There were a number of reasons for this large increase. The weather, of course, was favorable but the increase in irrigation during this ten years, as well as the adoption of hybrid grain sorghum, and increased use of commercial fertilizer were also important contributors to the increase. Much of this increase is here to stay (except for the possible effects of government restrictions on production).

Rough calculations indicate that only about 40 to 60 percent of Nebraska's feed grain is being fed on Nebraska farms. The rest is either being placed under government loan or is being shipped out of the state. Hence, there is a large feed grain base which could support substantial increases in livestock feeding operations within the state. Farmers needing additional volume of business might well look at opportunities in hog production.

Historically, hogs have been produced largely in the Corn Belt and to a lesser extent in the eastern fringes of some of the Great Plains states. Since feed is approximately 70 percent of the total cost of producing hogs, it seems probable that most of the hogs will continue to be produced in those areas where feed grains are produced.

Demand Prospects Good

Although there has been a slight downward trend in the per capita consumption of pork during the past ten years, over a 60-year period it has been relatively stable. During this time consumption has averaged approximately 65 pounds per capita. It does not seem likely that this rate will change significantly for any length of time during the next 10 to 15 years.

The rapid growth of population along the West Coast and in the southwestern United States during recent years is expected to continue. It is estimated that by 1970 there will be approximately 12 million more people in the western half of the United States than there were in 1960. Even if the current trend in per capita consumption of pork continues downward, this growth in population would mean an increase of roughly 700 million pounds in the demand for pork. This is the equivalent of 4 to 4.5 million hogs.

Feed grain production in the states west of the Great Plains has never been large nor is this situation likely to change materially. Consequently, it is expected that the western United States will continue to look to the feed grain producing areas for its supply of pork. The Great Plains states, being the nearest feed grain producing area of consequence, have a competitive advantage in this western market over the states farther east. The shorter distances mean lower freight rates and hence, lower marketing costs.

Capital, Labor Requirements

Many farms lack pasture, fencing, and water supplies away from the buildings. In such cases, hog production or cattle feeding are logical possibilities. Of these two, hog production is less speculative and requires a considerably smaller annual cash or credit outlay. Investments in buildings and equipment may be larger, however. Figures are not available on the amount invested in buildings and equipment used for hog production on Nebraska farms, but study of hog production on 76 farms in Indiana in 1957 indicates that the investment there was approximately $250-265 per sow (two litters). See Table 1.

The one litter system requires a smaller investment in buildings if the pigs are farrowed in May or June. Weather is mild enough at this time of year that heating equipment, ventilation, and insulation are not needed. This saving may be offset to a large extent, however, because of less complete use of build-

(continued on next page)

Table 1. Investments per sow (two litters)[a]

Item	Low one-third	Middle one-third	High one-third
Buildings and equipment	$250	$262	$265
Breeding herd	59	59	69
Feed	65	76	84
Other	55	60	67
Total	$429	$457	$485

[a] Partenheimer, R., "The Effects of Size of Enterprise on Costs and Returns from the Two Litter System of Hog Production on Selected Central Indiana Farms, 1957," unpublished M.S. thesis, Purdue University.

ings and equipment as compared to the two litter system.

Labor requirements vary tremendously from one farm to another depending on equipment and facilities for handling hogs. The Indiana studies (1956-1957) indicated that the large, most efficient producers were able to produce pork with as little as .52 hours of labor per hundredweight. The least efficient required 1.30 hours per hundredweight. The average was just under one hour of labor for each hundred pounds of hogs produced. The farmer who can raise and market close to 7 pigs per litter (as these Indiana farmers did in 1957) weighing an average of 215 pounds can expect to spend approximately 30 hours per sow if two litters are farrowed.

Factors Affecting Costs

As indicated in Table 2, the large herds had some cost advantage over small herds. The average cost of producing each hundred pounds was $15.30 in the small herds, $14.28 in the moderately large herds, and $13.29 in the large herds. The most marked differences appear to be closely related to the amount of feed required. The most efficient producers got 100 pounds of pork with roughly 4.25-4.75 bushels of corn and 40-45 pounds of 35 percent supplement, while the least efficient required 7 to 8 bushels of corn and 65 to 75 pounds of 35 percent supplement. The difference in feed costs accounts for nearly half of the differene in total costs of production. Smaller investments in buildings and equipment per sow and greater labor efficiency accounted for most of the remaining difference.

As shown in Table 3, the fewer pigs raised per litter, the higher the cost of production. The costs of maintaining the breeding herd do not vary in proportion to the number of pigs weaned. In other words, it costs almost as much to keep a sow that weans six pigs as one that weans eight or more.

To the extent that Specific Pathogen Free (SPF) programs can improve feed conversion rates and cut down on death losses, this relatively new development in the hog business holds real promise. Records kept by farmers who have been cooperating with the Department of Veterinary Science during the years 1958 through 1961 (1,345 litters) show an average of 8.5 pigs weaned per litter (14 percent death loss from birth), an average weight of 42.4 pounds at 56 days of age, an average weight of 200 pounds at 154

Table 2. Variation in costs per hundredweight of hogs produced with three different sizes of swine enterprises, central Indiana, 1956 and 1957.[a]

Items	Under 25 sows[b]			25-49 sows[b]			50 sows and over[b]			Average (28 sows)[b]		
	Most effic.	Group avg	Least effic.	Most effic.	Group avg	Least effic.	Most effic.	Group avg	Least effic.	Most effic.	Group avg	Least effic.
No. of enterprises in group	10	52	10	10	53	10	3	13	3	23	118	23
Avg. no. of sows farrowed (2 litters ea.)	16.5	15.8	15.5	34.5	33.6	30.9	53.8	59.3	58.2	29.2	28.4	27.8
Lbs. of feed per cwt. of hogs produced	300	418	536	315	406	526	282	380	457	302	408	521
Direct costs												
Feed[c]	$ 7.64	$10.64	$13.65	$ 7.94	$10.34	$13.43	$ 7.18	$ 9.70	$11.65	$ 7.71	$10.40	$13.29
Misc. (Elec., taxes, vaccination, etc.)	.83	.86	.74	.79	.91	.96	.79	.82	.96	.81	.88	.86
Total	$ 8.47	$11.50	$14.39	$ 8.73	$11.25	$14.39	$ 7.97	$10.52	$12.61	$ 8.52	$11.28	$14.15
Fixed costs												
Use of bldg., mchy., & equip.	1.97	2.18	2.55	1.79	1.74	2.41	1.88	1.61	1.70	1.88	1.94	2.38
Int. (6%) on hogs	.39	.44	.46	.42	.44	.48	.46	.44	.44	.41	.44	.47
Total	$ 2.36	$ 2.62	$ 3.01	$ 2.21	$ 2.18	$ 2.89	$ 2.34	$ 2.05	$ 2.14	$ 2.29	$ 2.38	$ 2.85
Total costs other than labor	$10.83	$14.12	$17.40	$10.94	$13.43	$17.28	$10.31	$12.57	$14.75	$10.81	$13.66	$17.00
Labor cost ($1.00 per hour)	1.01	1.18	1.30	.90	.85	.96	.52	.72	.88	.90	.98	1.09
Total costs	$11.84	$15.30	$18.70	$11.84	$14.28	$18.24	$10.83	$13.29	$15.63	$11.71	$14.64	$18.09

[a] Bauman, R. H., and Eisgruber, L. M., "Cost and Profits in Hog Production," Economic and Market Information, Purdue University, May 31, 1961.
[b] Sows farrowed twice per year.
[c] The corn price was $1.21 per bu., 35 percent protein equivalent $5.00 per cwt. Given the amount of protein fed in the average ration, the cost of feed is $2.55 per cwt.

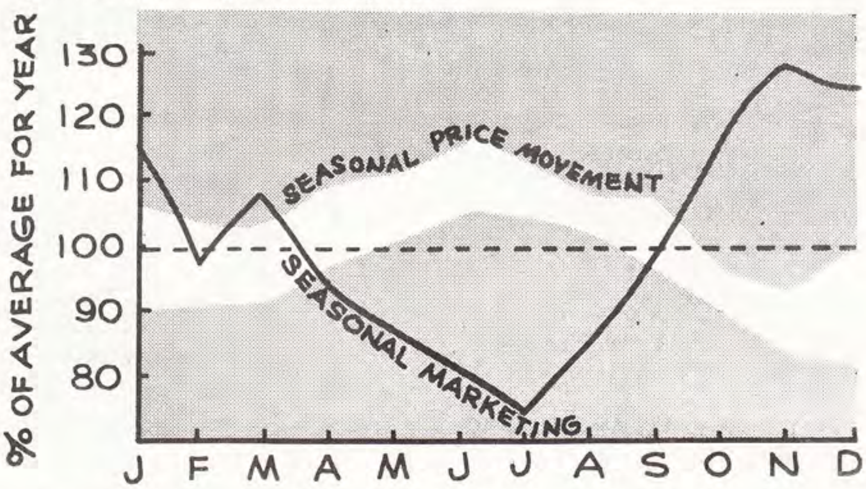
days of age, and an average daily gain of 1.6 pounds.

These figures compare favorably with those of top-level hog producers not using the SPF program. Even the best producers are apt to suffer serious setbacks occasionally during a lifetime of operation. For producers of this caliber, the SPF program is insurance against these occasional ravages of disease. The SPF program may be the "something extra" that is needed, together with improved management, to enable producers with average or slightly above average managerial ability to succeed in the business of pork production. It should be kept firmly in mind, however, that the SPF program is no substitute for management in the broad sense.

Seasonal Price Variations

Prices of hogs vary from season to season and from year to year. Both seasonal prices and year to

Figure 1—Seasonal marketings and variations in monthly average top prices of 200-220 pound slaughter hogs, Kansas City, 1953-57.



year prices tend to reflect the number of hogs marketed. As indicated in Figure 1, the peak in seasonal hog prices usually occurs in June or July. The low point is reached in November or December. Prices have averaged approximately 20 percent lower during these two months compared to the prices during June and July. Insofar as possible, it is desirable to avoid marketing hogs during October, November and December.

Table 3. Relationship of number of pigs raised per litter to costs, returns and other factors, 76 central Indiana farms. 1957 [a] (average enterprise size is 30 sows).

	Low one-third	Medium one-third	High one-third
Pigs farrowed per sow	7.6	8.6	9.4
Pigs weaned per sow	5.9	7.1	8.2
PIGS RAISED PER SOW	5.5	6.8	8.0
Average weight of market hogs (lbs.)	213	217	217
Hours of labor per cwt. of hogs produced	.96	.88	.81
Investment per sow and two litters (dollars)			
Bldgs. and equipment	250.05	261.64	265.34
Breeding herd	59.16	58.91	68.91
Feed	65.19	76.09	83.83
Other	55.35	60.45	66.87
Total	429.75	457.09	484.95
Feed requiremens per cwt. of hogs produced (pounds)			
Corn equivalent	383	363	339
35% protein	40	37	38
Pig starter	5	8	8
Mineral and salt	2	2	1
Total	430	410	386
Costs per cwt. of hogs produced (dollars)			
Feed	10.75	10.23	9.60
Bldg. and equipment use	1.57	1.42	1.18
Labor ($1 per hour)	.96	.87	.81
Other	3.49	3.25	2.95
Total	16.77	15.77	14.54
Costs per weaned pig (dollars)	9.61	8.73	8.67
Net inventory change (per cwt.)	− 1.53	− .02	− .69
Gross receipts per cwt. of hogs produced	19.08	17.50	17.49
Net returns to management per cwt. of hogs	.78	1.71	2.26
Net returns to management from the hog enterprise	548.26	1513.35	2354.00

[a] Derived from R. Partenheimer, The Effects of Size of Enterprise on Costs and Returns from the Two Litter System of Hog Production on Selected Central Indiana Farms, 1957, unpublished M.S. thesis, Purdue University, p. 87.

Summary and Conclusions

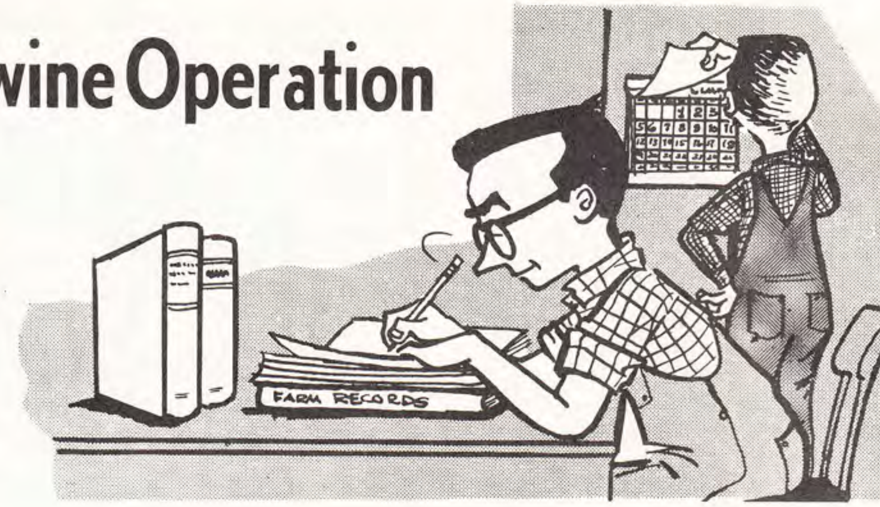
The growing demand for pork (and all food) in the western part of the United States, coupled with the increasing production of feed grains in the Plains states, provides a basis for possible expansion of hog production by Nebraska farmers.

Modern, two-litter hog operations require fairly large capital outlays for buildings and equipment. Before investing large sums in permanent, highly specialized buildings, the individual needs to give considerable thought to his interests and ability to meet the managerial requirements of an intensive hog operation.

Differences in managerial ability result in differences in costs of production. More specifically, care of the sow at farrowing time, number of pigs farrowed, freedom from disease, rates of feed conversion, labor efficiency, and marketing programs are all important factors affecting costs of production and net profits.

A high degree of managerial ability calls for technical and economic "know how," the ability to make sound decisions based on information at hand, and constant re-evaluation of decisions made and actions taken.

Planning the Swine Operation



Leo E. Lucas

In the field of business the most efficient operation survives. So it is in the swine industry. The efficient producer of high quality lean pork will continue to produce pork in the coming years.

Of prime concern to efficient pork production in Nebraska is adequate planning in the use of resources, equipment, and labor. Nebraska producers must strive for more efficiency in their total operation if they are to maintain or increase their present role in the industry. They will need to consider a complete program based on sound planning and topnotch management.

What are some of the factors Nebraska producers should consider in planning future changes in their operations or in planning new operations? The major considerations are:

(1) Nebraska is a surplus feed grain state—only 40-50 percent of the feed grains now raised are fed to livestock in this state.

(2) The average swine producer in Nebraska requires 196 days to put a 225-230 pound pig on the market.

(3) Nebraska continues to have an excessive monthly variation in the number of sows farrowed.

(4) Conversion of feed into pork is relatively inefficient (some farm records indicate seven to eight pounds of feed required per pound of gain).

(5)The average size of swine operations is small (less than 10 sows).

(6) There is a high percentage of inners and outers in swine production.

(7) Present figures indicate only 30-35 percent of market hogs grade No. 1.

(8) Increased irrigated acreage has resulted in greater availability of labor and feed for livestock operations.

(9) More feeder pigs are being shipped into Nebraska.

Size and Type of Operation

Although farm records indicate that a producer can be efficient with nearly any size of operation, there is a tendency for the 40 to 50 sow operation to be the most efficient.

Nebraska figures show an average size of less than 10 sows per farm. As a result many of the farms raising hogs in Nebraska do so only as a small part of the total operation. In many of these cases it appears that when the other work load gets heavy the swine operation suffers. This usually results in a very inefficient, poorly managed operation.

From personal observation and evaluation of records, it appears that when the swine operation reaches 20-25 sows it becomes of such a magnitude that the producer cannot afford to neglect it. Work at the University of Purdue indicates a need to farrow at least 20 sows at a time to achieve some labor efficiency. Therefore, in planning changes in the operation the producer should aim for a size that will permit him to spend the necessary time in management and care as well as giving him the advantage of savings in fixed costs and labor.

The type of operation is also a consideration in planning. With feed grain assured on irrigated farms many of these producers want to have feeding operations. They do not wish to farrow the pigs, but only to put into them their labor and feed. As a result an increased number of feeder pigs have been shipped into Nebraska over the past few years. It appears that this demand for feeder pigs will continue to increase. Planning should include consideration of feeder pig production to supply this need. An important part of any feeder pig operation is a valid contract between the producer and feeder.

Farrowing and Marketing Schedule

The excessive variations in farrowing and marketing of hogs in Nebraska is a factor affecting prices and returns to the operator. Nebraska as a state continues to have considerable variations in pigs marketed from month to month and season to season. Comparative figures show that 59 percent of the pigs in 1961 were farrowed in the spring and 41 percent in the fall, compared to a 1950 to 1959 average of 70 percent in the spring and 30 percent in the fall. Although the 1961 figures show a marked reduction in variation from the 1950-59 average there are still 18 percent more sows farrowed in the spring.

Take a look at Table 1 for the percent of sows farrowed each month. This shows that in 1961 the highest percentage of sows were farrowed in April, March, September and May, with $\frac{1}{5}$ of the total sows being farrowed in the month of April. If the average age of the pigs at market time in Nebraska is 196 days, these April pigs are marketed in early November when the average seasonal price is lowest (see Table 1 and Figure 1). Therefore in planning a farrowing schedule, attention should be given to the months of least farrowing. Table 1 shows these months to be December, November and January. Thus hogs farrowed in December will be on the market in late June or early July when the average seasonal prices are the highest. Careful planning on time of farrowing may considerably affect total dollars in the pocket book. If you are marketing your hogs in less than 196 days you should plan farrowing schedules accordingly.

The normal trend in past years of increasing hog numbers has been for much of the increase to come from spring farrowing during March, April, and May. This results in a high percentage of hogs being marketed during the months of low prices. Much of this is the work of inners and outers who get in on a high market and sell most of their market pigs during the late fall.

Another factor to consider is the number of times to farrow during a year. Operations range from producers who farrow once a year to those who farrow continually. As the trend continues to more uniform farrowing the year around, the need for housing to farrow in mid-winter and during the hot summer increases. This increased housing requirement probably has been the main reason many producers continue to farrow once or twice a year. However, if the price fluctuations shown in Figure 1 continue it appears it would pay to invest in the extra equipment required for multiple farrowing.

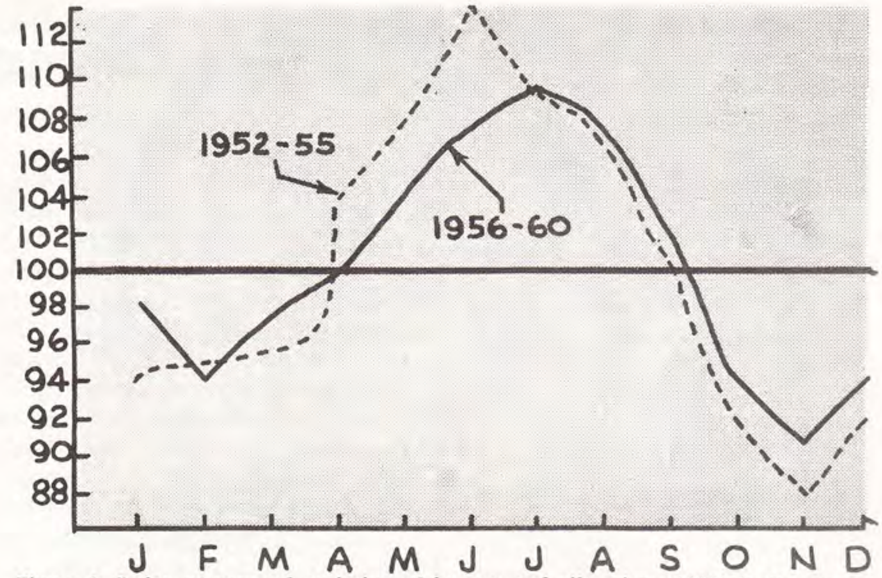


Figure 1—Index of seasonal variation of barrow and gilt prices (100% is the average price during the 1952-1960 period).

Feeding Cost and Level of Feeding

The producer should consider using home grown grains whenever possible as long as Nebraska continues to have a surplus of feed grain. With feed being 70 percent of the cost of production it will be the biggest opportunity to save money. Whether it will be cheaper to mix and grind on the farm or have it commercially mixed and ground can only be determined by comparing costs. Accurate feed records must be kept.

It is disheartening to see many farms where ear corn is still thrown on the ground (and usually in the mud) for feeding hogs. Probably no other change could increase the efficiency of these hog operations more than self feeders or feeding floors. It is, no doubt, some of these farms that are reporting feed conversion ratios of seven to eight pounds of feed per pound of gain.

Breeding also plays a major role in good feed conversion. Studies have shown that around 40 percent of the variation in feed conversion can be attributed to the breeding or genetics of the animals. This means that it is very worth while to have knowledge of the feed conversion ability of the boar. How many producers still buy a boar with only one thing in mind, a sow freshener? A top, efficient, producer must pay attention to records of growth rate and feed efficiency on potential stock. Numerous breeders have complete sets of records available to buyers.

Quality and Weight

An important final consideration is the quality of the product produced. Nebraska figures indicate that the average market hog weighs 229 pounds with 30 to 35 percent grading No. 1 and the rest primar-

Table 1. Pigs saved in Nebraska (thousands).

Spring			Fall			Total		
1950-59	1960	1961	1950-59	1960	1961	1950-59	1960	1961
2,871 70%	2,261 57%	2,632 59%	1,266 30%	1,711 43%	1,848 41%	4,138 100%	3,972 100%	4,480 100%

Percent of Nebraska Sows Farrowed by Months

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1961	4.4	7.3	13.3	20.4	11.3	6.0	4.6	7.7	11.8	7.6	3.3	2.4
1960	4.4	8.6	14.1	16.8	10.4	5.8	4.6	8.1	12.4	8.7	3.3	2.7
1955–59	4.1	9.1	18.4	20.8	11.9	4.9	3.8	6.7	10.4	5.6	2.6	1.7

Average Nebraska Prices (1950-58)

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
17.41	18.26	18.37	18.79	19.40	19.30	19.30	19.76	19.24	18.05	16.78	16.87

Table 2. 1960 report.

Age at marketing	Percent
21 weeks or less	1.4
22 to 25 weeks	32.1
26 to 30 weeks	53.6
31 weeks and over	12.9

Weight at marketing	Percent
199 lbs. or less	.5
200 to 209 lbs.	4.6
210 to 219 lbs.	12.1
220 to 229 lbs.	31.3
230 to 239 lbs.	25.2
240 lbs. and over	26.3

ily No. 2 and No. 3. Though it is important to have an efficient operation, it is also important to produce a product highly desired by the consumer. Otherwise, there will be little demand for pork.

Breeding is a major factor affecting the percentage of lean meat in the carcass. The producer should evaluate very carefully the meatiness of the boars and gilts he buys so that the end product he sells, the pork carcass, will yield a high percentage of lean cuts. The only way the commercial producer can evaluate his breeding animals is through carcass information on offspring.

A second factor is the weight of the market hog. After a hog reaches 225 pounds a higher percentage of the weight added to the animal is fat, a product not desired by the consumer. This is why hogs should be marketed between 200 and 225 pounds.

Nebraska records in 1960 show an average weight of 229 pounds, with 52 percent of the market pigs weighing over 230 pounds. It is easy to estimate that pigs weigh 215 pounds when they actually weigh 235 pounds. The producer should have an accurate way of knowing their weight (a scale). In years of ample corn production there has been a tendency to market hogs at a heavier weight rather than feed more pigs to a lighter weight. Producing hogs of heavy weights and with a low percentage of lean cuts will only help reduce the demand for pork.

Good Construction Is Important in Your

E. A. Olson

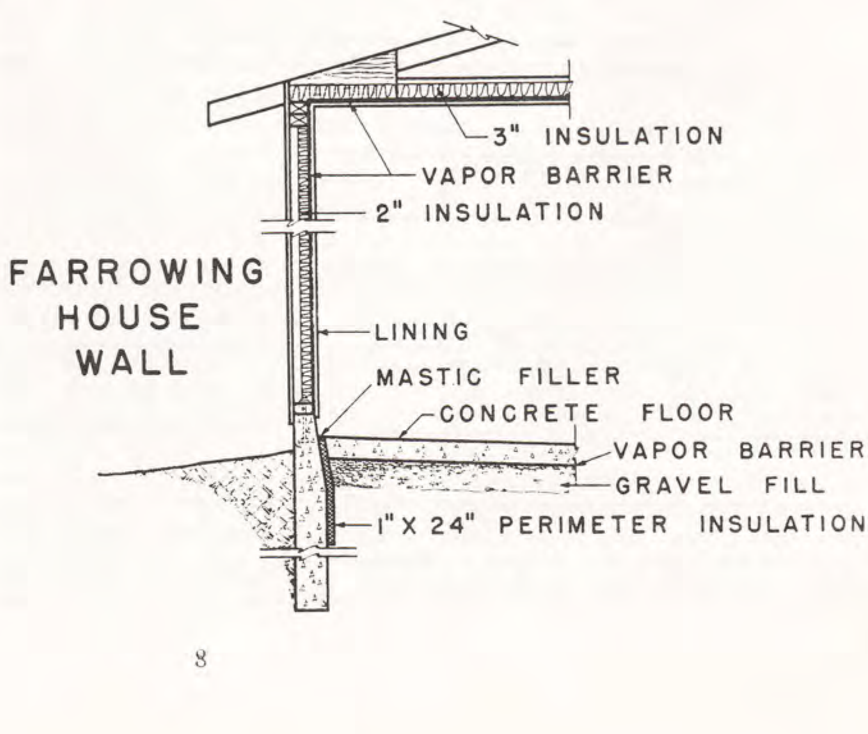
Farrowing houses should provide comfort, protection and sanitary conditions for the survival and rapid growth of new baby pigs. The importance of good quality housing has increased with the growth of the practice of multiple farrowing. If central farrowing facilities are used, the added cost of winterizing a house is more than offset by using it four or five times per year instead of once or twice.

Choose A Well Drained Site. In selecting the site for new swine facilities, try to pick an area that is well drained with a south slope. When good drainage is not available, earth filling should be considered. A topographic survey of the area can be a big help in determining where cuts and fills should be made to get a dry location. If a lagoon is used for manure disposal, the earth excavated can be used in fills that might be needed.

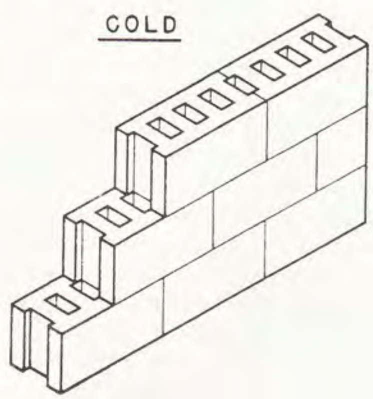
Put Your Plans On Paper. Getting your ideas on paper will help avoid costly mistakes. The farrowing house should be given first priority in planning the location of swine facilities. Consider how you will get sows to and from the building, and what driveway or traffic space you will need for providing feed and removing manure. Keep the location of your residence in mind. Odors from hogs can be very disagreeable. Putting the hogs generally east or northeast of the dwelling is usually best in Nebraska. If there are local conditions that affect wind direction, keep these in mind.

The modern farrowing house with floor, walls, and ceiling insulated, running water, ventilation, and heat in the floor, is almost as complicated as a dwelling. Combining all of these properly with the desired arrangement of equipment is a real challenge. Getting your plans on paper will permit you to erase and change mistakes before the building is started. Try to include all features such as floor construction, drains, ventilation, and water lines. Experience has shown that this procedure will help you get a more satisfactory house for less money and labor.

Quarter inch cross-section or graph paper will help you save time in getting your plans on paper. See your county Extension agent for ideas. He has several proven plans with ideas you may



WALL CONSTRUCTION



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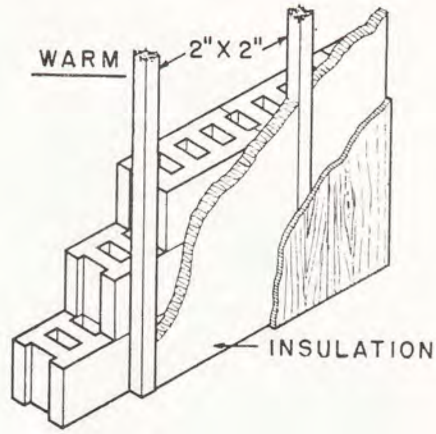

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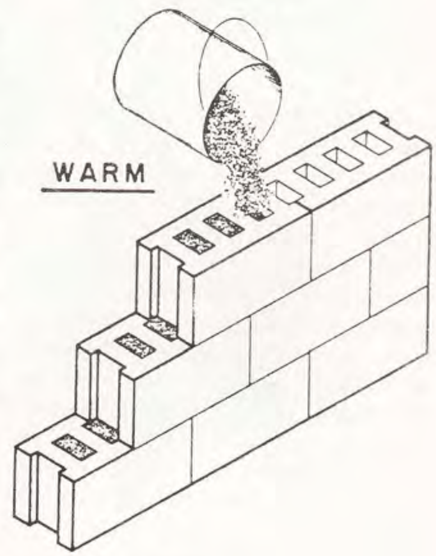


LIGHT WEIGHT BLOCK INSULATION IN CORES

find helpful. Most plans have a complete list of materials—this will help you get a quick estimate of material costs.

Some general ideas for central farrowing house construction are:

Building Width. Central farrowing houses generally have a service alley with rows of farrowing stalls or pens along the sides. Farrowing stalls permit backing the sows out frequently for watering and feeding outside of the building. This takes time but helps reduce cleaning, since most manure and urine will be deposited outside. A minimum width for this arrangement would be about 22 feet. This allows eight feet for the length of the farrowing stall and six feet for the central alley. A wider alley of 8 to 10 feet is sometimes used, but there is seldom an advantage in this additional space. Also, the wide alley requires larger doors which are hard to close tight, thus making it harder to keep the house warm.

Some operators prefer stalls that can open at either end. This makes it easier to get the sows out for water and feed, but requires an additional alley along the outside of the house. In this case, if all alleys are four feet wide the building width will be 28 feet. This arrangement is more convenient for the operator. Probably this three-alley layout cannot be justified unless sows are farrowed more than four times per year.

Floors Should Be Warm and Dry. Most producers prefer concrete floors since they are practical, durable, and easily cleaned. A warm and dry floor requires a well drained site, perimeter insulation and a vapor barrier.

Perimeter insulation should be installed along the inside surface of the foundation wall before the concrete floor is poured. To insure good results, use a waterproof insulation such as styrofoam, Flexcel, Fiberglas, or similar material at least one inch thick and 24 inches wide. Your lumber dealer should be able to supply you with the correct type of material.

Sometimes insulation is recommended under the floor, particularly if electric floor heat is used. This may reduce heat loss slightly; however, research indicates the saving does not justify the added cost. If a new floor is placed over an existing floor, an insulation strip 24 inches wide could be used under the floor in conjunction with a vertical strip next to the foundation.

After the earth has been shaped and well compacted, use a four to six inch fill of gravel or crushed rock to bring the finished floor to the desired elevation. To keep groundwater from coming up into the floor, place a vapor barrier of 55 pound asphalt roofing or six mil plastic over the rock fill. Set screed boards for striking off the concrete floor to the proper slope. A slope of one-half inch per foot from the wall to central alley is considered ample, although some operators prefer more. Unless the floor will carry heavy traffic, four inches of good quality concrete is thick enough. To keep the concrete floor from being slick, finish it with a wood float instead of a steel trowel.

The concrete should be kept wet for at least 5 days to allow it to cure properly. Properly cured concrete will be stronger and wear better. Cover the concrete with hay, straw, plastic, canvas or other material for proper curing.

Alleys will be drier if they are high in the middle and slope to the sides. Slope the floor at the edges of the alley to floor drains spaced along the sides of the walkway.

Walls—Insulate To Keep The House Warm. The walls and ceiling of a farrowing house need to be warm, dry, and easy to clean. This will help control disease, make the house more comfortable

(continued on next page)

for pigs and operator, and make it easier to remove excess moisture by ventilation.

This means that walls should be well insulated. For wood or metal construction, two inches of insulation in the walls is advisable. Most materials have about the same insulating value per inch of thickness, although many new materials, such as foamed plastic, are being developed which are better. Keep the wall and ceiling insulation dry. While batt or blanket insulation has a vapor barrier on one side, it is advisable to provide additional protection. Cover the inside wall surface with a 4 mil plastic sheet over the insulation and before the inside wall lining is applied. This will act as a *vapor barrier* and help keep the insulation dry.

Outside wall covering may be drop siding, corrugated metal, wood siding or exterior plywood. Plywood provides good wall bracing and eliminates the need for wind bracing. Experience has shown that 3/8 inch sheets are adequate. When metal covering is used, be sure to fasten with plenty of nails. Use nails with annular ringed shanks in preference to ordinary roofing nails. If sheathing is not used, place the metal corrugated sheets horizontally, or at right angles to the wall studs.

For lining the inside of the house, exterior plywood, corrugated metal (2 oz. zinc coating), cement—asbestos, or ship-lap boards can be used. At least two coats of a good quality, light colored paint will make the house lighter and easier to keep clean.

If concrete masonry is used, a light-weight concrete block is better than the regular sand-gravel block because of its greater insulating qualities. Producers using light-weight blocks report satisfactory results when the block cores are filled with a granular type of insulation. A 12-inch block is best for reducing the tendency to "sweat."

To protect the block and to make the house easier to clean, a cement paint should be applied both inside and out. This paint will seal the wall and keep out moisture that will reduce the effectiveness of the insulation.

If regular sand-gravel block is used for the wall, its insulating value can be improved with one-inch water and vapor proof rigid insulation cemented to the inside of the wall and coated with a cement mortar plaster. Another possibility would be to furr-out the wall. Two by two inch wood strips are nailed on vertically with concrete nails. They are spaced 16 or 24 inches on center. Insulation is placed between these strips and a vapor barrier and wall covering applied as for frame construction.

A ceiling will make the conventional gable-roofed house warmer and easier to ventilate. Because of a greater heat loss in the ceiling, use three inches of insulation. Also use a vapor barrier and lining under the insulation.

Ventilate To Remove Excess Moisture. Ventilating removes heat as well as moisture; hence, the amount of ventilation should be carefully controlled. Air flow can best be controlled by thermostat-operated fans. Forced air systems are recommended for properly insulated farrowing houses because of their positive action.

A new system of ventilating the individual stall or pen is shown in a new Midwest farrowing house plan. Copies of plans 72671 and 72672 are available from your County Extension Office.

Additional references on farrowing housing, available from your County Extension office are:

E.C. 59-708, "Swine Equipment Plans." USDA, Misc. Publication 744, "Hog Houses."

These publications are available from the sources indicated:

University of Illinois, Agricultural Engineering Department—Circular 780, "Hog Farrowing Houses and Equipment." Circular 830, "Electric Heating Cable for Swine."

Portland Cement Association, 720 City National Bank Building, Omaha, Nebraska—F6, "Modern Improvements For Top Pork Production."

MILO-The Future

D. B. Hudman

Milo has become second in importance to corn as a feed grain for hogs in Nebraska within the last ten years. This has been because its production rate has jumped to almost 20 times the rate ten years ago. Nebraska has about 80 million bushels of milo available per year for feed grain, or potentially enough to feed over 11,400,000 pigs from 40 to 200 pounds of body weight. This is about 2½ times as many pigs as were marketed in Nebraska in 1961.

Milo has become a quite popular swine feed because of recent findings. Research has shown that protein is the primary nutrient to be considered in the feeding of milo in pork production.

Factors to Consider

1. Milo has great variation in protein content—6 to 12 percent. With these extremes, the performance of pigs fed milo rations has not been uniformly satisfactory.

Therefore, milo should be analyzed for protein content and fed according to recommendations given in Tables 1 and 2.

In general, milo that contains 10 percent or more protein can be substituted for corn on a pound for pound basis.

2. Milo rations are not quite as well balanced for amino acid as corn rations when soybean meal is the primary protein supplement. Milo-soybean meal rations are definitely deficient in the amino acid, lysine. Results from the Nebraska station indicate that milo rations should contain 2 percent more protein than corn rations or should be supplemented with lysine to produce comparable pig gains. However, about 5 percent more feed is required per pound of gain.

3. Milo-fed pigs produce carcasses of comparable quality to corn-fed pigs. Carcass data from the Nebraska station showed little or no difference in the backfat thickness,

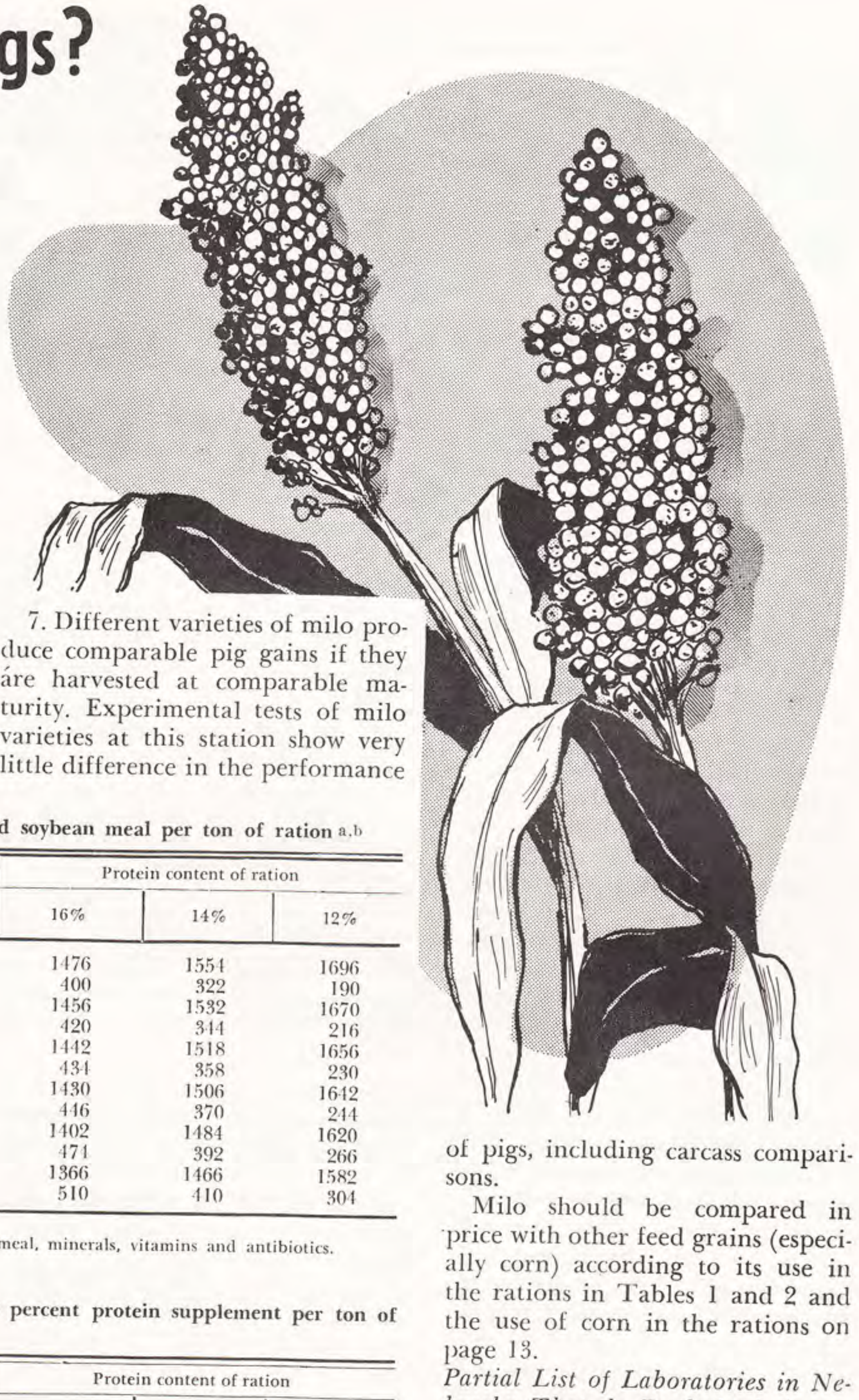
Feed Grain of Hogs?

percent of lean cuts, percent of ham and loin, carcass length, loineye area or dressing percentage of pigs fed milo or corn rations.

4. Milo has a tendency to have a hard outer coat. Therefore, it is recommended that milo be ground, cracked or rolled before feeding.

5. Ground milo will waste easier than ground corn, therefore, a tighter feeder may be needed. This waste may account for the higher amount of feed required when milo is fed in place of corn.

6. Milo has little or no vitamin A activity, so rations containing milo will need larger supplements of vitamin A than rations containing yellow corn. Vitamin A supplements are cheap. They should not cost more than 30 cents per ton of complete mixed ration.



7. Different varieties of milo produce comparable pig gains if they áre harvested at comparable maturity. Experimental tests of milo varieties at this station show very little difference in the performance of pigs, including carcass comparisons.

Milo should be compared in price with other feed grains (especially corn) according to its use in the rations in Tables 1 and 2 and the use of corn in the rations on page 13.

Table 1. Recommended levels of milo and soybean meal per ton of ration [a,b]

Protein content of milo	Feed ingredient	Protein content of ration		
		16%	14%	12%
11%	milo	1476	1554	1696
	44% soybean meal	400	322	190
10%	milo	1456	1532	1670
	44% soybean meal	420	344	216
9%	milo	1442	1518	1656
	44% soybean meal	434	358	230
8%	milo	1430	1506	1642
	44% soybean meal	446	370	244
7%	milo	1402	1484	1620
	44% soybean meal	471	392	266
6%	milo	1366	1466	1582
	44% soybean meal	510	410	304

[a] Based on rations listed on page 13.
[b] Other feed ingredients include dehydrated alfalfa meal, minerals, vitamins and antibiotics.

Table 2. Recommended levels of milo and 36 percent protein supplement per ton of ration [a]

Protein content of milo	Feed ingredient	Protein content of ration		
		16%	14%	12%
11%	milo	1482	1588	1752
	36% protein supplement	518	412	238
10%	milo	1456	1560	1720
	36% protein supplement	544	440	270
9%	milo	1432	1534	1688
	36% protein supplement	568	466	302
8%	milo	1412	1514	1666
	36% protein supplement	588	486	324
7%	milo	1380	1492	1642
	36% protein supplement	620	508	348
6%	milo	1334	1468	1582
	36% protein supplement	666	532	408

[a] Based on rations listed on page 13.
[b] Ten pounds of ground limestone should be incorporated in each ton of 12% protein ration.

Partial List of Laboratories in Nebraska That do Feed Analysis

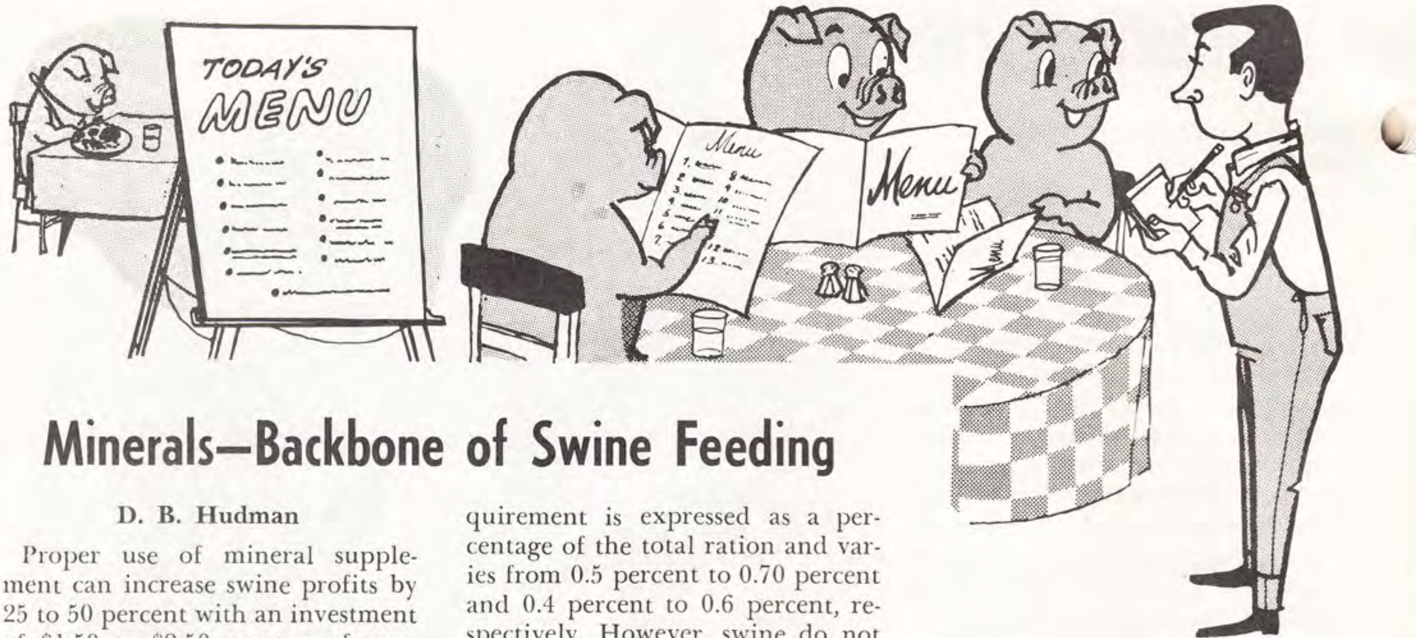
Doty Laboratories – Grain Exchange, Omaha, Nebraska

Harris Laboratories, Inc. – 624 Peach, Lincoln, Nebraska

Lexington Laboratories–Lexington, Nebraska

Midwest Testing Laboratories–826 North 76th Street, Omaha, Nebraska

Omaha Grain Exchange Laboratory–Grain Exchange Bldg., Omaha, Nebr.



Minerals—Backbone of Swine Feeding

D. B. Hudman

Proper use of mineral supplement can increase swine profits by 25 to 50 percent with an investment of $1.50 to $2.50 per ton of complete feed. The increased profits come primarily from a reduction of feed required per animal and increased average daily gains.

There are 13 mineral elements essential in swine nutrition. Of these, only seven must be supplied as special supplements. They are calcium, phosphorus, sodium, chlorine, iodine, iron and zinc. Common swine feed ingredients usually contain enough of the other six.

Minerals may be supplied in three ways: (1) as a part of a complete mixed ration, (2) as a part of a protein supplement or (3) as a separate mineral supplement. The first method is best because every pound of feed should have the required minerals at the required level and ratio. The second and third methods create some problems because protein supplements and mineral supplements are consumed at different rates from day to day. Therefore, mineral levels and ratios would vary from day to day.

Calcium and Phosphorus

Calcium and phosphorus are the primary minerals in swine feeding. They make up over 70 percent of the minerals in the pig's body. Eighty percent of the phosphorus and 99 percent of the calcium are present in the bones and teeth.

The calcium and phosphorus requirement is expressed as a percentage of the total ration and varies from 0.5 percent to 0.70 percent and 0.4 percent to 0.6 percent, respectively. However, swine do not utilize all sources of phosphorus equally.

Much of the phosphorus from plant feedstuffs (corn, milo, soybean meal, wheat, bran, etc.) occurs in the form of phytin which is only partially available to the pig. Only about 30 to 50 percent of the phosphorus from plants will be utilized by the pig. On the other hand, calcium and phosphorus supplements (steamed bone meal and dicalcium phosphate) are utilized efficiently.

Therefore, when rations are formulated with grain and soybean meal the phosphorus level should be increased about 0.1 to 0.20 percent. This can be done by using the calcium requirement as the required level for both calcium and phosphorus. The calcium to phosphorus ratio in all-plant rations then would be 1 to 1 (i.e., 0.65 percent calcium and 0.65 percent phosphorus). On this basis the calcium to phosphorus (utilizable phosphorus) ratio will never be greater than 1.25 to 1 for any group of swine regardless of the source of phosphorus.

The simple addition of a calcium-phosphorus mineral supplement to a complete ration that has an excessive level of calcium will not correct the calcium to phosphorus ratio. Monosodium phosphate or disodium phosphate should be used to correct the calcium to phosphorus ratio. The ratio of calcium to phosphorus is probably more important than the actual level of the two minerals.

It is recommended that the level of calcium in swine rations not exceed 0.8 percent. Higher levels may decrease pig gains and feed efficiency and increase the requirement for other minerals. Calcium and phosphorus should be furnished by supplements that have been defluorinated (fluorine driven off so that there is less than one part of fluorine to 40 parts of phosphorus).

Sodium and Chlorine

The sodium and chlorine requirement is usually met by feeding common salt at a rate of 0.5 percent in complete rations or 2.0 to 3.0 percent in protein supplements. Salt is a cheap source of sodium and chlorine. Research work at Indiana shows that one pound of salt can save about 185 pounds of feed when added at the 0.5 percent level to an all-plant protein (soybean meal) ration. On this basis a four cent investment in salt means a saving of about $5.50 in feed.

Salt can be toxic to swine when, (1) it has been omitted from feeds for a period of time and then fed at a high level, or (2) if water intake is restricted while pigs have

Table 1. Mineral deficiency symptoms, sources and recommended levels.

Mineral	Deficiency symptoms	Mineral source	Amount needed per ton of corn-soybean meat rations			
			16% Protein	14% Protein	12% Protein	36% Protein
Calcium and Phosphorus	a. poor growth b. loss of appetite c. lameness and stiffness d. impaired reproduction, weak and or stillborn e. weakened bone structure f. posterior paralysis in pregnant sows at farrowing g. depraved appetite (chewing on wood, stones, bones, etc.)	Dicalcium phosphate and	38 lbs.	38 lbs.	26 lbs.	180 lbs.
		ground limestone (ground oyster shell)	4 lbs.	4 lbs.	6 lbs.	......
		or				
		Steamed bonemeal	58 lbs.	58 lbs.	40 lbs.	......
		Other sources [a] (calcium and phosphorus) Defluorinated phosphates (phosphorus only) Monosodium phosphate Disodium phosphate				
Sodium and Chlorine	a. loss of appetite b. poor growth c. lack of thrift d. depraved appetite e. lowered milk production	Salt	10 lbs.	10 lbs.	10 lbs.	50 lbs.
		Other sources [a] Trace mineral mixes	....	....	....	......
		Trace mineralized salt	....	....	....	......
Iodine	a. hairless pigs farrowed b. dead or weak at birth c. impaired reproduction d. rough hair and skin e. undeveloped hoof walls f. bloated, pulpy condition about neck	Iodized salt	10 lbs.	10 lbs.	10 lbs.	50 lbs.
		Other sources [a] Trace mineral mixes	....	....	....	......
		Trace mineralized salt	....	....	....	......
Iron	a. paleness of colored skin b. paleness of mucous membranes (mouth, lips, etc.) c. drawn expression about forehead and eyes d. thickened, watery, wrinkled skin about neck and head e. thumps (labored breathing)	Iron-polysaccharide injections (100-150 mg. iron per pig at 3 days of age) Access to soil Pills, liquid or paste containing ferrous iron				
Zinc	a. parakeratosis (mangy appearance) b. reduced appetite and growth rate c. diarrhea and vomiting	Zinc carbonate	0.2 lb.	0.2 lb.	0.2 lb.	1.0 lb.
		Zinc oxide	0.14 lb.	0.14 lb.	0.14 lb.	0.7 lb.
		Zince sulfate	0.3 lb.	0.3 lb.	0.3 lb.	1.5 lbs.
		Other sources [a] Trace mineral mixes Trace mineralized salt				

[a] Variable mineral content.

access to feeds containing high levels of salt (over 2% of the daily feed intake).

Iodine

Iodine supplementation is needed primarily in rations for bred sows. This can be furnished by iodized salt, trace mineralized salt or trace mineral mixes. The effect of iodine becomes apparent in baby pigs farrowed from sows deficient in iodine. The baby pigs are usually born without hair and die soon after birth. The iodine requirement is very small and can be satisfied by using 0.5% iodized salt in swine rations or 2.0-3.0% of iodized salt in a protein supplement. Also, trace mineralized salt and trace mineral mixes may be used to supply the proper level of iodine in swine rations.

(continued on next page)

Table 2. Mineral needs in swine rations designed for home-mixing

Ingredient	Grower 16% Protein	14% Protein	12% Protein	Supplement[a] 36% Protein
Ground corn	1456	1552	1676	......
44% soybean meal	420.	324	210	1535
17% dehydrated alfalfa meal	50	50	50	175
Ground limestone	4[b]	4[b]	6[c]	......
Dicalcium phosphate	38[b]	38[b]	26[c]	180
Salt (Iodized)[d]	10	10	10	50
Trace minerals (high zinc, swine)[d]	2	2	2	10
Vitamin-antibiotic mix[e]	20	20	20	50
	2000	2000	2000	2000
Calculated % Calcium	.66	.65	.55	2.7
% Phosphorus	.65	.64	.52	2.1

a Amt. 36% protein supplement and corn req./ton of feed for:

	% in complete feed Ca	P
16% Protein—1460 lbs. of corn + 540 lbs. of supplement	.80	.75
14% Protein—1600 lbs. of corn + 400 lbs. of supplement	.62	.62
12% Protein—1740 lbs. of corn + 250 lbs. of supplement + 10 lbs. of ground limestone	.55	.54

b Ground limestone and dicalcium phosphate can be replaced by 58 lbs. of steamed bonemeal.
c Ground limestone and dicalcium phosphate can be replaced by 40 lbs. of steamed bonemeal.
d Can be replaced by trace mineralized salt.
e Vitamin-antibiotic supplementation—per ton of ration:

Vitamin A, I.U.	2,000,000	2,000,000	2,000,000	10,000,000
Vitamin D, I.U.	360,000	360,000	360,000	1,800,000
Riboflavin, Mg.	2,500	1,500	1,500	12,000
Niacin, Mg.	4,000	2,000	4,000	20,000
Calcium Pantothenate, Mg.	9,600	6,000	6,000	48,000
Choline Chloride, Mg.	100,000	100,000	100,000	500,000
Vitamin B_{12}, Mcg.	15,000	10,000	10,000	80,000
Antibiotic, Mg.	40,000	20,000	20,000	200,000

Iron

Iron is a component of blood. Its primary function in swine is to prevent pig anemia. Suckling pigs are more susceptible to anemia than older pigs due to their small reserve of iron at farrowing, the low iron content of sow's milk and the failure of pigs to consume dry feeds (creep rations) soon after birth.

The iron requirements of the suckling pig may be provided by: (1) allowing the pig access to clean sod, (2) giving iron pills, paste or liquid solutions of iron or (3) injecting with commercially-prepared iron compounds.

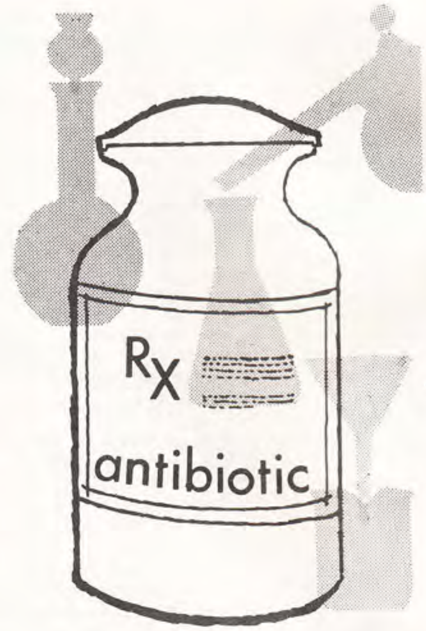
Zinc

The need for supplemental zinc in swine rations has become more apparent due to the use of corn-soybean meal rations and the increase of confinement feeding. Corn-soybean meal rations tend to have less zinc than rations containing animal protein (tankage and meat and bone scraps) because of the lower level of zinc in soybean meal. Also, green forage (pasture) and access to soil tends more nearly to meet the pig's need for zinc than feeding in confinement.

Research has shown that the need for zinc increases as calcium increases in the ration, especially if the calcium in the ration exceeds the pig's requirement. Therefore, the calcium content of the ration must be considered when determining the zinc requirement. The zinc requirement can be met by supplementing rations with trace mineral mixes, trace mineralized salts or single zinc-containing compounds such as zinc carbonate, zinc oxide and zinc sulfate. The zinc level needed for all pig rations is about 45-50 grams per ton or the amounts of zinc carbonate, zinc oxide or zinc sulfate shown in Table 1. If the calcium level of the ration is unavoidably above 0.8%, the zinc level should be doubled (90-100 grams per ton).

Mineral deficiency symptoms, sources and recommended levels of feeding are shown in Table 1.

Effectiveness of Antibiotic Supplements



E. R. Peo, Jr.

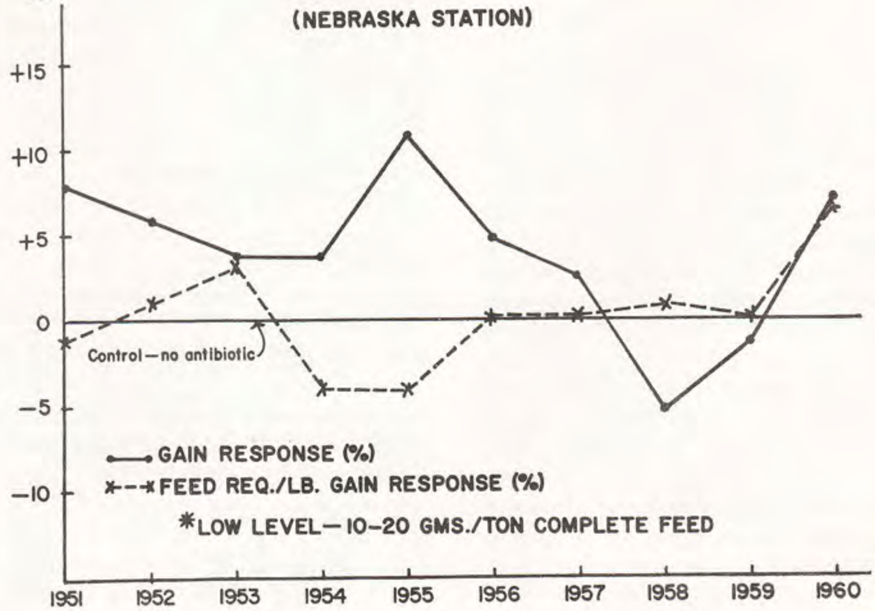
Swine fed on rations supplemented with low levels of antibiotics (10-20 gms/ton) generally gain faster and require less feed per pound of gain than swine not fed antibiotics.

However, the response obtained may vary, depending upon kind and level of antibiotic fed, length of use, season or year and disease level of a particular swine herd and/or its environment. These are conclusions from 10 years of experiments conducted at the Nebraska Station.

Yearly gain and feed efficiency (feed required per lb. of gain) response of swine fed antibiotics as compared to that of swine not fed antibiotics is shown in Figures 1, 2 and 3. Antibiotics did not always stimulate gains and improve feed conversion. As shown in Figure 1, in 1954 and 1955, gains were improved approximately 4 and 12 per cent, respectively, with antibiotics, but feed efficiency was decreased about 4 percent.

The opposite occurred in 1958 and 1959. During this period pig gains decreased but feed conversion improved slightly with antibiotics. For the balance of the 10-year period antibiotic-fed pigs made greater gains and required no more feed per pound of gain than those not fed antibiotics.

FIG. 1 YEARLY SWINE RESPONSE TO ANTIBIOTICS*
(NEBRASKA STATION)



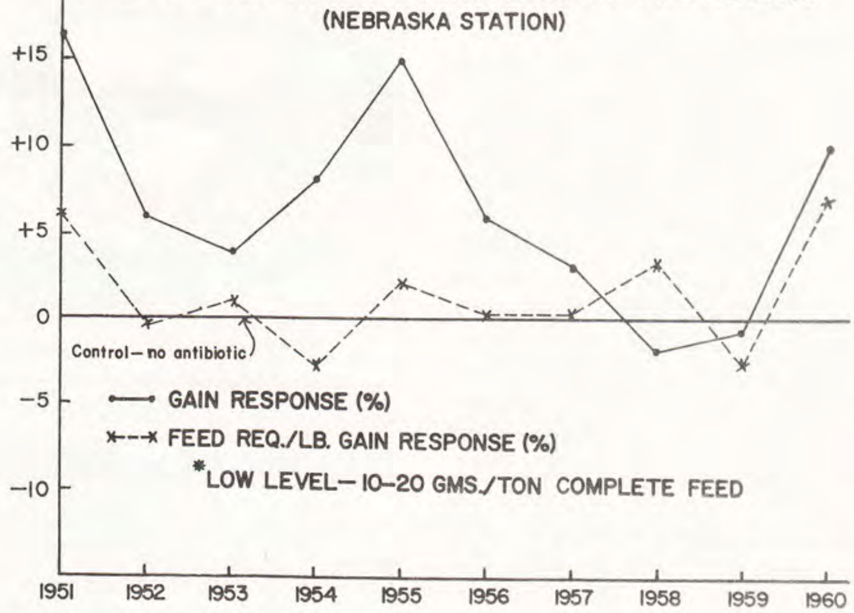
Gain response to broad spectrum antibiotics (spectrum refers to number of different types of bacteria an antibiotic will control) was greatest in 1951 and 1955 (Fig. 2). After 1955, the gain response to broad spectrum antibiotics decreased yearly and in 1958 and 1959, non-antibiotic-fed pigs gained approximately 2 percent more than pigs fed antibiotics.

In 1960 a different broad spectrum antibiotic was fed than had been used in the previous two years. The change in antibiotic probably contributed to the 10 and 7 percent improvement in gains and feed conversion, respectively. However, as shown in Figure 3, antibiotic change was not the only factor involved. In 1960, pig gains and feed efficiency were improved also by the use of narrow spectrum antibiotics, whereas, in 1958 and 1959 pigs fed narrow spectrum antibiotics gained less than, or about the same as, those not fed antibiotics. The same general picture was true for feed required per pound of gain.

Two recent experiments at the Nebraska Station further emphasize the variation in swine response —not only to types but also to levels of antibiotics. In the first experiment (Exp. 135) all antibiotics were fed at a level of 10 mg. per pound of ration, except that Oleandomycin was fed at the rate of 5 mg. per pound (see Table 1 for ration composition). As shown in Table 2, the greatest average daily gain was made by the pigs fed the ration without antibiotics. The least gain was made by pigs fed a ration supplemented with the antibiotics procaine penicillin + streptomycin. However, there were no significant differences in average daily gains. Except for the treatment in which sulfaquinoxaline + procaine penicillin + streptomycin were fed, pigs receiving antibiotics required less feed per pound of gain than those not fed antibiotics.

In the second experiment (Exp. 135-B) some changes were made in types and levels of antibiotics fed. Aureomycin was used in place of Terramycin. Tylosin replaced zinc bacitracin + procaine penicillin.

FIG. 2 YEARLY RESPONSE TO BROAD SPECTRUM ANTIBIOTICS*



The levels of procaine penicillin + streptomycin and sulfaquinoxaline + procaine penicillin + streptomycin were doubled and tripled, respectively. Oleandomycin was fed at the same level as in Experiment 135. The level selected for a particular antibiotic was based primarily on current recommendations. In addition to the antibiotic changes, the basic ration used in Experiment 135-B was also changed. Composition is given in Table 1.

The results of Experiment 135-B are summarized in Table 3. The greatest average daily gain was made by the pigs fed the basal ration plus 10 milligrams per pound of Aureomycin. Pigs fed Aureomycin gained .17 pound more per day than pigs fed the basic ration without antibiotics. The difference was significant. Pigs fed the basic ration plus 20 milligrams of procaine penicillin + streptomycin per pound

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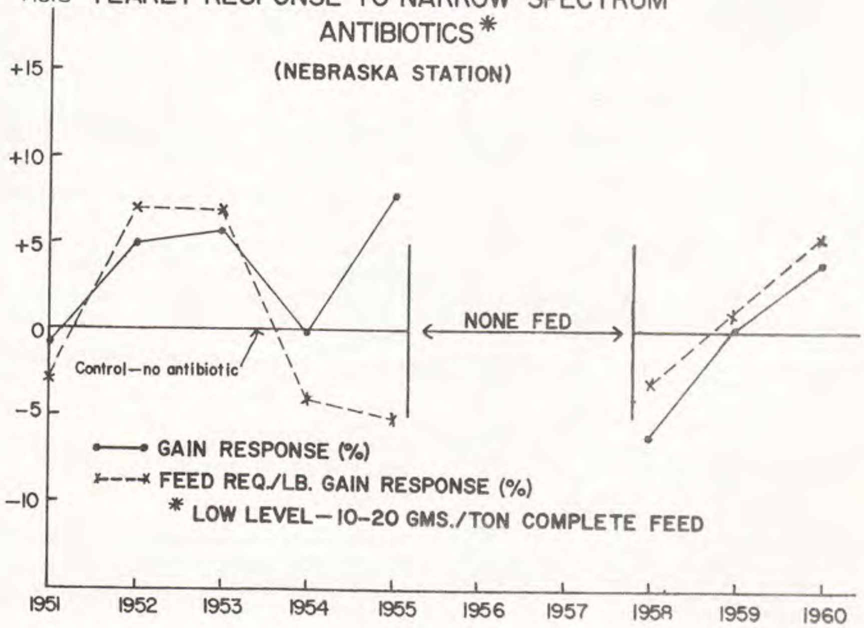
FIG. 3 YEARLY RESPONSE TO NARROW SPECTRUM ANTIBIOTICS*



also made significantly greater gains (.13 pound/day) than those not fed antibiotics.

In Experiment 135 the reverse was true. Pigs fed the unsupplemented basic ration gained .11 pound per day more than pigs fed procaine penicillin + streptomycin. The basic difference between experiments for this antibiotic was levels. Pigs fed the basic ration with Tylosin or sulfaquinoxaline + procaine penicillin + streptomycin made greater gains than those fed rations with Oleandomycin or no antibiotics. However, the differences were not significant. The feed required per pound of gain was significantly less when pigs were fed antibiotics except for those fed the basic ration plus Tylosin.

After 10 years of continuous use at the Nebraska Station it appears that antibiotics still have a beneficial effect on growth rate and feed conversion when added to swine rations at relatively low levels. Occasionally, during the period, antibiotics failed to improve gains or feed efficiency. However, since it doesn't appear possible at present to predict when antibiotics will or will not prove beneficial, their continual use is recommended. Benefits other than improved gains and feed efficiency may accrue from the use of antibiotics in swine rations.

Table 1. Composition of experimental rations.[a,b]

Ingredient	Exp. 135 (Lbs.)	Exp. 135-B (Lbs.)
Ground yellow corn	79.9	......
Ground milo	......	81.7
44% soybean meal	16.7	......
50% soybean meal	......	13.0
17% dehydrated alfalfa meal	......	2.0
Ground limestone	1.0	0.9
Steamed bonemeal	0.8	0.8
Salt (iodized)	0.5	0.5
Trace minerals	0.1	0.1
Vitamin mix[c]	1.0	1.0

[a] For experiments 135 and 135-B, respectively, calculated analysis protein, 14 and 16%; calcium 0.6 and 0.6%; phosphorus, 0.4 and 0.4%.

[b] For antibiotic additions, see tables 2 and 3.

[c] Contributed the following amounts of vitamins per pound of complete ration for experiments 135 and 135-B, respectively; Vit. A, 2000, 1920 I.U.; vit. D_2, 90, 180 I.U.; riboflavin, 1.0, 1.0 mg.; niacin, 4.5, 4.5 mg.; calcium pantothenate, 2.0, 2.0 mg.; choline chloride, 50, 50 mg.; vit. B_{12}, 5.0, 5.0 mcg.

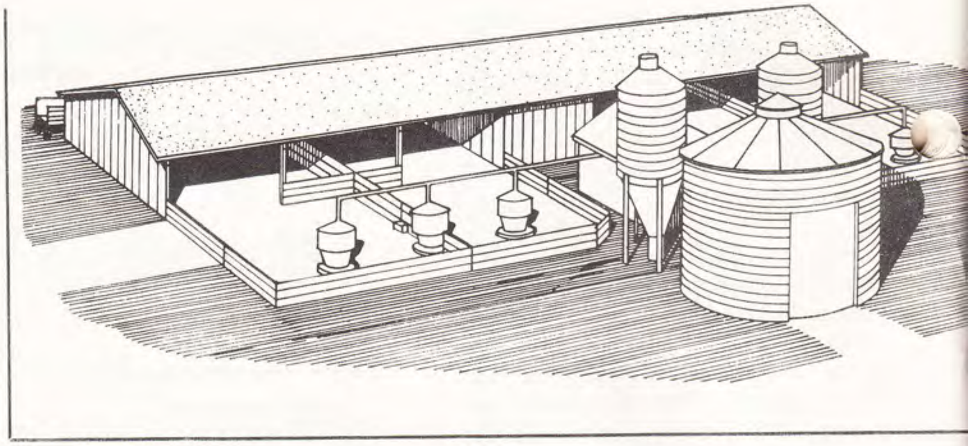


Table 2. Comparison of antibiotics for growing-finishing swine [a] (Nebr. Swine Exp. 135).

Item	Treatment[b]					
	Sulfaquinoxaline + procaine penicillin + streptomycin (10 mg/lb)	Control (no antibiotic)	Procaine penicillin + streptomycin (10 mg/lb)	Zinc bacitracin + procaine penicillin (10 mg/lb)	Oleandomycin (5 mg/lb)	Terramycin (10 mg/lb)
Pigs per pen, no.	7[c]	7[c]	7	7	7[c]	7
Pens per treatment, no.	2	2	2	2	2	2
Av. initial wt., lb.	25.6	25.0	24.6	24.7	24.7	24.7
Av. final wt., lb.	194.8	200.2	185.1	191.2	195.7	189.1
Av. daily gain, lb.[d]	1.50	1.56	1.44	1.49	1.54	1.47
Av. feed per lb. gain, lb.[d]	3.06	3.05	2.95	2.94	2.90	2.87

[a] Test conducted on concrete for 112-day period.
[b] Kind and amount of antibiotic added per lb. complete ration.
[c] One pig removed during test; data not included.
[d] Means underscored by same line are not significantly different at P = 0.05 or less.

Table 3. Comparison of antibiotics for growing-finishing swine[a] (Nebr. Swine Exp. 135-B).

Item	Treatment[b]					
	Aureomycin (10 mg/lb)	Procaine penicillin + streptomycin (20 mg/lb)	Tylosin (10 mg/lb)	Sulfaquinoxaline + procaine penicillin + streptomycin (30 mg/lb)	Oleandomycin (5 mg/lb)	Control (no antibiotic)
Pigs per pen, no.	7	7	7	7	7	7
Pens per treatment, no.	3	3	3	3	3	3
Av. initial wt., lb.	59.2	59.2	59.1	59.2	59.2	59.2
Av. final wt., lb.	188.7	185.6	181.4	180.1	177.9	176.3
Av. daily gain, lb.[c]	1.85	1.81	1.75	1.73	1.70	1.68
Av. feed per lb. gain, lb.[c, d]	3.51	3.55	3.64	3.52	3.57	3.78

a Test conducted on concrete for 70-day period.
b Kind and amount of antibiotic added per lb. complete ration.
c Means underscored by same line are not significantly different at P = 0.05 or less.
d Means underscored by broken lines are not significantly different at P = 0.05 or less.

Mechanized Hog Feeding System

M. L. Mumgaard

Better methods of preparing and handling feeds for hogs help cut costs. Some degree of mechanization is available to all hog raisers, but it requires planning. Mechanization is not simply a matter of choosing what bin or grinder to buy; it is a consideration of many things.

Corn harvesting equipment must work with the storage and conditioning equipment. The storage also must fit the processing and mixing arrangement, which in turn, complements the method of distributing the feed.

The job to be done must be analyzed and planned in terms of the entire farm and farmstead. The job includes: (1) harvesting, (2) storage, (3) processing, (4) assembling, and finally (5) distributing the feed to the hogs. All of these functions and their relationships to each other must be kept in mind when planning a mechanized system.

Four Rules

An efficient feed handling system involves four rules or principles. These are:

1. Move feed as little as possible or not at all.
2. Condense it or change its form.
3. If it must be moved, handle large amounts.
4. Make the flow of materials continuous whenever possible.

Principle 1 is very important because it will cost the least, but will take the most planning. The feed storage and processing center should be near the feeding area. This permits using the continuous flow method of getting the feed to the hogs by the use of augers. Self-feeders also permit least movement of feed because they can also serve as storage bins.

With hogs, the largest single item of feed will probably be grain, probably produced on the same farm as the hogs. The grain storage and processing unit should be so located that it will fit efficiently into the total feed handling system. The storage units should match the method of harvesting and even crop conditioning may be necessary. Getting grain out of a bin is as important as getting it into the structure. Since augers are the best grain moving tool, they should be planned into the storage unit.

Overhead gravity discharge bins are convenient but may be costly in comparison with ground level bins and auger systems. Good self-unloading bins are the metal hoppered tanks equipped with augers.

Augers vary in size from 3½" up to 12" in diameter. Augers are very flexible and inexpensive to use. All the attachments necessary for a 4" auger conveying system for a hog setup are available. Many of the new hog finishing buildings are so designed that augers are required to get the feed to the hogs. Augers allow a more flexible placement of feeders. When feeder placement is no problem, they permit greater use in cleaning and management of the hogs. With an auger feeding system, a bulk storage bin or feed processing center must be placed next to the hog finishing building.

Processing, Mixing Feed

Processing and mixing is one of the more costly parts of feed handling. Some methods are:

1. Haul the feed to town and back.
2. Have commercial grinder and mixer do the job on the farm.
3. Use a tractor powered mill.
4. Use a small electric mill-mixer combination.
5. Use a portable unit with grinder, mixer, and transport all in one unit.

Some work has been done in Illinois and other states on the probable cost of these methods. They found that having feed ground at an elevator (the farmer hauling) costs a minimum of about $5 per ton. Having the feed custom ground on the farm (including all costs) would probably cost between $2.80 and $3.60 per ton. Custom grinding costs do not vary much in relationship to the quantity. The cost varies considerably for other on-the-farm systems according to

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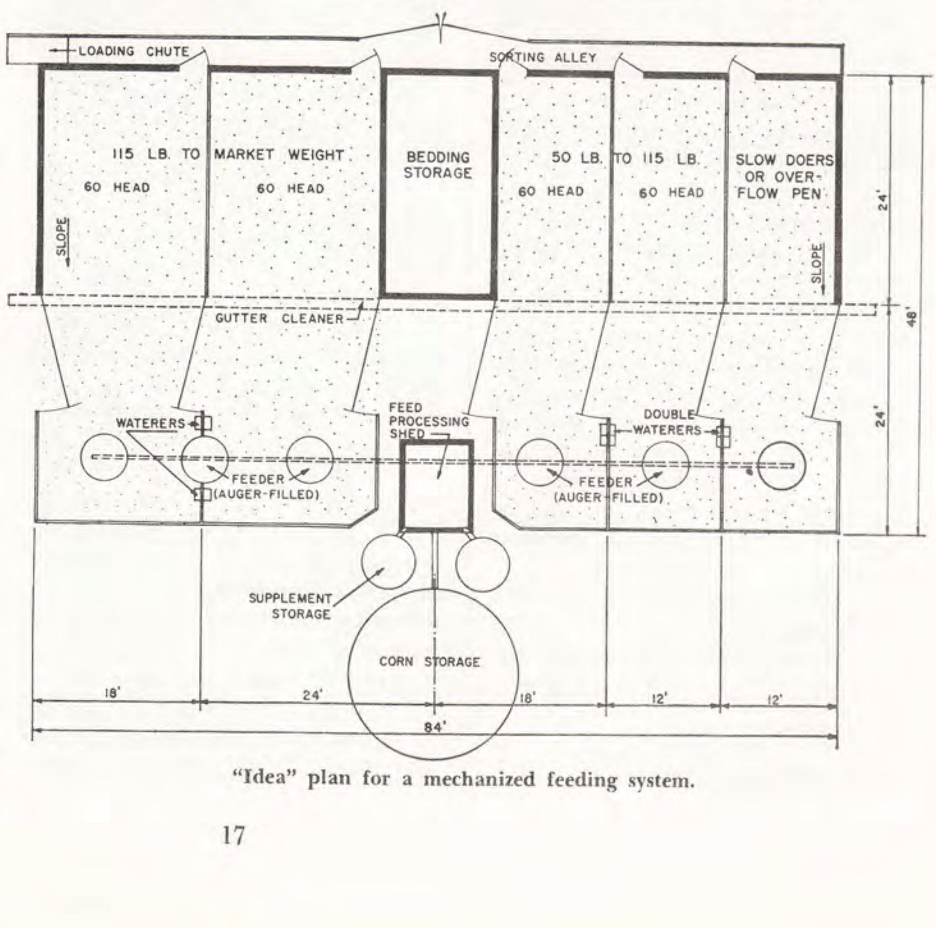


"Idea" plan for a mechanized feeding system.

the quantity processed per year. Processing 75 tons per year will cost about $3 per ton with tractor and grinder, the same as an electric mill. A portable mixing-grinder unit would be considerably higher. One hundred tons per year can be ground for about $2.80 with a tractor and $2.50 with an electric mill. At 300 tons the tractor operation still costs $2.50 and an electric mill drops to about $1 per ton.

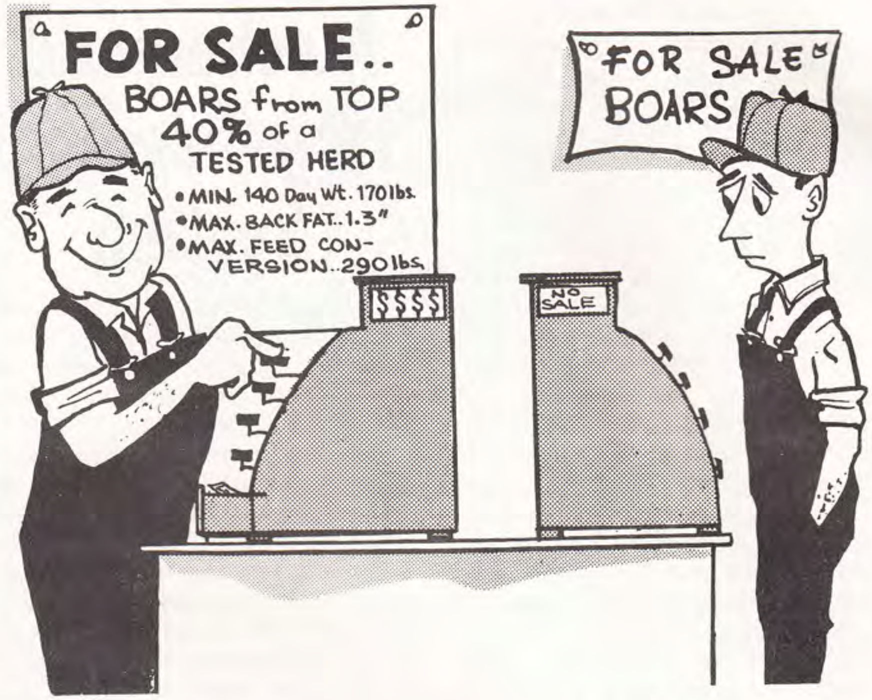
An electric mill requires a relatively high investment of around $1,200 for a complete automatic setup. This includes the mill and all the necessary bins, augers, etc. These mills meter the feed and mix it while grinding. Most of them allow at least four ingredients for each ration.

The portable mixing-grinding machine performs three operations (grinding, mixing, and transporting feed). It is designed primarily for decentralized feeding operations. It is practical if the feed is stored in various locations about the farmstead and it is not possible to get a central feed handling center. This type of mill should not be considered when starting a new feed handling system.

Summary

In summary, there are great opportunities for saving money and labor in setting up a feed handling and processing system for a hog farm. Equipment for processing and handling feed for hogs is relatively inexpensive and requires a minimum amount of power, but using it to the best advantage requires careful planning. Many things are dependent upon each other. Plans should be put on paper. These plans should include an inventory of all requirements, including amounts of feed, where it is going to be fed, and types of rations needed. Then the best location for the feed handling center must be selected, keeping in mind the four principles of feed handling.

1. Don't move it.
2. Condense it.
3. Handle larger amounts, if the distance it has to be moved is very great.
4. If at all possible, make the flow of feed continuous.



What Are Records Worth?

L. J. Sumption

Increasing the frequency of genes for rapid, efficient, lean body growth is the greatest challenge and opportunity ever presented to swine breeders. Methods are available *now* to build the kind of market pig needed in the future. The major job is to encourage the widespread use of existing knowledge through education and the competitive efforts of individual breeders.

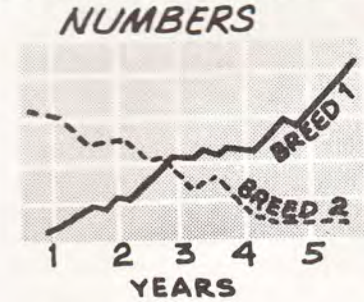
Selection is the most powerful genetic tool the swine breeder has. The genetic progress breeders can make toward the efficient production of lean pork depends on the availability and effective use of facts. *These facts are records of performance.*

Efficient commercial swine production requires superior performing boars of 3 or 4 breeds to maximize hybrid vigor through systematic crossbreeding. None of the present breeds have a guaranteed position in the future boar market. Their popularity will depend on the performance of their crossbred progeny. Therefore, there will be intense selection *between breeds* as well as within.

More "Good Ones" Needed

There has been a drastic change in numbers of some breeds in the past decade. The breeds that have improved their genetic potential for efficient lean growth have increased. Others have decreased sharply. These trends will probably continue at a faster rate. It is possible that some breeds will disappear completely. Apparently there is now a much better understanding of the misleading phrase, "there are good ones in every breed." The

CHANGES IN BREED NUMBERS



important thing to breeders and commercial producers is that there be a *high frequency* of "good ones" in the breeds they use.

The breed organizations and individual breeders with the foresight and determination to start a sound selection program (and carry it through) can dominate the swine industry in ten years or less.

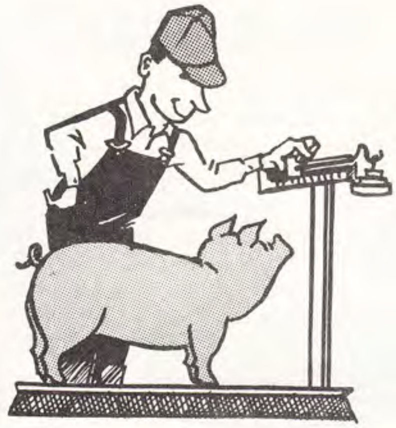
Detailed performance records were once considered a short term fad; now they are an economic necessity. The essential records include growth rate, probe backfat thickness and carcass data.

Litter size is not emphasized (though pigs will be counted anyway) because there is little chance of improving fertility by selection. We know that growth rate and backfat thickness will respond to selection. We know that when growth rate is improved, feed per pound of gain is reduced. However, this approach is not as accurate as selecting directly for feed efficiency. It will become increasingly important to select for feed efficiency by keeping records on feed consumption. Some Nebraska breeders are now obtaining feed data on all or part of their herds. Several breeders are preparing to individually feed a large number of boars.

Carcass Data Necessary

Finally, the serious swine breeder should obtain carcass data periodically on a sizable number of pigs from his herd to get an idea of what progress he is making. He must be able to offer current evidence to his customers that his fast growing, efficient pigs with low backfat thickness are producing carcasses superior in quality to the general market run.

For maximum improvement, performance records should be obtained on a *herd basis*. The breeder needs this information to select replacement stock intelligently and to know afterward how much selection he actually practiced. Methods of using records in an improvement program were discussed in the last Swine Report (No. 372). Complete herd records will help the prospective purchaser of breed-



ing stock compare the merit of the stock offered for sale to the herd average.

The cost and time required are sometimes considered to be major barriers to collecting essential performance records. It is surprising how many Nebraska breeders who used to sell several hundred boars a year don't have a scale on the place that would weigh a 200 pound pig. The annual cost of owning and using an adequate scale might amount to about 10¢-15¢ per animal. Anyone can learn to do an acceptable job of backfat probing in 30 minutes. The annual cost of collecting backfat data in most Nebraska herds would be one day's time and a 25¢ steel ruler.

Most packing firms now can provide carcass data to breeders for a nominal service fee. The cost of collecting the records can be offset by the immediate improvement in the performance of the herd, *provided the records are used to select the best stock produced.* The value of being able to sell breeding stock competitively based on performance records is an additional benefit.

Investment in the Future

The breeder might look upon selection as an investment in the future of his own business. Each time he selects his top performing young stock for replacements he gains additional interest on his investment. Thus, if a breeder replaces his entire herd each year, the interest on his investment in selection can be compounded annually. As the level of performance of a herd is raised by selection, it provides a foundation upon which to build further improvement.

The problem of performance selection can be examined by looking at records from one of our University herds (Table 1).

First the average performance of the entire herd is given. The next column shows the best record made by one individual for each trait. Then note the difference between the herd average and the best record. We know that only a fraction of these differences in performance are hereditary (called heritability). For example, only 30 percent of the superiority for 140 day weight is heritable. Now, if the *extreme individual* were mated to *an average pig*, the predicted change in progeny performance for each trait is given in the last column. Many factors will affect how actual progress compares with this prediction.

(continued on next page)

Table 1. An example of how selection can work.

Trait	Herd average	Best record	Difference	Heritability	Predicted change[a]
140 day wt., lbs.	185	235	50	30%	7.5 lbs.
Backfat, inches	1.40	0.80	0.60	50%	0.15 in.
Feed/cwt., lbs.	290	230	60	30%	9.0 lbs.
Lean cuts/live wt., %	37	40	3	50%	0.75 %
Loin eye area, sq. in.	4.00	6.50	2.50	50%	0.62 sq. in.
Feed/lb. of lean cuts	7.84	5.75			

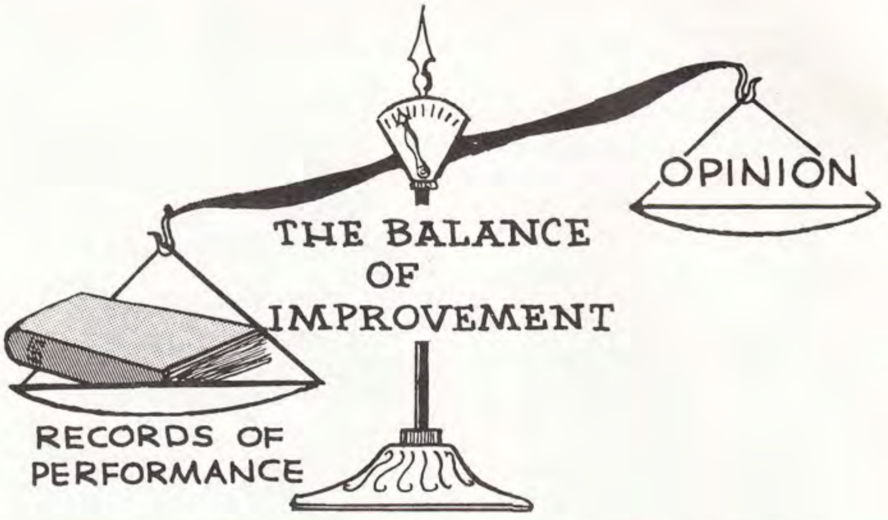
[a] Figures in this column result from mating animals with top record with one of average performance.

First of all, on the negative side, the breeder will have to use more than one extreme individual to perpetuate his herd. Secondly, he will usually select for more than one trait. This is nearly always a compromise, because the same individual will seldom be superior in every trait. These two factors will tend to lower selection differentials for each trait.

Limits to Change

Obviously there are limits to the amount of change one can make in some of these traits. But these "plateaus" need not concern us until after we have made considerably more change in the lean-fat ratio. On the positive side, the breeder will attempt to choose parents all of which are *above average* in the traits for which he is selecting. Thus, both parents will usually contribute to the predicted improvement. The rate of change indicated may be slower than one might desire, but it is large enough to have real economic meaning even in a short time. Furthermore, the traits outlined in Table 1 are related in such a way that it is possible to improve them as a unit.

For example, as a breeder selects for increased growth and reduced backfat simultaneously, he is really selecting for *one trait* and that is lean body growth. Lean pigs require less feed per unit of gain. Selection for leanness might also improve feed efficiency. The economic importance of the small differences in several traits are more clear when they are expressed in a single figure. The amount of feed required per pound of lean cuts produced is shown at the bottom of Table 1. This difference is large enough to mean something. If it were possible to select directly for only one trait this would probably be the present choice.



It is pertinent to know what evidence there is that the predictions from Table 1 might be fulfilled in a selection program. The USDA study of selection for high and low backfat provides useful evidence after only six generations (that is, six years on a gilt-litter basis) in a herd of less than 20 gilts. The data for the various lines is reported in Table 2.

There was a decided reduction in feed required per pound of lean cuts in the low fat line, but there are not sufficient data to make accurate comparisons.

The methods used in the USDA study were the *same* ones available to *any swine breeder anywhere in the world*. The objectives were clear, the methods were simple and the results are convincing. It requires collection, evaluation and *use* of essential records. Then the breeder must be consistent in working toward a useful goal.

No Alternative for Breeders

Without records the *multiplier* of breeding stock might be lucky enough to make some improvement. For many traits he may merely mark time, but there is no guarantee against a reduction in genetic potential.

The individual who wishes to be recognized as a *breeder* really has no suitable alternative. He must keep records. Breeders must decide how they can best serve the swine industry. Those who are willing to intensify selection for efficient lean body growth will supply the basic seed stock to commercial producers.

These key breeders will probably be a small, specialized group using an increasingly professional approach. A second group may specialize in multiplying the basic stocks and making them available to the commercial producers. Breeders who are unwilling to change their herds to meet present market needs will probably go into commercial production as they begin to lose customers. This trend has been in progress for 20 years. It will intensify.

We have reached the point where "pretty good" pigs are simply not good enough to command attention. The industry needs the highest possible percentage of lean hogs that can be attained in the shortest possible time.

Positive progress has already been made. Despite much closer trimming of pork cuts, there has been no increase in lard production. But this is not a time to rest. The basic incentive for improvement can now come from breeders because we know lean hogs grow more efficiently than fat ones. We have the selection meth-

Table 2. Data from a 6-generation study of selection for high and low backfat at Beltsville, Maryland.

	Backfat inches	Daily gain lbs.	Lean cuts %	Loin eye area sq. in.
High	2.04	1.42	35	2.94
Control	1.63	1.52	38	3.69
Low	1.27	1.48	39	3.99

ods necessary to improve lean growth rate. Merit buying of hogs at the market place should further stimulate the rate of change.

The time for merit buying is *now* when the differences in trimmed carcass value are large and the supply of superior animals is small. There is little need for a premium when the vast majority of stock satisfies existing demands for leanness.

Records Valuable

The value of performance records must be considered carefully by each breeder. Many organizations, including the University of Nebraska, encourage producers to purchase breeding stock only from herds where adequate records are available. In this case, records become extremely valuable. They might mean the difference between selling a significant number of animals as breeding stock or selling an entire pig crop at market price. On the other hand the commercial producer cannot afford the luxury of a poor performing sire because he depends upon the superior market performance of the sire's crossbred progeny as his sole source of income.

When you look at what records of performance are worth to you, it is important to look at their cost. Ask yourself what it costs to get the records required to conduct a sound program of genetic improvement. But, don't stop until you have asked also the more important question—what will be the economic consequences if these records are *not collected* and *used?*

Antibiotics for SPF Swine

D. M. Danielson

Gains and feed conversion were improved when Specific Pathogen Free (SPF) swine were fed rations containing antibiotics. However, the response was somewhat less than is usually found with non-SPF swine.

These results came from an experiment at the North Platte Station with 164 SPF Duroc and crossbred pigs. The purpose of the experiment was to determine the value of feeding Terramycin, Tylosin (a new antibiotic) and procaine penicillin + streptomycin to SPF swine both in dry lot and on pasture. Composition of the experimental rations is shown in Table 1.

All antibiotics were fed at the same level according to the weight of the pig. From the start of the study until the pigs weighed about 75 pounds, antibiotics were fed in a grower ration at a rate of 20 milligrams per pound of feed. From 75 to 125 pounds the antibiotic level was reduced to 10 milligrams per pound in a 14 percent protein ration. From 125 pounds to the end of the experiment pigs were fed a 12 percent protein ration with antibiotic level of 5 milligrams per pound of feed.

Results are summarized in Table 2.

The data indicate that antibiotics are useful in SPF swine production. When higher levels of antibiotics were fed, the gain response was about 10 percent. However, since the response was reduced appreciably by the end of the feeding period more research is needed on levels and kinds of antibiotics to use in rations for SPF swine.

Table 1. Composition of experimental rations [a]

Ingredient	Pounds		
	Grower	14% Protein	12% Protein
Ground yellow corn	70.00	79.55	86.00
44% solvent soybean meal	17.50	13.10	7.00
17% dehydrated alfalfa meal	....	2.50	2.50
60% fishmeal	2.50	....	....
Dried whey	5.00	....	....
50% meat and bone meal	2.50	2.50	2.50
Ground limestone	0.65	0.50	0.20
Steamed bonemeal	0.25	0.50	0.20
Salt	0.50	0.50	0.50
Trace minerals (high zinc, swine)	0.10	0.10	0.10
Vitamin premix[b, c]	1.00	0.75	0.60

[a] Terramycin, Tylosin and procaine penicillin + streptomycin were each fed at a rate of 20 mg., 10 mg. and 5 mg. per lb. of feed in the grower, 14 and 12% protein rations, respectively.

[b] Finely ground yellow corn used as a carrier for vitamins.

[c] Contributed the following amounts of vitamins per lb. of feed for the grower, 14 and 12% protein rations, respectively: vit. A, 1800, 510, 510 I.U.; vit. D_2, 180, 90, 90 I.U.; riboflavin, 1.0, 1.0, 1.0 mg.; calcium pantothenate, 2.0, 2.0, 2.0 mg.; niacin, 4.5, 4.5, 4.5 mg.; choline chlorine, 198, 115, 155 mg.; vit. B_{12}, 20, 5, 5 mcg.

Table 2. Response of SPF growing-finishing swine to different antibiotics [a]

Item	Dry lot[b]				Pasture[b]			
	Control (no antibiotic)	Terramycin	Tylosin	Procaine Penicillin + Streptomycin	Control (no antibiotic)	Terramycin	Tylosin	Procaine Penicillin + Streptomycin
Pigs/pen, no.	5	5	5	5	7	7	7	7
Pens/treatment, no.	4[c]	4[c]	4	4[d]	3[d]	3	3	3[c]
Av. initial wt., lb.	44.6	44.9	44.7	44.4	54.1	54.6	54.5	55.0
Av. final wt., lb.	190.2	192.9	189.7	169.0	163.6	166.4	166.0	168.0
Av. daily gain, lb.	1.73	1.76	1.73	1.80	1.56	1.60	1.59	1.62
Av. feed/lb. gain, lb.	3.39	3.45	3.38	3.31	2.97	2.85	2.84	2.87

[a] Antibiotic level fed was 20 mg/lb. feed initial to 75 lbs. body weight, 10 mg. from 75-125 lbs., 5 mg. from 125 lbs. to final wt.

[b] Test conducted on concrete for a 84-day period; on alfalfa pasture for a 70-day period.

[c] Two pigs removed during test.

[d] One pig removed during test.

Tests of New Worm Remedies

George W. Kelley, Jr.

Worming your pigs may not increase their growth rate because the damage probably was done before you treated them. But the treatment may bring dividends to later litters. The most severe damage happens shortly after worm eggs are eaten. The eggs hatch in the small intestine and the new worms make a trip around the body before growing up.

During this trip they penetrate the gut wall to get to the blood vessels leading to the liver; burrow through the liver to reach veins leading to the heart and from there are pumped into the lungs. The worms break through the lung walls into the air sacs. Bleeding, coughing, labored breathing and thumping result. Coughing carries the worms up the windpipe into the throat where they are swallowed and transported back into the intestine to grow into adults.

If the pig catches a respiratory disease while the worms are breaking into the lungs losses will be severe (see page 18 in 1961 Nebraska Swine Production Report).

1,000,000 Eggs Per Day

Each female worm lays over a million eggs every day. To reduce the number of eggs around the place remove adult worms from your pigs. Each female worm removed prevents the deposit of nearly one-half billion eggs a year. It takes 60 days for a worm to reach egg-laying age, so treat your pigs every 60 days. This will protect the new pig crop.

Industry is continually searching for new, better and cheaper wormers. Here is an evaluation of new remedies based on our experiments.

Three Products Tested

In 1961 three products were tested at the North Platte Experiment Station. One of these (Hygromycin B)[1] has been sold for several years. This remedy was re-evaluated. A second compound, modified hygromycin,[2] will not be sold, partly as a result of our test. The third drug, cadmium *p*-toluenesulfonate (HC-1)[3], is being prepared for market and will no doubt be introduced as soon as the company receives permission from the Food and Drug Administration. The test procedure was as follows:

Ninety-six weanling pigs were divided into eight lots of 12 pigs each. Pigs of about the same size were placed in each lot so that each group was of nearly equal weight.

Treatments were added to the basic ration and fed free choice. Pigs in pens I and V received five pounds Hygromix A150 per ton of feed from the beginning of the test. Pigs in pens II and VI received 18 grams of the modified hygromycin per ton of feed from the beginning of the test. Pigs in pens III and VII received 0.05% cadmium HC-1 in their ration for three days when 100 days of age. Pigs in pens IV and VIII received no medication. Each treatment was duplicated to assure repeatable results.

Adult roundworms

Each pig was weighed every two weeks and the feed consumption of each lot measured. Feed consumption was noted during the days that HC-1 cadmium was added to the ration to measure whether the pigs liked the medication.

Test Results

The counts of worm eggs per gram of feces are presented in Table 1.

Hygromix A150 performed best. Worm eggs were found in the droppings of only two pigs on this treatment and the pigs passed less than ten eggs per gram of feces. By the end of the test none of the pigs fed Hygromycin B had worms, whereas the untreated pigs were spreading 798 eggs per gram of feces.

The HC-1 cadmium compound removed worms from all but two pigs in each lot. These two apparently did not eat enough feed during the three-day medication to consume enough drug to kill their worms. However, in the repeated HC-1 treatment the worms in the two infected pigs were lost before the end of the test perhaps indicating a delayed action of the drug on the worms in those pigs.

The modified hygromycin had no effect on the worms and has no promise as a new worming remedy.

The HC-1 medicated feed was readily eaten by the pigs (Table 2).

Weight gains and feed consump-

[1] Hygromycin B, an antibiotic resulting from the growth products of *Streptomyces hygroscopicus,* a mold which grows in the woods. It is sold in a premix, Hygromix, by Eli Lily Company.

[2] Hygromycin B, like some other antibiotics, produces deafness in a small number of animals when fed for a long period of time. The drug is thus being modified to eliminate that undesirable characteristic. N-Benzyl hygromycin was used in our test.

[3] Being developed by Hess and Clark Company, Ashland, Ohio.

Table 1. Counts of worm eggs per gram of feces of pigs on 1961 North Platte test of worm remedies [a]

Lot	Treatment	First Sample [b]			Second Sample [c]			Third Sample [d]		
		Number pigs examined	Pigs with worms	E.P.G.[e] of feces	Number pigs examined	Pigs with worms	E.P.G.[e] of feces	Number pigs examined	Pigs with worms	E.P.G.[e] of feces
1	Hygromix A 150	11	0	0	12	2	7	11	0	0
5	Hygromix A 150	10	0	0	11	0	0	11	0	0
2	Modified Hygromycin	12	6	246	8	8	207	12	12	744
6	Modified Hygromycin	8	6	604	9	9	647	10	9	578
3	HC-1	11	6	144	10	2	179	11	2	204
7	HC-1	11	8	508	9	2	468	11	0	0
4	Untreated	9	7	184	10	9	548	10	10	654
8	Untreated	10	7	444	10	10	788	10	10	942

[a] The pigs were allotted on July 6 when about six weeks of age. They were first sampled on August 21, 1961. The HC-1 cadmium remedy was given on August 21-24—after the first egg counts were done.

[b] *Sample 1* on August 21; pigs averaged 90 days of age. Hygromix (Lots 1 & 5) and Hygromycin derivatives (Lots 2 & 6) had been on medicated feed since July 6 (46 days).

[c] *Sample 2* on September 14; Hess and Clark cadmium compound. (HC-1, Lots 3 & 7) had been administered at 0.0567% of total diet for three days, August 21-24—about 10 days prior to this sample. Note that only two pigs were positive in these lots and it would appear that these had not eaten full ration because both had high counts.

[d] *Sample 3* on September 28; twenty-four days after cadmium was administered. In Lot 3 the same two pigs were positive as on preceding sample. Positive pigs in Lot 7 had lost their infections by the time of the last sampling.

[e] Average number of eggs per gram of feces of those pigs with worms.

Table 2. Feed consumption of HC-1 medicated feed (0.0567%) for the three-day treatment period compared to non-medicated controls.

Lot	Treatment	Pounds of feed consumed per pig per day
3	HC-1	5.79
1	Control	5.49
7	HC-1	5.50
8	Control	5.33

tion of pigs while on the trial are presented in Table 3.

Pros and Cons of Present Remedies

Although numerous worming remedies are sold under several different brand names almost all contain one of three chemicals; piperazine, cadmium salts and Hygromycin B.

Piperazine is the active ingredient in most wormers. It is cheap, effective, easy to administer and almost non-toxic. Piperazine is usually given in drinking water but it is also given in medicated feed. It is probably more effective when given in the feed. Prices quoted recently[4] indicate that you can treat a 50-pound pig for about three cents and a 150-pound pig for nine cents. Pigs should be treated every 60 days after weaning or at about 50 and 150 pounds. Thus, the entire worming program with piperazine will cost about twelve cents per pig.

Cadmium compounds are good wormers but are generally slower acting than piperazine and slightly more toxic. When cadmium is given it deposits in the flesh and pigs must be held 30 days before they can be used as food. Cadmium is usually given in the feed over a period of 3 to 14 days. Worms pass out slowly and not many will be seen on the ground. Cadmium oxide costs about 7 cents to treat a 50-pound pig and 15 cents for a 150-pound pig.

Hygromycin B is an antibiotic. It is the active ingredient of Hygromix A150 evaluated earlier. Hygromycin B is continuously administered with the feed. This is a distinct advantage when feeding a complete mixed ration because the worming program is going on continuously. No worm eggs are produced when pigs are on Hygromycin B. The medicated feed must be fed for at least three weeks before it has full worming effect.

The amount of Hygromycin B in the feed is very critical. Anything that reduces the feed intake of the pigs greatly reduces the effectiveness of Hygromycin B.

Free choice concentrates containing Hygromycin B or medicated concentrates to be added to ground corn by pour on is a hazardous way to give Hygromycin B because of the danger of not giving enough drug to kill worms.

Hygromycin B, like some other antibiotics, affects the hearing of animals. It has very little deafening effect on growing-finishing animals but will cause deafness when fed to older animals. For this reason Hygromycin B-medicated feeds should not be given to pigs after they reach 150 pounds.

The modified Hygromycin tested in this trial was made to overcome the effects of the drug on hearing, but when modified the chemical lost its ability to kill worms.

Feed, medicated with Hygromix A150, costs $2.00 more per ton than comparable unmedicated feed. At this price it would cost about 22 cents per pig to treat from 35 to 125 pounds weight. Fifty days later the pigs should be marketed so this 22 cents takes care of the whole worming program. This increased cost may be offset by continuous freedom from worms.

[4] From feed dealers and agricultural chemical distributors in Lincoln, Nebraska during December, 1961.

Table 3. Average daily gain and feed efficiency of pigs receiving worming remedies

	Treatment			
	Hygromix A150	Modified Hygromycin	HC-1 Cadmium	Control
Av. Daily Gain, Lb.				
Replication I	1.78	1.78	1.89	1.79
Replication II	1.69	1.75	1.79	1.73
Average	1.74	1.77	1.84	1.76
Feed/Lb. of Gain				
Replication I	3.16	3.25	3.24	3.21
Replication II	3.00	3.02	2.97	3.05
Average	3.08	3.14	3.11	3.13

Purchasing SPF Pigs

L. C. Welch

The past year has been marked by a growing interest in the Nebraska SPF (Specific Pathogen Free) Swine Certification Program. Cooperating producers now number 72 as compared with 38 enrolled at this time last year.

As the number of producers has grown there has been an improvement in the quality of certified SPF boars and gilts being offered for sale. Buyers should be aware of this quality improvement and select seed stock from only those herds which average over 155 pounds at 140 days, have a herd average backfat of less than 1.4 inches at 200 pounds, and are "Certified SPF."

An aid to the buyer is an index which is calculated for each pig meeting certification standards. This index incorporates the 140 day weight and backfat thickness into one figure. A minimum qualifying individual would index 100. Buyers should select breeding stock from herds whose average index is 120 or above, trying also to obtain those individuals whose index is above the herd average index.

SPF producers enrolled in the Nebraska program probably have more performance data on their herds than many purebred producers raising non-SPF hogs. Buyers should ask for this data as an aid in selecting the best breeding stock.

For information concerning the Nebraska SPF Swine Certification Program or the availability of breeding stock, write to: SPF Coordinator, Department of Veterinary Science, College of Agriculture, Lincoln 3, Nebraska.

SPF swine records of performance.

Year	No. litters	Avg No. born	Raised to 56 da.	Mort. (%) to 56 da.	56 da. wts.		154 da. wts.		Daily gain 56-154 da.	B.F.[a] (in.)	Avg index
					Avg pig	Avg lit.	Avg pig	Avg lit.			
1958	69	11.0	8.7	21.1	42	365	196	1697	1.57	1.43	......
1959	213	10.0	8.4	16.0	44	368	207	1736	1.67	1.46	......
1960	507	9.7	8.3	15.0	41	340	193	1554	1.55	1.38	121
1961 Spring	556	9.8	8.7	11.7	43	375	202	1710	1.62	1.41	122
3½ yr.-7 seasons	1345	9.9	8.5	14.2	42	360	200	1637	1.60	1.41	123
Control 1[b]	430	9.5	7.6	20.0	.....	......	155	1179	......	......	......
Control 2[c]	954	10.4	9.5	9.0	.....	......	166	1577	......	......	......

[a] Backfat—200 lb. Boars and Gilts.
[b] Wisconsin Swine Selection Cooperative Herd Analysis, 1958.
[c] The 25 Iowa Master Swine Producers given certificates for outstanding sw'ne production in 1960.