



# Pork Industry Handbook

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## Performance Guidelines for the Swine Operation

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The success of a swine enterprise is measured in terms of profits. Profits are determined by how well an operation is managed from both financial and production management aspects. The purpose of this fact sheet is to provide performance guidelines or standards (Table 1) with which to compare the performance results you are getting on your farm. This comparison will provide a production profile and will enable you to identify where production management can be improved. The production profile can be used to:

- Provide an early warning of developing problems
- Provide clues to basic weaknesses in your program
- Monitor herd health
- Provide information for budgeting or feasibility studies
- Provide a basis for incentive payments to labor
- Identify major costs
- Permit a comparison with other producers
- Provide a basis for seasonal adjustments in management

### Records

Records must be available to establish the production profile. Select those items in Table 1 that you think are important production criteria, ones for which you are willing to spend the time and effort necessary to collect the necessary data. Collecting and not using data is a waste of your time. Discipline yourself to be selective and honest with your record keeping, data evaluation, and management decisions.

### Determining Your Swine Production Profile\*

Table 1 lists measures of performance for establishing a production profile. Presented for each measure are: (1) three levels of performance, excellent, average, and poor, (2) attainable goals, and (3) a space to record the results being achieved on your farm. The following text provides a brief discussion of each performance standard, what it measures, and how it is calculated.

Some items listed in Table 1 are measures of overall performance, such as hogs raised per litter farrowed, and are broad indicators of management. Such comprehensive measures have the weakness of failing to pinpoint a problem, if it is the only record kept. You may decide that records on more specific measures, such as pigs/litter farrowed alive, are also required in your operation for production management decision making. Your swine performance profile should be continued over the years to allow a study of trends and emerging problems.

**1. Pregnancy rate.** Pregnancy rate provides an early warning of a reproduction problem provided you make an effort to detect open or recycling females. A female that fails to conceive means no pigs at farrowing from her and fewer from the herd as a whole. Yet it costs as much to feed and maintain an "open" sow as it does a pregnant one, and feeding open sows increases the costs per market hog sold. Knowing the pregnancy rate per sow group or period also allows you to prepare for gluts or shortages of pigs.

\* Some definitions and formulas were adapted from "Generally Accepted Terms and Formulas for the Pork Industry," available from National Pork Producers Council, P.O. Box 10383, Des Moines, Iowa 50306.

Pregnancy rate is defined as the percent of females within a group that check positive for pregnancy within 40 days post mating. It is calculated as follows:

$$\text{Pregnancy rate (\%)} = \frac{\text{No. females checked positive for pregnancy within 40 days post-mating}}{\text{No. mated females within a contemporary group}} \times 100$$

**2. Farrowing rate.** Farrowing rate reflects any failures or successes of mating, conception, and gestation. To ensure a full farrowing house it is important to know herd (sows and gilts separately) and seasonal history in regard to this measure. Farrowing rate is the percent of mated females that farrow within a contemporary group.

$$\text{Farrowing rate (\%)} = \frac{\text{No. of mated females that farrow within a contemporary group}}{\text{Total no. of mated females for this contemporary group}} \times 100$$

**3. Average number of live pigs born per litter.** This is the total number of live pigs farrowed by a group of sows divided by the number of litters farrowed. Separate calculations for sow and gilt litters because it is important, for troubleshooting and for planning, to know how gilts compare with sows in your herd.

$$\text{Average no. live pigs born/litter} = \frac{\text{Live pigs born}}{\text{No. of litters farrowed}}$$

**4. Number stillborn per litter.** Any pig that has not moved from the back end of the sow is counted as born dead or stillborn. The number of mummified pigs can be included with the number stillborn, or a separate record on these might be useful. Mummified pigs are ones born degenerate (discolored and shriveled or decomposed); these died sometime during gestation.

$$\text{No. stillborn/litter} = \frac{\text{Total pigs born dead}}{\text{No. of litters farrowed}}$$

$$\text{No. mummified pigs/litter} = \frac{\text{Total mummified pigs}}{\text{No. of litters farrowed}}$$

**5. Average pig birth weight.** Divide total weight of all live pigs at birth by the number of pigs that were weighed. The heavier the pigs at birth, the greater is their chance for survival.

$$\text{Average pig birth wt.} = \frac{\text{Total wt. of all live pigs at birth}}{\text{Total no. of live pigs weighed}}$$

**6. Pigs weaned per litter farrowed.** This is calculated by taking the total number of pigs weaned from a group of sows or over a time period divided by the number of litters farrowed to produce those pigs.

$$\text{Pigs weaned/litter farrowed} = \frac{\text{No. of pigs weaned}}{\text{No. of litters farrowed}}$$

**7. Weaning percentage.** This is the percentage of pigs alive at birth that are weaned. It reflects the death loss between farrowing and weaning and, thus, would

indicate any management or health problems during this period. Weaning percentage is calculated as follows:

$$\text{Weaning percentage} = \frac{\text{No. of pigs weaned}}{\text{No. of live pigs born}} \times 100$$

**8. Average weaning weight.** This is the total weight of weaned pigs divided by the number of pigs. A three-week weight can be an evaluation of sow milk production because baby pig feed consumption is minimal up to 3 weeks of age. To provide useful information for culling and selection it is necessary to adjust weaning weights to a standard age by using appropriate adjustment factors.†

$$\text{Average weaning wt.} = \frac{\text{Total wt. of weaned pigs}}{\text{No. of pigs weaned}}$$

**9, 10. Average daily gain and age at 230 lb.** Rate of gain and days to market measure the same thing, the speed at which animals proceed through the system. Average daily gain is the amount of weight gained per day per pig during a defined time period. A rapid rate of gain results in a reduction of building, labor, and other overhead costs. Rapid gains may also mean a substantial savings in feed, because fast-gaining pigs are usually good converters. To calculate age at 230 lb., the birth date is essential. Average daily gain is calculated as follows:

$$\text{Average daily gain} = \frac{\text{Total ending wt.} - \text{Total beginning wt.} - \text{Total beginning wt. of pigs that died}}{\text{No. of pigs at the end} \times \text{total no. of days}}$$

The following formula predicts the age of the animal when it reached or will reach 230 lb.

$$\text{Days to 230 lb.} = \text{actual age in days} + \left[ \frac{(230 - \text{actual wt.}) \times (\text{actual age} - 38)}{\text{actual wt.}} \right]$$

**11. Whole herd feed efficiency.** Feed efficiency for the herd is the amount of feed required to produce a pound of pork. It is an important performance measure because feed makes up such a large part of the total cost of producing hogs, at least 60% for the farrow to finish operation.

$$\text{Lb. feed/lb. gain} = \frac{\text{Total lb. of feed fed/year (or per time period)}}{\text{Total lb. of pork produced/year (or per time period)}}$$

Total pounds of feed fed = beginning inventory + feed purchases + home produced feed - ending inventory

Total pounds of pork produced = (ending inventory + sales) - (beginning inventory + purchases).

**12, 13, 14, 15. Loin muscle area, fat depth, average backfat, and percent lean.** A progressive pork producer is aware of what the consumer wants—lean pork. The operation is geared to raising meat-type market animals. Lean animals are more efficient in converting feed to weight gain than are fat ones. Choosing a

† NSIF 4, *Sow Productivity Indexing*, 1981 National Swine Improvement Federation, 101 Peters Hall, University of Minnesota, St. Paul, MN 55108.

meaty lean herd sire will probably do more to improve carcass leanness than will altering various environmental aspects.

Loin muscle area or loin eye area (longissimus muscle area) is an indicator of muscling or leanness. At slaughter the loin muscle cross-sectional area is measured between the 10th and 11th rib with a compensating polar planimeter, or by the more common method using a plastic grid.

Fat measurements are excellent indicators of leanness. The lower the fat measurements, the higher the lean in the animal or carcass. One measurement is fat depth (including skin) measured over the loin at the 10th rib. A second method is to measure fat thickness at the last rib. A third measure is average carcass backfat (including skin) thickness—the average of three backfat measurements taken along the midline at the first rib, last rib, and last lumbar vertebra. To adjust backfat to a standard weight of 230 lb., use the following formula.

Backfat at 230 lb. = actual backfat +

$$\left[ \frac{(230 - \text{actual wt.}) \times (\text{actual backfat})}{(\text{actual wt.} - 25)} \right]$$

Percent lean gives a measure of quantity of muscle in a carcass. The booklet *Procedures to Evaluate Market Hog Performance* provides information and formulas for carcass and performance measures. This, along with the *Lean Guide to Pork Value*, is available from the National Pork Producers Council, P.O. Box 10383, Des Moines, IA 50306. Refer also to Pork Industry Handbook fact sheet PIH-42, *Carcass Evaluation*.

**16. Hogs discounted at market.** This measure includes those market hogs that are sorted out and discounted by the buyer. "Tail-end" hogs not sold through the normal marketing channels should be included as discounts. A record of the causes for the "tail-enders" can aid in production management decisions.

$$\text{Percent hogs discounted} = \frac{\text{No. of hogs discounted}}{\text{Total no. of hogs marketed}} \times 100$$

**17. Mortality, birth to weaning.** This is mortality expressed as a percentage of total live pigs born. Any pig that moved away from the back of the sow should be counted as having been born alive. This measure provides information on management and herd health during this period. Some producers will want to identify and keep a record of the cause of deaths.

$$\text{Percent mortality} = \frac{\text{No. died (birth to weaning)}}{\text{No. of live pigs born}} \times 100$$

**18, 19. Mortality in nursery and mortality in growing-finishing stage.** This is pig mortality expressed as a percentage of the animals entering the nursery and/or growing-finishing building or stage of the life cycle. It should be calculated after the animals in question have passed through the stage. An identification of cause of death would be valuable information.

Percent mortality =

$$\frac{\text{No. died in nursery and/or growing - finishing stage}}{\text{Total no. entering for this group}} \times 100$$

**20. Sow mortality.** This is calculated as the number of sows that die annually as a percentage of the average sow herd size. For average sow herd size calculations see Pork Industry Handbook fact sheet PIH-45, *Economics of Reproductive Performance and Breeding Herd Management*. Average number of sows in the herd should be based on the average monthly counts from a monthly inventory. Records on the causes of death as well as reasons for sows leaving the herd would provide additional valuable information.

$$\text{Percent sow mortality} = \frac{\text{No. of sows that die/year}}{\text{Average sow herd size}} \times 100$$

Gilts are included in the sow herd count as soon as they are selected for breeding and their unselected contemporaries are sent to slaughter. Gilts must be counted as part of the breeding herd if they are 7 months old. Cull sows are excluded from the count at culling time.

**21, 22. Litters per female per year (or per time period) and pigs weaned per female per year (or per time period).** To calculate this measure, divide total number of farrowings per year (or per time period) by average sow herd size. These measures do not pinpoint management problems but do give an annual evaluation of production and performance that is useful in high intensity production units. Those swine producers using less intensive production methods should revise downward the standards in Table 1 for this measure.

$$\text{Litters/female/year} = \frac{\text{Total no. of farrowings/year (or per time period)}}{\text{Average sow herd size}}$$

$$\text{Pigs weaned/female/year} = \frac{\text{Total pigs weaned}}{\text{Average sow herd size}}$$

**23. Hogs raised/female/year.** This measure is an indicator of performance from conception to market. It is affected by fertilization, by the implantation rate and survival of embryos during gestation, and by livability and performance from birth to market. It is calculated by dividing number of hogs produced by average sow herd size.

In calculating hogs raised per year, use an equivalent weight (e.g., no. of 230 lb. hog equivalents raised), and take into account inventory changes, home consumption, sales, and purchases.

$$\text{Hogs raised/female/year} = \frac{\text{No. of hogs raised}}{\text{Average sow herd size}}$$

**24, 25. Litters farrowed per crate per year and pigs weaned per crate per year or per time period.** The performance level standards in Table 1 are for high intensity systems and may not be appropriate for lower intensity swine units. It is possible to establish a goal that is too high for this measure and actually reduce performance and increase production costs by farrowing too many litters per crate.

This is the total number of farrowings per year divided by the average number of farrowing crates. Use this measure along with pigs weaned per litter farrowed, weaning percentage, and average weaning weight for a more precise evaluation of production management.

Litters farrowed/crate/year (or per time period) =

$$\frac{\text{Total no. of farrowings/year (or per time period)}}{\text{Average no. of farrowing crates}}$$

Pigs weaned per crate per year or per time period is calculated by dividing total pigs weaned by the average number of farrowing crates. This measure reflects the breeding efficiency, pigs weaned per litter, and the number of groups of sows serviced by a farrowing house:

Pigs weaned/crate/year (or per time period) =

$$\frac{\text{Total pigs weaned/year (or per time period)}}{\text{Average no. of farrowing crates}}$$

**26. Square feet of nursery, growing, finishing space/hog produced/year.** To make this calculation, take the inside measurement and determine the total square feet in all those facilities used between farrowing stage and marketing. Divide total square feet by the number of market hog (230 lb.) equivalents produced. The performance standards in Table 1 are for slotted floor, fully roofed facilities or high intensity production systems only.

Square feet of nursery, growing, finishing space/hog produced/year =

$$\frac{\text{Total square feet}}{\text{No. of market hogs produced}}$$

**27. Labor efficiency.** Labor represents the second or third largest cost of hog production. Labor efficiency is expressed in terms of production per person working full time for a year. The term F.T.E. or full-time equivalent is sometimes used. Divide the hours of labor used or required producing hogs by the number of hours that you would expect a full-time person to work in a year. For example, an FTE might be based upon a 40-hour week or 2,000 hours per year.

$$\text{Full-time equivalent} = \frac{\text{No. of hours labor used}}{2,000}$$

Listed below are the formulas for calculating labor efficiency. It is assumed that the measures are calculated once per year.

Farrow to Finish producers:

$$\text{Sows/F.T.E.} = \frac{\text{Average sow herd size}}{\text{Full-time equivalents}}$$

$$\text{Hogs produced/F.T.E.} = \frac{\text{No. of market hog (230 lb.) equivalents produced}}{\text{Full-time equivalents}}$$

Farrow-to-feeder producers:

Feeders produced =

No. of weaned pigs in ending inventory + no. sold - no. of weaned pigs in beginning inventory.

THEN

$$\text{Feeders produced/F.T.E.} = \frac{\text{Feeder pigs produced}}{\text{Full time equivalents}}$$

Finish:

Hundredweight (cwt.) of pork produced =

$$\frac{(\text{Ending inventory} + \text{sales}) - (\text{Beginning inventory} + \text{purchases}) \text{ in lb.}}{100 \text{ lb.}}$$

THEN

$$\text{Cwt. pork produced/F.T.E.} = \frac{\text{Cwt. pork produced}}{\text{Full time equivalents}}$$

## Where Do I Go from Here?

The answer to that question depends largely on what records of performance you have decided to keep, and the reasons for which you selected them. Where you go depends then on the results of your swine production profile. In addition to the standards in Table 1, compare your swine performance with results from the farm record service sponsored by agricultural colleges, and to the history of performance on your farm.

The production profile should reveal where the "weak links" are in your swine operation. Post the records you have collected as a reminder to you and your help as to where improvements need to be made. Set and post your goals for various measures for next week, month, or year. If your animal performance scores are consistently above average, this indicates that from a management or husbandry standpoint you may be ready to handle a bigger operation. Think seriously about advisability of expansion or do so only with great caution if your swine performance standards are only average. It would be better to improve performance in your existing program before trying to cope with a larger operation. Don't expand if performance measures are found to be below average.

In most cases, poor animal performance can be traced to poor management, that is, the absence of, or improper application of, proven management practices. Therefore, to pinpoint the source of a problem, develop a checklist of management practices that affect the performance measures which you found to be below average. For example, let's assume conception rate is low on your farm. The checklist might include items such as:

	Yes	No
—Were boars free of any lameness or stiffness?	<input type="checkbox"/>	<input type="checkbox"/>
—Were boars free of external parasites?	<input type="checkbox"/>	<input type="checkbox"/>
—Were boars maintained in comfortable quarters?	<input type="checkbox"/>	<input type="checkbox"/>
—Were boars free of flu or high body temperatures prior to and/or during breeding?	<input type="checkbox"/>	<input type="checkbox"/>
—Was "boar power" adequate?	<input type="checkbox"/>	<input type="checkbox"/>
—Were sows and gilts in breeding condition (i.e., not too fat or too thin)?	<input type="checkbox"/>	<input type="checkbox"/>
—Were rations free of molds?	<input type="checkbox"/>	<input type="checkbox"/>

The number of items in such a checklist can be quite long. Seek out an expert trained and experienced in swine management techniques in developing such a troubleshooting checklist. Also read and try some of the management techniques described in other fact sheets in the Pork Industry Handbook.

**Table 1. Production measures for determining production profile.**

Performance measure	Unit	Performance level			Attainable goal	Your farm
		Excellent	Average	Poor		
1. Pregnancy rate	%	Over 85	75-85	Under 75	90	_____
2. Farrowing rate	%	Over 85	70-85	Under 70	88	_____
3. Av. no. live pigs born/litter						
gilts	no.	Over 9.5	7.5-9.5	Under 7.5	10.5	_____
sows	no.	Over 10.5	8.5-10.5	Under 8.5	12.0	_____
4. Stillborn/litter	no.	Under 0.8	0.8-1.5	Over 1.5	0.5	_____
5. Av. birth weight*	lb.	3.0-4.5	2.5-3.0	Under 2.5	3.5	_____
6. Pigs weaned/litter farrowed						
gilts	no.	Over 8.0	6.5-8.0	Under 6.5	9.0	_____
sows	no.	Over 8.5	7.0-8.5	Under 7.0	11.0	_____
7. Weaning percentage	%	Over 90	80-90	Under 80	90.0	_____
8. Av. weaning weight						
3 weeks	lb.	Over 12	9-12	Under 9	14	_____
4 weeks	lb.	Over 16	11-16	Under 11	18	_____
5 weeks	lb.	Over 20	14-20	Under 14	24	_____
6 weeks	lb.	Over 25	20-25	Under 20	32	_____
9. Av. daily gain						
Birth-to-market	lb.	Over 1.25	1.0-1.25	Under 1.0	1.38	_____
40 lb.-to-market	lb.	Over 1.40	1.2-1.4	Under 1.2	1.58	_____
10. Age at 230 lb.	days	Under 182	182-227	Over 227	165	_____
11. Feed efficiency for the herd						
Farrow-to-finish	lb. feed/ lb.gain	Under 4.0	4.0-4.25	Over 4.25	3.5	_____
Farrow-to-feeder	lb. feed/ lb.gain	Under 4.5	4.5-5.0	Over 5.0	4.25	_____
40 lb.-to-market	lb.feed/ lb. gain	Under 3.4	3.4-3.8	Over 3.8	3.00	_____
12. Loin muscle area @ 230 lb.	sq.in.	Over 5.4	4.7-5.4	Under 4.7	5.6	_____
13. Fat depth, 10th rib @ 230 lb.	in.	Under 0.9	0.9-1.3	Over 1.3	0.8	_____
14. Av. backfat @ 230 lb. or last rib fat thickness	in.	Under 1.1	1.1-1.4	Over 1.4	1.0	_____
15. Percent lean	%	Over 56	52-56	Under 52	57	_____
16. Hogs discounted at market	%	Under 2	2-5	Over 5	1.5	_____
Mortality						
17. Birth to weaning	%	Under 10	10-20	Over 20	Under 10	_____
18. Nursery	%	Under 4	4-8	Over 8	Under 4	_____
19. Growing-finishing	%	Under 2	2-4	Over 4	Under 2	_____
20. Sows	%	Under 2	2-5	Over 5	Under 2	_____
21. Litters/female /year	no.	Over 2.0	1.6-2.0	Under 1.6	2.2	_____
22. Pigs weaned/female /year	no.	Over 18	14-18	Under 14	21	_____
23. Hogs raised/female /year	no.	Over 17.5	13.5-17.5	Under 13.5	20	_____
24. Litters farrowed/ crate/year†	no.	Over 8	6-8	Under 6		_____
25. Pigs weaned/crate /year†	no.	Over 70	50-70	Under 50		_____
26. Sq. ft. of nursery, grow-finish space/ hog produced/year†	sq.ft.	Under 2.8	2.8-3.2	Over 3.2		_____

(continued)

**Table 1. Production measures for determining production profile. (continued)**

Performance measure	Unit	Performance level			Attainable goal	Your farm
		Excellent	Average	Poor		
27. Labor efficiency†						
Farrow-to-finish						
Sows/F.T.E.	sows	Over 175	100-175	Under 100		_____
Hogs produced/F.T.E.	hogs	Over 2500	1500-2500	Under 1500		_____
Farrow-to-feeder						
Sows/F.T.E.	sows	Over 250	150-250	Under 150		_____
Feeders produced/ F.T.E.	pigs	Over 4000	2500-4000	Under 2500		_____
Finish						
Pork produced/ F.T.E.	cwt.	Over 12500	7500-12500	Under 7500		_____

\* Farrowing difficulties may occur if pig birth weight is over 4.5 lb.

† These standards are for intensive production systems.

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