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# What does attrition cost and what is it worth to reduce?

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## Introduction

From an industry perspective, if pork is to be competitive with other protein sources (i.e., beef, poultry, and fish), then it is imperative that the industry produces a high quality product at the lowest cost possible. Furthermore, because average long-run profits are zero in a competitive industry, from an individual producer's perspective it is critical to be a low cost producer. While producing a high quality product is important, this paper focuses strictly on costs of production. There are numerous factors that ultimately impact the cost of production and many of these factors are interrelated. However, to quantify the impact of a specific factor that producers have to make management decisions about requires an economic analysis that focuses on this key factor. Specifically, this paper examines the impact that sow attrition rate has on the cost and returns of producing a weaned pig. This information is useful for producers as they identify strategies for culling sows that best fit into their operations.

The effect that parity has on sow productivity has been widely researched, and based on this research, optimal parity distributions have been suggested.[1-4] However, the economic consequences of varying from this optimal distribution have not been quantified. In other words, the following question has not been answered: How does the cost of production and the resulting economic returns vary as the parity distribution within a herd varies? In order for producers to make informed decisions, they need quantitative information; thus, an economic analysis that quantifies the costs and returns associated with parity distribution (i.e., sow attrition) is warranted. Quantifying the economic costs and returns associated with sow attrition is complicated because of the numerous interacting factors. This may be one reason that optimal parity distributions have not been quantified in terms of costs and returns. Because of all the factors impacting optimal parity distribution, any economic analysis will require a number of assumptions and the validity of these assumptions must be tested over time. Thus, a sensitivity analysis around some of these key factors is also an important part of an economic analysis.

## Method of economic analysis

There are a number of methods that can be used to analyze the economic returns of an investment or enterprise, e.g., net present value, internal rate of return, partial budget, whole-farm analysis, benefit/cost ratio. In this analysis, projected budgets are used to compare returns for various parity distributions (i.e., sow culling strategies). This is an appropriate method of analysis because this research considers an operation that is in "steady-state," or on-going, not one that is starting up. Costs in the budgets reflect full "economic costs" rather than cash flow costs.

Projected budgets were developed for sow operations that cull sows after their first through their tenth parities to identify the optimal parity distribution. Each of these 10 budgets or scenarios represents a different parity distribution. For example, an operation that culls sows after their first parity would essentially be a gilt farm with 100 percent of sows as one-parity sows. Similarly, an operation that culls all sows after their second parity would be comprised of only one- and two-parity sows. On the other hand, an operation that does not cull sows until after their tenth parity will have a distribution of first-parity through tenth-parity sows. While it may seem unrealistic to consider operations that cull all sows after one or two parities, these scenarios are included in the analysis for comparison purposes.

## Assumptions in economic analysis

Numerous assumptions were made in order to construct budgets for the ten different strategies for culling sows (i.e., parity distributions) previously discussed. The following are some of the key assumptions made that impact costs and returns.

- The selling price of a weaned pig is constant across all parities and is based on the K-State formula for SEW pigs.[5] In other words, it is assumed that parity has no impact on progeny value.
- Regardless of parity distribution, there are 220 sows farrowing every four weeks.

- Investment in facilities (buildings and equipment) averages $5,776 per farrowing crate ($1,115 per sow in inventory).
- Annual costs of buildings and equipment are based on a 15-year life for buildings, a 10-year life for equipment, and an interest rate of 10%.
- Cost of a replacement gilt is $200/head.
- Sow cull income varies based on the weight of the sow. Cull sow prices ($/cwt) are held constant across weights with the exception of gilts sold that did not conceive, which are valued at higher prices.
- Sow death loss is calculated as a percent of each gilt purchased, as opposed to a percent of inventory on an annual basis. Based on values reported by Dean and Xue,[6] death loss is assumed to be 4% for first parity sows and increases linearly by 0.33% for each successive parity (results in a death loss of seven percent for tenth parity sows).
- Breeding/genetic charge is based on the cost of a replacement gilt, the salvage value of cull sow, and the replacement rate. Semen cost is based on two matings and is assumed equal for all scenarios.
- Feed cost is based on five-year average prices and is $142.51/ton and $133.65/ton for lactation and gestation diets, respectively.
- Feed consumption varies by parity. Gestation intake ranges linearly from 5.15 to 6.00 lb/head/day for parities 1 through 10. Lactation intake ranges nonlinearly from 10.25 to 12.55 lb/head/day for parities 1 through 10.
- Total costs for labor, repairs, utilities, and professional fees all are held constant across scenarios. However, these costs on a per-weaned-pig basis do vary based on production.
- Costs for marketing, transportation, veterinary services, drugs, and supplies are assumed to be constant on a per-weaned-pig basis.

In addition to the assumptions listed above, there are two other major assumptions affecting the costs and returns—conception rates and pigs weaned per litter. Assumed conception rates for gilts and sows at the various parity levels are shown in **Figure 1**. These relationships were estimated based on reasonable expectations as well as information from the National Pork Producers Council's (NPPC) Maternal Line Genetic Evaluation Program.[7] The conception rate as a percent of original gilt numbers is slightly below 80% for first parity sows and then decreases to approximately 20% by the tenth parity. The conception rate as a percent of the previous parity is basically constant at 86%. Clearly, the ability to get sows bred back will play a significant role in the optimal parity distribution. Therefore, the sensitivity of costs and returns to the conception rate assumption is examined as well.

Another major assumption impacting the optimal parity distribution is pigs weaned per sow by parity. Pigs weaned per sow is a function of both pigs born alive as well as preweaning mortality. **Figure 2** shows the pigs born alive and preweaning mortality by parity assumed here. Pigs born alive are maximized at parity six. This information is based on a large number of previous studies that reported pigs born alive by parity.[2,8-19] The studies covered numerous countries and spanned multiple decades. The quadratic equation for pigs born alive per sow was estimated from 270 observations, where each observation is an average value representing numerous sows reported in a research study. Preweaning mortality is based on several reported studies.[20,21] Because only two studies were located and neither of these studies reported preweaning

Figure 1: Conception rate by parity

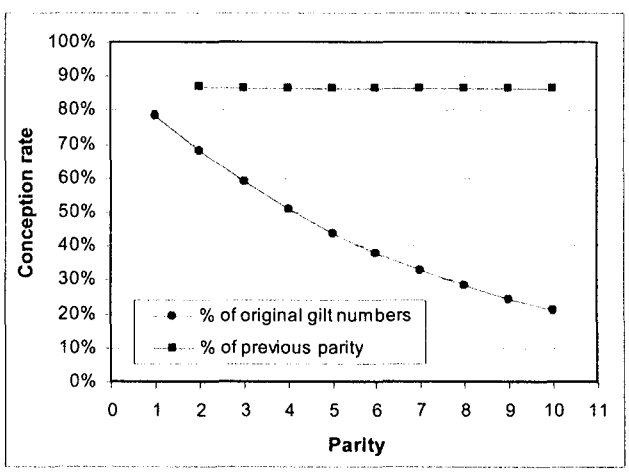
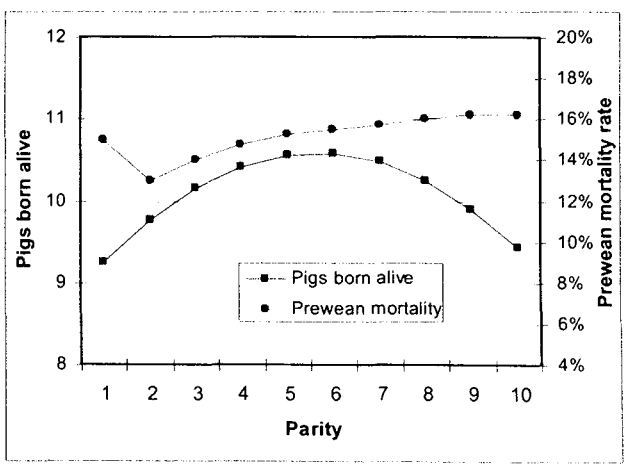



Figure 2. Sow production per litter by parity



mortality out to ten parities, the information shown in **Figure 2** does not fit any particular functional form. Rather, it was estimated using the information from the studies while attempting to maintain consistency with biologic principles. Together the values in **Figure 2** give pigs weaned per litter by parity which is used to calculate costs and returns for each of the ten parity distributions examined. Similar to conception rate, the relationship of pigs weaned per litter and parity will impact the optimal parity distribution so the sensitivity of costs and returns to this relationship is examined.

Given the assumptions listed, the production and cost and returns were estimated for each of the ten different strategies for culling sows. All analyses are based on steady state production. That is, the swine operation is assumed to be operating at a point where its sow herd size is constant from month to month (i.e., gilts purchased is exactly equal to sows culled and sow death loss).

## Results

**Table 1** reports the production information for the different sow culling strategies. Based on the assumptions used here, in order for producers to achieve a parity distribution with less than 20% gilts, they need to keep sows that breed back for at least eight parities. The total pigs weaned/sow/year is maximized when sows are kept for eight parities; however, differences between culling sows after 5 through 10 parities are quite small. Actually, pigs/sow/year (p/s/y) is only noticeably lower when sows are culled after parity 1 (i.e., gilt farm) or parity 2. Given the production information presented in **Table 1**, costs and returns can be estimated allowing for the most profitable sow culling strategy (i.e., parity distribution) to be identified.

As would be expected, a culling strategy of selling all sows after the first parity (i.e., a gilt farm) is extremely unprofitable due to the high sow depreciation cost. The cost of producing a weaned pig decreases at a decreasing rate as sows are kept for additional parities. The total cost of producing a weaned pig is minimized when sows are kept through eight or nine parities before culling. However, for sows kept between 6-10 parities there is less than 40¢ per head difference in cost. Based on the assumptions used here, returns per head are approximately twice as high when sows are kept for 7-10 parities before culling (average of $2.95/head) compared to a strategy of culling after four parities ($1.45/head).

### Sensitivity analysis for costs

A sensitivity analysis was conducted to determine how changing various cost assumptions impacted returns over total costs (i.e., line F in **Table 2**). Because differences in breeding herd depreciation cost is the major cost difference, several gilt replacement costs were considered. If replacement gilts are valued at $150 per head (original assumption was $200), returns are still maximized when sows are kept for eight parities (**Table 3**). However, with

Table 1: Parity distribution and production from sow herd

| Parity prior to culling[a] | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Percent of farrowings from each parity (steady-state parity distribution) | | | | | | | | | |
| Parity 1 | 100.0 | 53.6 | 38.2 | 30.7 | 26.4 | 23.3 | 21.4 | 19.7 | 18.5 | 17.7 |
| Parity 2 | | 46.4 | 33.2 | 26.6 | 22.7 | 20.2 | 18.6 | 17.0 | 16.2 | 15.5 |
| Parity 3 | | | 28.6 | 23.0 | 19.5 | 17.4 | 15.9 | 14.7 | 13.9 | 13.2 |
| Parity 4 | | | | 19.8 | 16.8 | 15.2 | 13.6 | 12.7 | 12.1 | 11.4 |
| Parity 5 | | | | | 14.5 | 12.9 | 11.8 | 10.9 | 10.3 | 10.0 |
| Parity 6 | | | | | | 11.1 | 10.0 | 9.5 | 8.9 | 8.6 |
| Parity 7 | | | | | | | 8.6 | 8.2 | 7.6 | 7.3 |
| Parity 8 | | | | | | | | 7.3 | 6.7 | 6.4 |
| Parity 9 | | | | | | | | | 5.8 | 5.5 |
| Parity 10 | | | | | | | | | | 4.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Average parity[b] | 1.00 | 1.46 | 1.90 | 2.32 | 2.70 | 3.07 | 3.40 | 3.76 | 4.05 | 4.32 |
| Sow inventory | 1,220 | 1,196 | 1,188 | 1,184 | 1,184 | 1,182 | 1,182 | 1,179 | 1,179 | 1,180 |
| Annual purchases | 3,640 | 1,950 | 1,391 | 1,112 | 962 | 849 | 780 | 719 | 672 | 650 |
| Replacement rate | 298% | 163% | 117% | 94% | 81% | 72% | 66% | 61% | 57% | 55% |
| Total litters/year[c] | 2,860 | 2,860 | 2,860 | 2,860 | 2,860 | 2,860 | 2,860 | 2,860 | 2,860 | 2,860 |
| Litters/sow/year | 2.34 | 2.39 | 2.41 | 2.42 | 2.42 | 2.42 | 2.42 | 2.43 | 2.43 | 2.42 |
| Pigs born alive/litter | 9.25 | 9.49 | 9.68 | 9.83 | 9.93 | 10.01 | 10.04 | 10.06 | 10.05 | 10.03 |
| Pigs weaned/litter | 7.96 | 8.25 | 8.42 | 8.53 | 8.61 | 8.66 | 8.68 | 8.68 | 8.67 | 8.64 |
| Pigs weaned/sow/year | 18.7 | 19.7 | 20.3 | 20.6 | 20.8 | 20.9 | 21.0 | 21.1 | 21.0 | 20.9 |
| Total pigs sold/year | 22,756 | 23,599 | 24,078 | 24,399 | 24,614 | 24,758 | 24,823 | 24,839 | 24,792 | 24,704 |

[a]Represents the sow culling strategy. For example, "3" would indicate sows are kept for three parities at which time they are culled. Sows not breed back prior to their final parity are culled at the time they are open.

[b]Average parity is simply the weighted average parity. For example, the average parity for sows culled after their third parity is calculated following manner: (38.2% x 1 + 33.2% x 2 + 28.6% x 3) = 1.90.

Table 2: Cost-return budget for a farrow-to-weaned pig operation

| Parity prior to culling[a] | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| VARIABLE COSTS PER PIG SOLD: | | | | | | | | | | |
| 1. Grain | $4.09 | $3.99 | $3.98 | $3.99 | $4.02 | $4.05 | $4.10 | $4.15 | $4.21 | $4.29 |
| 2. Protein | 1.89 | 1.86 | 1.86 | 1.87 | 1.88 | 1.90 | 1.92 | 1.94 | 1.97 | 2.00 |
| 3. Base mix: vitamins, minerals, etc. | 0.98 | 0.96 | 0.96 | 0.96 | 0.97 | 0.97 | 0.98 | 1.00 | 1.01 | 1.03 |
| 4. Pig starter | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5. Feed processing | 0.56 | 0.54 | 0.54 | 0.54 | 0.55 | 0.55 | 0.56 | 0.56 | 0.57 | 0.58 |
| 6. Labor | 7.25 | 6.99 | 6.85 | 6.76 | 6.70 | 6.66 | 6.65 | 6.64 | 6.66 | 6.68 |
| 7. Veterinary, drugs, and supplies | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 8. Utilities, fuel, and oil | 1.32 | 1.27 | 1.25 | 1.23 | 1.22 | 1.21 | 1.21 | 1.21 | 1.21 | 1.21 |
| 9. Transportation and marketing costs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10. Building and equipment repairs | 1.18 | 1.13 | 1.10 | 1.08 | 1.07 | 1.07 | 1.06 | 1.06 | 1.06 | 1.07 |
| 11. Breeding/genetic charge | | | | | | | | | | |
| a. Depreciation | 16.83 | 7.54 | 4.87 | 3.67 | 3.06 | 2.63 | 2.38 | 2.18 | 2.02 | 1.97 |
| b. Semen | 2.01 | 1.94 | 1.90 | 1.88 | 1.86 | 1.85 | 1.84 | 1.84 | 1.85 | 1.85 |
| c. Interest | 0.80 | 0.80 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.78 | 0.79 | 0.79 |
| d. Insurance | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| 12. Professional fees (legal, accounting, etc.) | 0.53 | 0.51 | 0.50 | 0.49 | 0.49 | 0.48 | 0.48 | 0.48 | 0.48 | 0.49 |
| 13. Interest on 1/2 variable costs | 0.82 | 0.60 | 0.53 | 0.50 | 0.49 | 0.48 | 0.48 | 0.47 | 0.47 | 0.48 |
| A. TOTAL VARIABLE COSTS | $40.34 | $30.20 | $27.21 | $25.83 | $25.17 | $24.72 | $24.53 | $24.39 | $24.38 | $24.51 |
| FIXED COSTS PER PIG SOLD: | | | | | | | | | | |
| 14. Depreciation on bldgs and equip | 4.21 | 4.02 | 3.92 | 3.87 | 3.83 | 3.81 | 3.80 | 3.79 | 3.80 | 3.81 |
| 15. Interest on bldgs and equip | 3.16 | 3.02 | 2.95 | 2.90 | 2.88 | 2.86 | 2.85 | 2.85 | 2.85 | 2.86 |
| 16. Insurance and taxes on bldgs and equip | 0.78 | 0.74 | 0.73 | 0.72 | 0.71 | 0.71 | 0.70 | 0.70 | 0.70 | 0.71 |
| B. TOTAL FIXED COSTS | $8.14 | $7.78 | $7.60 | $7.49 | $7.42 | $7.37 | $7.35 | $7.34 | $7.35 | $7.38 |
| C. TOTAL COSTS PER PIG SOLD | $48.48 | $37.98 | $34.81 | $33.32 | $32.60 | $32.10 | $31.88 | $31.73 | $31.73 | $31.90 |
| D. GROSS RETURNS PER PIG SOLD | $34.77 | $34.77 | $34.77 | $34.77 | $34.77 | $34.77 | $34.77 | $34.77 | $34.77 | $34.77 |
| E. RETURNS OVER VC (D-A),$/hd | -$5.57 | $4.57 | $7.56 | $8.93 | $9.59 | $10.05 | $10.24 | $10.37 | $10.39 | $10.25 |
| F. RETURNS OVER TC (D-C), $/hd | -$13.71 | -$3.21 | -$0.04 | $1.45 | $2.17 | $2.67 | $2.88 | $3.03 | $3.03 | $2.87 |
| G. NET RETURN ON INVESTMENT | -12.8% | 1.8% | 6.5% | 8.8% | 10.0% | 10.8% | 11.1% | 11.4% | 11.4% | 11.1% |

[a] Represents the sow culling strategy (sows are culled after the parity number listed)

Table 3: Sensitivity of returns over total costs ($/hd) to various cost assumptions

| | Parity prior to culling | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| *Cost of Replacement Gilt, $/hd* | | | | | | | | | | |
| $150 (-25%) | -$5.39 | $1.15 | $3.05 | $3.91 | $4.30 | $4.56 | $4.62 | $4.64 | $4.55 | $4.35 |
| $200 (base) | -$13.71 | -$3.21 | -$0.04 | $1.45 | $2.17 | $2.67 | $2.88 | $3.03 | $3.03 | $2.87 |
| $250 (+25%) | -$22.03 | -$7.57 | -$3.13 | -$1.02 | $0.04 | $0.79 | $1.15 | $1.42 | $1.52 | $1.39 |
| *Cost of Gestation/Lactation Diets, $/ton* | | | | | | | | | | |
| $100/$107 (-25%) | -$11.79 | -$1.33 | $1.84 | $3.33 | $4.07 | $4.58 | $4.82 | $4.99 | $5.02 | $4.89 |
| $134/$143 (base) | -$13.71 | -$3.21 | -$0.04 | $1.45 | $2.17 | $2.67 | $2.88 | $3.03 | $3.03 | $2.87 |
| $167/$178 (+25%) | -$15.64 | -$5.09 | -$1.92 | -$0.44 | $0.28 | $0.76 | $0.95 | $1.08 | $1.05 | $0.85 |

these lower gilt prices, the advantage in returns for sows kept 7-10 parities (average of $4.54/head) compared to sows kept four parities ($3.91) is cut by more than half of what it was when gilts were valued at $200 per head. On the other hand, if gilts are valued at $250 per head, returns are maximized by keeping sows for nine parities. At this higher gilt price, the advantage in returns for sows kept 7-10 parities (average of $1.37/head) compared to sows kept four parities (-$1.02) increases almost a dollar per head compared to when gilts were valued at $200 per head. While returns are maximized in all cases with sows kept for 8-9 parities, the advantage of doing so increases (decreases) as the price of replacement gilts increases (decreases).

Costs for both the gestation and lactation diets were varied by ±25% to determine how sensitive returns are to feed costs (**Table 3**). While increasing or decreasing feed costs impacts the level of returns, it has almost no impact on relative differences between parity distributions. As feed costs increase, the optimal culling strategy is to sell sows slightly quicker and when feed costs decrease the

optimal strategy is to keep sows a little longer; however, the changes are quite small. Therefore, based on the assumptions used in this analysis, from a management perspective the optimal sow culling strategy is basically invariant to feed costs.

## Sensitivity analysis of reproductive traits

All cost and return results presented in **Tables 2** and **3** were based on the pigs weaned per litter and conception rate relationships with parity displayed in **Figures 1** and **2**. Because these factors have a major impact on economic returns, a logical question is, How sensitive is the optimal parity distribution to these factors? To answer this question, the conception rate and the pigs weaned per litter relationships displayed in **Figures 1** and **2** were modified to see what impact this has on optimal parity for culling sows.

Several alternative relationships between conception rate and parity were considered. **Figure 3** shows the base conception rate (i.e., that shown in **Figure 1**) as well as conception rates that are ±10%. In other words this answers the following question: What is the impact if the conception rate is higher or lower at every parity by 10% compared to the initial assumption? Another scenario considered was, what is the impact of starting at the same conception rate as the base scenario but decreasing at a faster or slower rate? **Figure 4** shows this scenario when conception rates are equal at parity 1, but then decrease to a level at parity 10 that is ±40% of the base scenario. Given these alternative scenarios, there are a total of five different conception rate-parity relationships that are considered (base, base +10%, base –10%, +40% at P10, and –40% at P10). The steady state number of gilts purchased every month and the resulting parity distribution for each culling strategy had to be recalculated for each of these five scenarios.

In addition to considering alternative conception rates, an alternative litter size by parity relationship was considered. **Figure 5** shows the initial pigs born alive by parity data used (base) as well as a modified series of this data (hypothetical). The data shown by the "hypothetical" line represent sows that reach their peak litter size at an earlier parity as compared to the relationship that was estimated from historical studies. The area under the curves is essentially identical, which means that over ten parities the average litter size is held constant, but the distribution is changed. It is important to note that the "hypothetical" line is simply that—this information was estimated simply to answer the "what if" question and is not based on any actual production. The reason for "shifting" the peak litter size to the left (i.e., at an earlier parity) was to see if this pattern in litter size by parity would result in sows optimally being culled after fewer parities. Clearly, shifting the maximum litter size to higher pari-

Figure 3: Alternative conception rates by parity (Case 1)

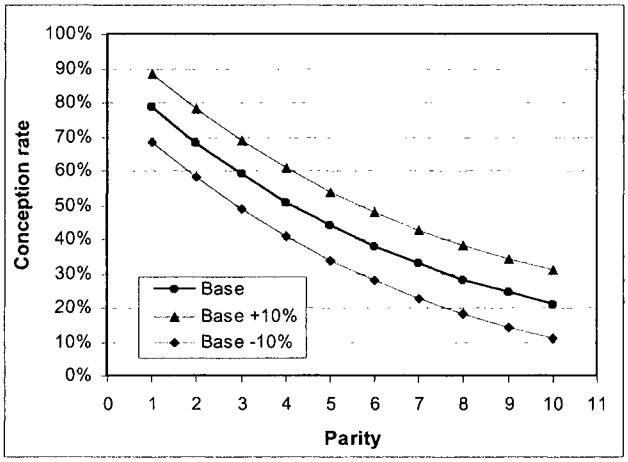



Figure 4: Alternative conception rates by parity (Case 2)

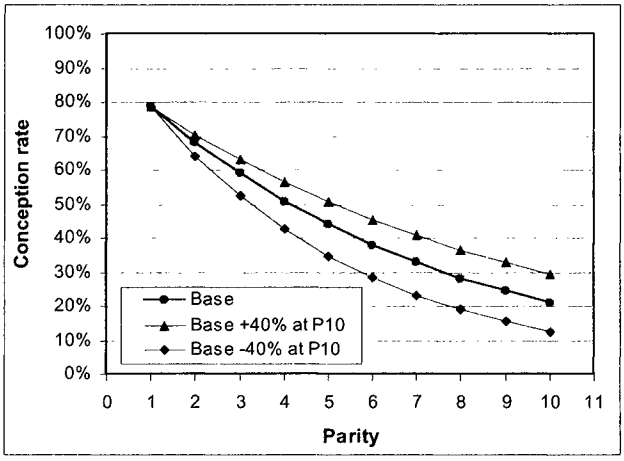
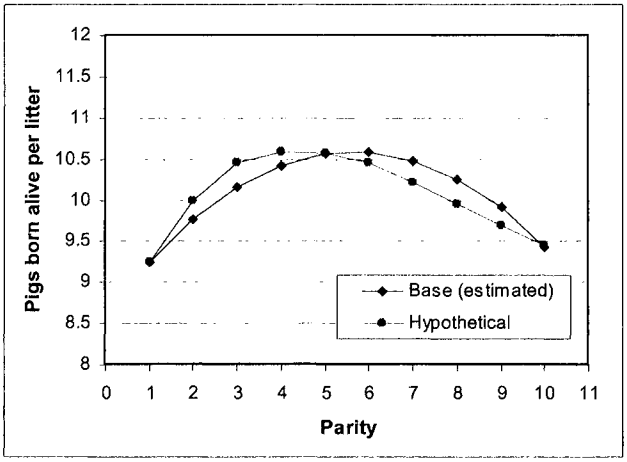



Figure 5: Alternative litter sizes by parity



ties will not decrease the age at when sows should be culled and thus is not considered here.

The net returns per head for the various conception rate and litter size assumptions for the ten different sow culling strategies are given in **Table 4**. All cost and price assumptions are held constant at their original values. In the base scenario for both conception rate and litter size, returns are maximized when sows are culled after eight or nine parities (these are the same numbers as Line F in **Table 2**). At the alternative conception rates, returns are maximized when sows are culled after either eight or nine parities. Additionally, it can be seen that when conception rates increase (base +10% and +40% at P10), the level of returns increase considerably. For example, with a strategy of culling sows after eight parities, returns increase by 76¢ per head when conception rates increase 10 percent ($3.79 vs. $3.03). For an operation producing 24,000 pigs per year that would equate to an increase in returns of $18,240. Similarly, by decreasing the rate of decline in conception rates between parities (i.e., +40% at P10), returns increase by 50¢ per head ($3.53 vs. $3.03). Likewise, when conception rates decrease (i.e., base – 10% and –40% at P10), returns decrease considerably. Furthermore, the increases and decreases are not symmetric. That is, a 10% decrease in conception rates has a much greater negative impact on returns than the positive impact from a 10% increase in conception rates.

When the litter size assumption is changed to the hypothetical relationship shown in **Figure 5**, net returns are maximized with sows being culled after their eighth parity for all conception rate scenarios. With the exception of sows culled after their first parity, the level of returns increases with the hypothetical litter size by parity relationship compared to the base scenario because larger litter sizes occur at the lower preweaning mortality rates. Based on the information in **Table 4**, it can be seen that the level of returns vary with productivity but the optimal parity distribution is quite robust over the conception rate and litter size scenarios considered.

## Discussion and practical implications

In a competitive industry such as the swine industry, it is important to be a low cost producer. Being a low cost producer in the swine industry starts with producing a weaned pig at the lowest cost possible. This paper examines the impact that various sow-culling strategies have on costs and returns in a farrow-to-wean operation. The optimal parity distribution is a complex issue because it is related to conception rates, litter size, feed intake, as well as other factors. The results of this analysis indicate that the most economical time to cull a sow is after her eighth or ninth parity. However, the additional benefits of keeping a sow beyond about six parities are relatively small. As would be expected, the optimal time to cull a sow decreases as the cost of replacement gilts increases and vice-versa. Feed costs impact the level of costs and returns but have very little impact on the optimal parity distribution. Similarly, over a range of conception rates and litter sizes, the optimal time to cull a sow is relatively constant. The information in this analysis can be useful for producers as they develop strategies for when sows should be culled. Additionally, this information can help producers quantify the impact conception rates have on returns.

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Table 4: Sensitivity of returns over total costs ($/hd) to productivity assumptions

| | Parity prior to culling | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| *Conception rate scenario—Litter size by parity relationship—"Base"* | | | | | | | | | | |
| Base | -$13.71 | -$3.21 | -$0.04 | $1.45 | $2.17 | $2.67 | $2.88 | $3.03 | $3.03 | $2.87 |
| Base + 10% | -$11.36 | -$1.85 | $0.94 | $2.26 | $3.04 | $3.54 | $3.66 | $3.79 | $3.63 | $3.59 |
| Base –10% | -$16.84 | -$5.02 | -$1.51 | $0.27 | $1.15 | $1.61 | $1.77 | $1.90 | $1.87 | $1.87 |
| +40% at P10 | -$13.71 | -$2.96 | $0.35 | $1.80 | $2.67 | $3.19 | $3.42 | $3.53 | $3.54 | $3.43 |
| -40% at P10 | -$13.71 | -$3.66 | $0.80 | $0.73 | $1.43 | $1.79 | $2.11 | $2.18 | $2.17 | $1.94 |
| *Conception rate scenario—Litter size by parity relationship—"Hypothetical"* | | | | | | | | | | |
| Base | -$13.72 | -$2.80 | $0.50 | $1.95 | $2.59 | $3.00 | $3.12 | $3.18 | $3.14 | $2.98 |
| Base + 10% | -$11.37 | -$1.45 | $1.47 | $2.76 | $3.45 | $3.85 | $3.86 | $3.91 | $3.71 | $3.66 |
| Base –10% | -$16.85 | -$4.59 | -$0.95 | $0.79 | $1.59 | $1.96 | $2.03 | $2.10 | $2.03 | $2.02 |
| +40% at P10 | -$13.72 | -$2.55 | $0.89 | $2.31 | $3.08 | $3.50 | $3.63 | $3.64 | $3.60 | $3.49 |
| -40% at P10 | -$13.72 | -$3.26 | $1.31 | $1.24 | $1.87 | $2.14 | $2.36 | $2.38 | $2.33 | $2.11 |

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