# Use of a Bio-Economic Model to Assess the Financial Impact
# of Changes in Breeding Herd and Growing Pig Performance

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## Objective:

* Use bio-economic models to assist with evaluating the costs of substandard performance in the...
  ...breeding herd
  ...growing pig herd

## Materials and Methods:

* Two bio-economic models were developed using a commercial spreadsheet (Lotus 1-2-3).

* For the breeding herd model, the MOVC method (margin-over-variable-cost) is used to calculate financial differences between two model herds.

* For the growing pig herd, financial output between two model herds is reported as the difference in total net profit per 1000 head facility per turn.

## Materials and Methods:

* Breeding herd inputs:
  -- *weaning-to-first service interval*
  -- *service-to-nonfarrowing interval*
  -- *gestation length*
  -- *lactation length*
  -- *farrowing rate*
  -- *liveborn per litter*
  -- *percent preweaning mortality*
  -- *percent post-weaning mortality*
  -- *MOVC per pig sold*

* Breeding herd outputs:
  -- *pigs weaned per mated female day*
  -- *pigs weaned per mated female per year*
  -- *pigs sold per mated female per year*
  -- *MOVC per mated female per year*

## Materials and Methods:

* Breeding herd baseline assumptions:
  -- *10.0 liveborn per litter*
  -- 12% preweaning mortality
  -- 5% post-weaning mortality
  -- 7 day weaning-to-service interval
  -- 115 day gestation length
  -- 21 day lactation length
  -- 65 day service-to-nonfarrowing interval
  -- 80% farrowing rate

## Materials and Methods:

* Breeding herd comparison values:
  - 0.1 pig per litter born alive
  - 1.0% farrowing rate
  - 1.0% preweaning mortality
  - 1.0 day weaning-to-service interval
  - 1.0 day service-to-detect open interval

**Table 1:** Change in Pigs Weaned per Mated Female per Year Following a Change in Each Input Variable.

| Input Variable | Baseline PWMFY | Adjusted PWMFY | Difference |
|---|---|---|---|
| + 1% Farrow Rate | 19.320 | 19.489 | + 0.168 |
| + 0.1 Liveborn/Litter | 19.320 | 19.514 | + 0.193 |
| - 1% Prewean Mortality | 19.320 | 19.540 | + 0.220 |
| - 1 Day Wn->1stServe | 19.320 | 19.467 | + 0.146 |
| - 1 Day Lactation Length | 19.320 | 19.467 | + 0.146 |
| - 1 Day Serve->NonFarrow | 19.320 | 19.349 | + 0.029 |

**Figure 1:** Relative Opportunity Cost per Mated Female per Year of Changes in Farrowing Rate and/or Liveborn per Litter



U.S. Dollars per Mated Female per Year

Margin-Over-Variable-Costs (MOVC) per Pig
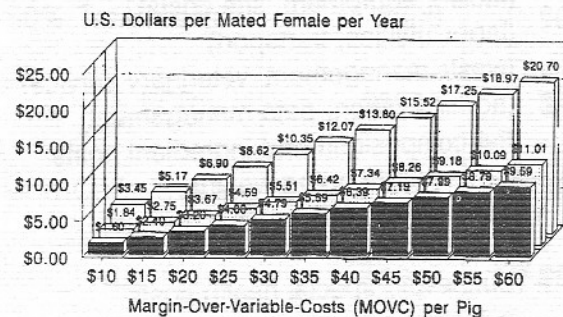
■ 1% Farrow Rate □ 0.1 Live/Litter □ 1% FR & 0.1 LB/L

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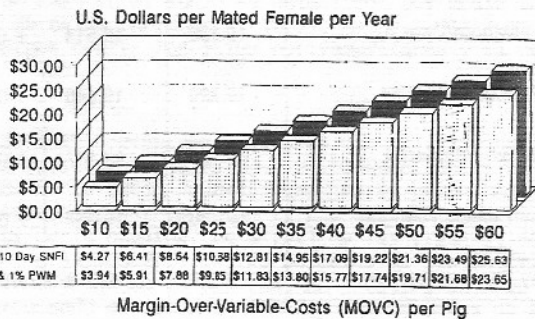
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Figure 2: Relative Opportunity Cost per Mated Female per Year of Changes in Preweaning Mortality or Two Reproductive Intervals



U.S. Dollars per Mated Female per Year

Margin-Over-Variable-Costs (MOVC) per Pig
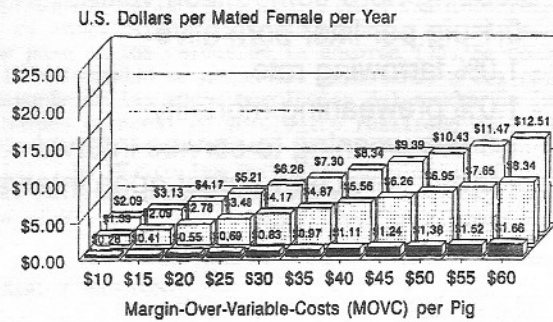
■ 1 Day Serve->NonFarrow  □ 1 Day Wean->1st Serve  □ 1% Prewean Mortality

Figure 3: Relative Opportunity Cost per Mated Female per Year of Changes in Various Input Combinations



U.S. Dollars per Mated Female per Year

| | $10 | $15 | $20 | $25 | $30 | $35 | $40 | $45 | $50 | $55 | $60 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1% FR & 10 Day SNFI | $4.27 | $6.41 | $8.54 | $10.38 | $12.81 | $14.95 | $17.09 | $19.22 | $21.36 | $23.49 | $25.63 |
| 0.1 LB/L & 1% PWM | $3.94 | $5.91 | $7.88 | $9.85 | $11.83 | $13.80 | $15.77 | $17.74 | $19.71 | $21.68 | $23.65 |

Margin-Over-Variable-Costs (MOVC) per Pig

□ 0.1 LB/L & 1% ᴾWM  ■ 1% FR & 10 Day SNFI

### Materials and Methods:

* Growing pig herd inputs:
  -- *Fixed cost category totals*
     (facility, equipment, site costs)
     (labor, utilities, transport)
     (waste management, veterinary service)
     (administration, data management)
  -- diet composition and ingredient costs
  -- starting and ending weight
  -- days-on-feed, down days per turn
  -- feed conversion
  -- routine and special health costs
  -- mortality and culls
  -- purchase and sale price
  -- contract, incentive payments

### Materials and Methods:

* Growing pig herd outputs:

  -- revenue
  -- pig costs (raw material)
  -- fixed costs
  -- feed costs
  -- non-feed variable costs

  -- throughput (margin-over-pig costs)
  -- operating expense
  -- net profit (margin-over-all costs)

(Reported per 1000 head spaces, per pig sold)

### Materials and Methods:

* Growing pig herd baseline assumptions:
  -- 1,000 head facility
  -- $45 pig cost at 22 kg
  -- $92.40 or $105.60 market price per 100 kg
  -- $164.66 feed cost per 1000kg
  -- 3.0 feed conversion ratio
  -- 727 g average daily gain
  -- 130 days-on-feed
  -- 3 down days per turn (2.74 turns/year)
  -- $0.80 routine health cost per pig
  -- $1.00 special health cost per pig
  -- 3.0% mortality
  -- 3.0% culls

### Materials and Methods:

* Growing pig herd comparison values:
  - 0.10 average daily gain (ADG)
  - 0.10 feed conversion ratio (FCR)
  - 1.0% mortality
  - 1.0% culls
  - 50% treatments

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# Questions ?

Conclusions:

* Bio-economic models can be used to estimate the opportunity costs of substandard performance in the breeding and growing pig herds.

* All input changes examined play a meaningful financial role in the profit potential of pig farms.

* These opportunity cost estimates can serve as a starting point for considering the possible benefit:cost of intervention strategies under mangement consideration.

## Opportunity Costs Associated with Changes in Growing Pig Performance

| Measure Changed | /1000 pig spaces | /pig sold |
|---|---|---|
| 0.1 ADG | $3034 | $3.13 |
| 0.1 FCR | $1510 | $1.56 |
| 1% Mortality | $902 | $1.57 |
| 1% Culls | $878 | $0.91 |
| 50% Treatments | $500 | $0.52 |
| ADG & FCR | $4639 | $4.78 |
| Mort,Culls,Treats | $2156 | $2.98 |
| ALL | $6807 | $7.81 |

(At $105.60 per 100 kg sold.)

## Opportunity Costs Associated with Changes in Growing Pig Performance

| Measure Changed | /1000 pig spaces | /pig sold |
|---|---|---|
| 0.1 ADG | $2301 | $2.37 |
| 0.1 FCR | $1510 | $1.56 |
| 1% Mortality | $748 | $1.57 |
| 1% Culls | $781 | $0.81 |
| 50% Treatments | $500 | $0.52 |
| ADG & FCR | $3905 | $4.03 |
| Mort,Culls,Treats | $2031 | $2.88 |
| ALL | $6033 | $6.96 |

(At $92.40 per 100 kg sold.)