Assessing Economic Opportunity of Improving Mortality Rate in Wean-to-Finish Swine Production

If pig production is profitable, lowering the mortality rate improves net income. However, it can be difficult to determine what cost can be incurred to lower mortality rate and achieve a profit. The purpose of this fact sheet is not to determine the cost of mortality mitigation strategies but to help producers determine the income opportunity of improving mortality in their operation as compared to the potential cost of a strategy to lower mortality. Mortality reduction strategies and costs will most certainly vary among operations and situations.

A budget model is commonly used to project economic costs and returns and this fact sheet and accompanying spreadsheet use estimated budgets and sensitivity tables to highlight and compare net income changes due to changes in mortality rates. The main economic costs and returns of changing mortality are highlighted.

The main revenue factors that change with increased mortality are less revenue from market hog sales and the value of manure. On the cost side, feed, feed manufacturing, marketing and potentially health expenses decrease as pigs die. Some of the factors such as feed, feed manufacturing, health expenses and manure value, are affected by the timing of when pigs die during the feeding period.

The information provided here is designed to serve as an economic guide to the value of improving mortality for the wean-to-finish phase of the production process. The main inputs included in the budget are:

Revenue Change

Market hog sales
- Main inputs are carcass price, weight of pigs sold, and mortality rate.
- The mortality rate multiplied by the value of a pigs sold is the lost revenue.
- As the sale price of market hogs increases the lost revenue also increases and vice versa.

Value of manure
- An assumed value of manure nutrients per head sold is the main input.
- The value is decreased by the percent mortality rate and the timing of pig death loss during the feeding period.
- The earlier or lighter weight the average pig dies during the feeding period results in less manure value.

Cost Change

Feed
- Main inputs are feed efficiency, weight gain of pigs, cost of feed and when pigs die during the feeding period.
- Mortalities reduce the amount of feed fed as projected in the budget.
- The timing of average death loss during the feeding period affects how much feed is not consumed. An assumed average weight for mortalities is used as an input. The weight input is used to determine how much of the projected feed cost is reduced.
- Cost of feed purchased per head is reduced by the mortality rate multiplied by the normal feed cost multiplied by the percent of feed value not consumed.
- As feed cost goes up, feed efficiency declines. Or, if pigs die earlier in the feeding period, the cost savings goes up with increased mortality and vice versa.

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Feed processing and delivery
- This is similar to the feed cost calculation with an added input of the cost per ton to mix and deliver feed.
- As pigs die and less feed is consumed there is less cost to manufacture and deliver feed.
- Cost of feed mixing and delivery per head is reduced by the mortality rate multiplied by the normal feed delivery cost multiplied by the percent of feed value not consumed.

Veterinary and health
- It is assumed most of the cost occurs in the early part of the feeding period before pigs weigh 50 pounds.
- If pigs die before 50 pounds, the veterinary and health charge per head is reduced by 50% for the pigs that die.
- For death loss that occurs after 50 pounds, there is no assumed reduction in veterinary and health costs.

Marketing cost - transportation and check-off
- Mortalities decrease this cost as pigs are not sold.
- The projected marketing cost times the mortality rate is the cost reduction per head.

Other expenses in the budget such as utilities, labor and facility charges will likely not change as mortality changes. These expenses don't accrue on a per head basis but on a group or operation basis and the total cost is not likely to change within normal mortality ranges.

Using the following assumptions, the net profit per head is $6.37 with a 6% mortality rate and $7.42 with an improved 5% mortality rate, or a net income increase of $1.04 per head (Table 1). The budget inputs assume no mortality rate, but the budget outputs are adjusted to reflect the revenue and cost changes associated with mortality rates.

Income per head
$70 per cwt. carcass price marketing at 284 pounds live weight
$2.30 manure value per head

Expense per head
$35 weaned pig price per head
$0.09 per pound of feed
2.7 pounds of feed per pound of gain (feed efficiency)
$12 per ton feed processing and delivery cost
$4.50 veterinary and medical cost
$1.00 marketing cost
$13.99 other variable costs
$11.79 fixed cost

Some of the above inputs or assumptions may change as mortality mitigation strategies are implemented. Two of those inputs that could substantially affect the economic outcome are feed efficiency and the timing of mortality or average weight of mortalities. In the accompanying Decision Tool, **Pig Survivability Project - Wean-to-finish mortality economic modeling**, www.extension.iastate.edu/agdm/livestock/xls/ b1-78improvingmortality.xlsx, changing these two inputs along with the mortality rate is an option. For the examples presented here, they are assumed to be the same.

Using the assumptions described, Table 1 shows the revenue and cost changes for a starting group size of 2,400 pigs at 6% mortality compared to an improved 5% mortality and assuming an average weight of 150 pounds for pigs that die.

Table 1. Partial budget comparing 0% mortality to 5% and 6%

	Per head		Per group (2,400 head)	
Revenue change	6.0%	5.0%	6.0%	5.0%
Less market hogs	$ (8.83)	$ (7.36)	$ (21,184)	$ (17,653)
Less manure	$ (0.08)	$ (0.07)	$ (203)	$ (169)
Total revenue change	**$ (8.91)**	**$ (7.43)**	**$ (21,387)**	**$ (17,823)**
Cost change				
Feed cost	$ 2.43	$ 2.03	$ 5,834	$ 4,862
Feed processing and delivery	$ 0.16	$ 0.14	$ 389	$ 324
Total Feed	**$ 2.59**	**$ 2.16**	**$ 6,223**	**$ 5,186**
Veterinary and health	$ 0	$ 0	$ 0	$ 0
Marketing	$ 0.06	$ 0.05	$ 144	$ 120
Net income change	**$ (6.26)**	**$ (5.22)**	**$ (15,020)**	**$ (12,517)**

Table 2 summarizes the partial budget changes in revenue, cost, and net income due to the one percentage point change in mortality. The net income per head change of $1.04 is the same as that shown using the full budget.

Table 2. Effect of 1.0% mortality improvement

	Per head	Per group (2,400 head)
Revenue change	$ 1.49	$ 3,565
Cost change	$ (0.43)	$ (1,037)
Net income change	$ 1.04	$ 2,503

The net income change represents the economic opportunity of decreasing mortality. Assuming there would be some cost associated with decreasing mortality, the net income change represents the maximum amount that could be spent to achieve the mortality rate improvement and make the operation more profitable.

Some mortality mitigation strategies may affect more than one group of pigs so the number of pigs placed over a period of time should be used instead of number of pigs in one group.

Sensitivity tables are also available to compare net income per head over a range of mortality rates and market hog prices, feed costs and feed efficiency. Using the budget estimates above, the results of three sensitivity analyses are shown in Table 3. As overall profitability increases the value of a change in mortality increases. Also, the value of a market hog price, feed cost or feed efficiency change can be assessed as compared to the mortality rate change.

Use the accompanying **Decision Tool**, www.extension.iastate.edu/agdm/livestock/xls/b1-78improvingmortality.xlsx, to compare two different mortality rates on a per head and a total group basis for the factors outlined above.

Table 3. Sensitivity analyses of net income per head by carcass price, feed price and feed efficiency

		Carcass price per hundredweight				
Net income per head		$ 66.00	$ 68.00	$ 70.00	$ 72.00	$ 74.00
	4.00%	$ 0.39	$ 4.42	$ 8.46	$ 12.50	$ 16.53
	5.00%	$ (0.57)	$ 3.42	$ 7.42	$ 11.41	$ 15.40
Mortality %	6.00%	$ (1.53)	$ 2.42	$ 6.37	$ 10.32	$ 14.28
	7.00%	$ (2.49)	$ 1.42	$ 5.33	$ 9.24	$ 13.15
	8.00%	$ (3.45)	$ 0.42	$ 4.29	$ 8.15	$ 12.02

		Feed price per pound				
Net income per head		$ 0.07	$ 0.08	$ 0.09	$ 0.10	$ 0.11
	4.00%	$ 22.79	$ 15.62	$ 8.46	$ 1.30	$ (5.87)
	5.00%	$ 21.65	$ 14.54	$ 7.42	$ 0.30	$ (6.82)
Mortality %	6.00%	$ 20.52	$ 13.45	$ 6.37	$ (0.70)	$ (7.77)
	7.00%	$ 19.39	$ 12.36	$ 5.33	$ (1.70)	$ (8.73)
	8.00%	$ 18.26	$ 11.27	$ 4.29	$ (2.70)	$ (9.68)

		Feed efficiency (pound of feed per pound of gain)				
Net income per head		2.60	2.65	2.70	2.75	2.80
	4.00%	$ 11.01	$ 9.73	$ 8.46	$ 7.19	$ 5.91
	5.00%	$ 9.95	$ 8.68	$ 7.42	$ 6.15	$ 4.89
Mortality %	6.00%	$ 8.89	$ 7.63	$ 6.37	$ 5.12	$ 3.86
	7.00%	$ 7.83	$ 6.58	$ 5.33	$ 4.08	$ 2.83
	8.00%	$ 6.77	$ 5.53	$ 4.29	$ 3.05	$ 1.80

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