Improving Overall Feed Efficiency In Swine Production

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The cost of feed constitutes the largest single expense in producing pork, making up 70 to 80 percent of the total cost. Thus, improvements in overall feed efficiency can amount to very important savings. It is hoped that the information presented will serve two useful purposes. First to serve as a general guide in the organization of a modern swine production operation and second to bring attention to possible areas of improvement in existing swine operations.

To start the discussion one might ask, "How would you go about producing market hogs with an overall feed efficiency of 4.0:1?" That is 4.0 pounds of feed used in the entire operation for each pound of live hog marketed. This level of efficiency is possible today even though many herds are probably operating at an efficiency between 5.00 and 6.00:1.

In brief, these things would be required:

1. Nutritionally adequate rations for all stages of the life cycle.
2. Superior breeding stock—particularly from the standpoints of litter size and efficiency of gain.
3. Adequate housing and environmental control.
4. A sound herd health and sanitation program.
5. High reproductive efficiency in the sow herd.
6. The culling of non-productive sows as quickly as possible.
7. Minimum death loss at any age.
8. Marketing at weights not to exceed 220 pounds.
9. Eliminating feed wastage.

Feed efficiency during the growing-finishing stages has been emphasized for many years and considerable improvement has been made in this regard. However, there are many other areas, or segments, in the total pork production operation that have been given inadequate attention. For convenience in this discussion I have chosen to divide the complete production cycle into five periods, namely (1) pre-breeding, (2) breeding and gestation, (3) farrowing and lactation, (4) starting (5) growing and finishing. The possibilities for improving overall feed efficiency in each of these areas will be discussed.

Pre-breeding

It is common to select gilts at a weight of about 200 pounds as replacements for the breeding herd. Such gilts will average around 160-170 days of age. They are commonly bred at eight months or 240 days of age. This gives a pre-breeding period of 70-80 days. During this time the gilt will have consumed 350-385 pounds of feed (see Table 1, Feed Budget—Basic Considerations). She should gain 80-90 pounds during

Table 1. Swine Production—Feed Budget—Basic Considerations—Feed Allowances and Weight Changes (Estimated)

	Age in Days		Days in	Weight Changes			Feed Consumption	
	Start	Finish	Period	Start	Finish	Gain or Loss	Feed per Day	Total Feed
	Days	Days	Days	Pounds	Pounds	Pounds	Pounds	Pounds
Pre-breeding	170	240	70	200	290	90	5.5	385
Gestation No. 1	240	360	120	290	410	120	5.5	660
Lactation No. 1	360	402	42	410	360	—50	11.0	462
Recovery Period No. 1	402	427	25	360	390	30	7.0	175
Gestation No. 2	427	547	120	390	510	120	6.0	720
Lactation No. 2	547	589	42	510	470	—40	11.5	483
Recovery Period No. 2	589	614	25	470	520[3]	60	10.0	250
Summary	170	614	440	200	520	320		3135

[3]Sows smoothed up ready for market.
The above are estimates of the amounts of feed consumed by the breeding herd during each phase of a program in which sows are kept for two litters and then sold for slaughter.

this period. This is about as well as one can hope to do during this period. If daily feed intake is reduced, gain will be reduced sharply. Also, there is good evidence to indicate that ovulation rate would be reduced by reducing the feed intake, particularly just prior to breeding.

How important is it that gilts be eight months old when bred? Is this much time necessary for satisfactory sexual development? Good experimental evidence on the reproductive performance of gilts bred at various ages is not available. However, by drawing from research records, we find that most gilts are coming in heat regularly at 180-200 days of age. If bred when 240 days of age most of them will be in their third or fourth heat period.

Research data indicate that ovulations increase by about 2.5 ova from the first to the third heat. About 115 pounds of ration is required to carry a gilt from one heat period to the next. It appears that no great advantage is to be gained by breeding at second heat as compared to waiting to breed on the third heat. Under good management, breeding on second heat might tend to save a small amount of feed per pig raised as compared to breeding on third heat. However, allowing gilts to pass the third and subsequent heat periods unmated, could be an important factor influencing overall feed efficiency.

A sow or gilt will require about the same quantity of feed during gestation whether she farrows a litter of 5 or 12, therefore the use of highly productive breeding stock is very important to overall feed efficiency. However, having "good breeding stock" does not in itself insure high reproductive performance. Providing good management and satisfactory environmental conditions are equally as important in securing large litters of husky pigs.

The combined effect of litter size is shown in Table 2, columns 1 and 2. Column 1 indicates the number of pigs produced for each female maintained in the herd per year (two farrowings). A good average would be 14 or 15 pigs per sow kept in the herd per year. Figures in column 2 indicate that 215 to 230 pounds of feed consumed by the breeding herd would be invested in each weanling pig at this level of sow productivity. Many producers are inclined to give little concern to the loss of pigs at farrowing. The facts are that the loss of a pig at farrowing represents a loss of a minimum of 100 pounds and possibly as much as 200 pounds of feed for the breeding herd plus the housing, labor, etc., involved and the loss of an opportunity for profit on the pig itself. If only eight pigs are raised per sow per year the feed consumed by the breeding herd, per pig weaned, amounts to nearly 400 pounds.

Table 2. Estimated Feed Requirements per Head and Per Hundred Pounds Of Market Hog with Varying Sow Productivity and Feed Efficiency

Pigs per sow per two litters (annual) (1)	Feed Consumed Breeding Herd Pounds (2)	Feed Consumed per Head after Weaning at Efficiencies of: 3.0 lbs. (3)	3.2 lbs. (3)	3.4 lbs. (3)	3.6 lbs. (3)	Total Feed Required Per CWT of market Hog at Efficiency of: 3.0 lbs. (4)	3.2 lbs. (4)	3.4 lbs. (4)	3.6 lbs. (4)
5	640	1200	1234	1268	1302	558	574	590	607
6	530	1090	1124	1158	1192	507	523	539	558
7	455	1015	1049	1083	1117	472	389	503	520
8	399	959	993	1027	1061	446	462	478	493
9	355	915	949	983	1017	426	441	457	473
10	320	880	914	948	982	409	425	441	457
11	291	851	885	919	953	396	412	427	443
12	268	828	862	896	930	385	401	417	433
13	247	807	841	875	909	375	391	407	423
14	230	790	824	858	892	367	383	399	415
15	215	775	808	843	877	360	376	392	408
16	202	762	796	830	864	354	370	386	402
17	190	750	784	818	852	349	365	380	396
18	180	740	774	808	842	344	360	375	392
19	171	731	765	799	833	340	356	372	389
20	163	723	757	791	825	336	352	368	384

(1) The figures in this column are the numbers of pigs weaned per year per sow in the herd (2 litters), including infertile sows, death losses, etc. Under good management, this figure may range from 12 to 16.

(2) Figures in this column represent the amount of feed consumed by the breeding herd, both sexes, for each pig weaned. Figures show for level of sow productivity from 5 to 20 pigs per year per sow in the herd. The 3135 pounds of feed (Table 1) estimated to carry a gilt through two reproductive cycles and put her in shape to market is divided by the number of pigs shown on each line to obtain these figures. Feed for the boar has been added to this amount at the rate of six pounds per pig with a slight upward adjustment as pigs per sow decreased.

(3) The figures under the heading "Feed Consumed Per Head . . ." were calculated by multiplying the gain made by the pigs after weaning, 170 pounds (215 pounds market weight minus 45 pounds weaning weight = 170 pounds gain) by the proper feed efficiency figure, adding the 50 pounds of starter ration consumed before weaning and the share of the feed consumed by the breeding herd. Example: 170 pounds gain × 3.2 feed efficiency + 50 pounds of starter + 640 pounds of feed for breeding herd equals 1234 of feed required to produce a 215 market hog under these conditions.
Example: 1234 ÷ 215 = 574 pounds of feed per hundred weight of market hog.

(4) These figures are obtained by dividing the feed per head by the market weight of 215 pounds.

Reproductive efficiency is a very important factor in determining overall efficiency.

In rebreeding sows for the second and subsequent litters there is always the question of whether they should be allowed a three weeks "rest period". Again, research data precisely on this point is not available. However, observations and practices followed would indicate that sows weaned 35 days post farrowing, or later, and in strong condition, may be successfully rebred on the first heat following weaning. Here, much depends on the nturitional status of the sows at weaning.

One of the bonuses of adequate nutrition during lactation is early and successful rebreeding. On the other hand, "lactation fatigue" is common among females bred at an early age and rebred for successive litters as rapidly as possible. Such sows, if to be used further, require a rest period of at least three weeks and possibly more. However, in our experience, sows that have been self-fed well balanced rations during lactation, ovulate, breed, and carry subsequent litters satisfactorily when bred on the first heat following weaning at 35 or 42 days. To allow them additional recovery time may be inefficient use of feed. The use of individual sow feeding stalls may be very important at this time. With stalls sows can be fed on an individual basis and assisted materially in recovering from the previous lactation.

Flushing is the practice of increasing the nutrient intake of the female for a short time before breeding, in an effort to increase the number of ova shed. Research on this point indicates that flushing for a period of 10-12 days is as effective as a longer period. An increase from 5.0 to 7.5 pounds per day of a well balanced ration would be considered adequate flushing. This adds up to a total of 25-30 pounds of feed and would be expected to result in 1.5-2.0 more ova shed. This is a wise use of feed, particularly if gilts have been closely restricted during the pregestation period.

Breeding and Gestation

While flushing increases ovulation, continued heavy feeding leads to high embryonic mortality. Thus, the daily feed allowance should be reduced from the flushing level immediately after breeding.

The degree of control of daily feed indicated above can best be accomplished by use of individual sow feeding stalls which permit the feeding of each sow according to her stage in the reproductive cycle and her condition. Such a practice has been followed by European producers for years and is now becoming more common among producers in this country. Table 1 indicates an average daily intake for this period of 5.5 pounds per day as an average on which to base a feed budget. This would allow around 5.0 pounds per day for the first 90 days and above 6.0 for the remainder of the gestation period. Size and growthiness of the females will be a factor to consider, with the larger, faster growing kind taking a little more feed. Conditions of housing and environmental temperature also influence the response obtained from a given feed allowance.

There may be a tendency for some to overfeed during gestation. Such a practice is not only a waste of feed but may actually result in lower productivity. This is particularly true of purebred producers whose customers expect to see herd boars and sows in show condition. If pasture can be used in any phase of a swine production program it would be most effective during the prebreeding and gestation periods.

Farrowing and Lactation

For the period from a few days before farrowing to about one week past farrowing many producers regulate the feed intake in accordance with what they consider to be the needs of the individual sows. For the remainder of the lactation period self-feeding a complete ration is common practice. For most sows with seven pigs or more this is probably the most economical way. They will require all of a well balanced ration they can eat to provide milk for the litter. Most good milking sows will lose weight during this period even when self-fed. Adjusting litter size at birth by transferring pigs among sows less than 12 hours post farrowing is a good practice where facilities make such a practice workable.

The age at weaning or length of the lactation period has a definite bearing on the amount of sow feed consumed during this period. A 56 day lactation period is no longer necessary. Forty-two or thirty-five days, that is 6 or 5 weeks seem to be adequate. Few commercial producers are successful with 3 or 4 weeks weaning. Dropping back from 8 to 6 weeks weaning will reduce the sow feed by about 165 pounds but cause increased consumption of starter ration by about 90 pounds per litter. This will result in a net saving of about 75 pounds of feed per litter. With exceptionally good buildings and equipment and skilled management five week weaning might lead to additional savings in feed.

Starting (up to 60 pounds)

Nutritionally adequate diets, sound herd health program and adequate environmental control are the big features leading to efficient conversion of feed to gain during this period. Palatable, nutritionally adequate diets leading to high daily intake and gain are most important in moving pigs through this critical period. Amino acid levels, antibiotic fortifications, mineral levels and energy values are of importance. Environmental temperature between 60 and 75°F promote maximum performance. The bacterial "load" present in the quarters will also be a factor in performance. Scours, pneumonia and disease problems generally cause more trouble during this period than later. Post weaning death losses from any cause must be avoided.

Self-feeding, completely mixed, well balanced, well fortified rations in a comfortable and clean environment provides greatest efficiency. Cutting corners during this period generally leads to trouble.

Growing-Finishing (60 pounds to market)

If the job has been well done to this point, the rest is simple. Simply supply adequate environmental control, good nutrition and reasonably clean quarters. Completely mixed rations may be slightly more efficient than free-choice feeding but not necessarily more profitable. Moderately fine grinding of grain is to be recommended in either case. Feed wastage during this period is a major problem in some operations. This should not be permitted. It is better that pigs have to "work" a little to get what they want to eat than to waste any. In many operations wastage amounts to 10-15 percent during this period.

Feed requirements per unit of gain increase as pigs become older and heavier. This is because a larger portion of the daily intake is used for maintenance in the heavier pig and each unit of gain represents more stored energy than the previous one. Considering the "overhead" cost of the pig at weaning and efficiency of gains on the individual pig, pork is produced at the lowest feed cost on pigs marketed at a weight between 200-220 pounds, by most producers. Holding pigs beyond this weight results in lowered overall feed efficiency for most producers.

The overall feed efficiency figure, that is the total feed required to produce a pound of live market weight hog, including the cost of feed consumed by the breeding herd, is probably the best single measure of the efficiency of a swine production unit. No portion of the total production program can be very far out of line if the overall feed efficiency is good. Producers using much over four pounds of total feed per pound of hog marketed should examine all phases of the operation to locate the "weak" areas.

In summary, there are many factors in addition to the nutritional adequacy of the rations being fed, which have a strong influence on the pounds of feed required to produce a pound of market hog. Productivity of the sow herd, herd health, death losses at any stage, and environmental factors such as temperature and moisture are all very important.