Efficiency:
The complexities of a seemingly simple subject

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Pork industry's definition of “efficiency” has changed over the years (centuries)

Efficiency not measured

Forage to convert "food" of no or poor value (roots, nuts, grass, etc.) into products of value to humans: food, leather, etc.

On subsistence farm, convert low value materials into food, etc and generate cash to purchase goods not produced on the farm

On increasingly specialized farms, convert grain into cash for profit and raise standard of living of farm family

On mixed farm, convert grain into cash for profit, to cover other farm costs and provide food, etc to the farm family

On heavily capitalized farm, cover expenses and provide expected return on investment

Efficiency = productivity

On heavily capitalized farm, convert grain into cash to pay bills, cover other farm costs and provide food, etc to the farm family

Efficiency = cash income

Efficiency = financial returns

Measures of efficiency change over time because farm goals change

Our definition of “efficiency” has changed over the years (centuries)

Efficiency = cash income

"Efficiency" means different things to different people

FINANCIAL EFFICIENCY

Feeding efficiency

Labor efficiency

Total enterprise efficiency

Animal efficiency

Environmental efficiency

Efficiency of use of natural resources

Nutrient efficiency

WHAT GETS MEASURED GETS MANAGED

OR

YOU CANNOT MANAGE WHAT YOU DO NOT MEASURE
Impact of Increasing Energy Concentration on Grow-Finish Performance

<table>
<thead>
<tr>
<th>DIET DE, Mcal/kg</th>
<th>3.09</th>
<th>3.24</th>
<th>3.34</th>
<th>3.42</th>
<th>3.57</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial wt., kg</td>
<td>31.2</td>
<td>31.1</td>
<td>31.5</td>
<td>31.2</td>
<td>31.1</td>
</tr>
<tr>
<td>Final wt., kg</td>
<td>115.1</td>
<td>115.3</td>
<td>115.1</td>
<td>115.0</td>
<td>115.5</td>
</tr>
<tr>
<td>Daily gain, kg</td>
<td>1.00</td>
<td>1.01</td>
<td>1.03</td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td>Daily feed, kg</td>
<td>2.80</td>
<td>2.66</td>
<td>2.64</td>
<td>2.61</td>
<td>2.47</td>
</tr>
<tr>
<td>Feed conversion</td>
<td>2.78</td>
<td>2.63</td>
<td>2.56</td>
<td>2.56</td>
<td>2.47</td>
</tr>
<tr>
<td>Fat, mm</td>
<td>16.8</td>
<td>17.8</td>
<td>18.3</td>
<td>18.6</td>
<td>19.4</td>
</tr>
<tr>
<td>Loin, mm</td>
<td>61.7</td>
<td>60.6</td>
<td>62.7</td>
<td>60.3</td>
<td>61.1</td>
</tr>
</tbody>
</table>

Framework for Developing Feeding Programs

An evolving U.S. pork industry: 1992 to 2004

- Due to consolidation, average farm inventory grew from 945 hd to 4,646 hd
- Farrow-to-finish production declined from 65% to 18% of total sales; specialized finishing operations grew from 22% to 77% for the same period
- The share of corn fed to hogs on the same farm it was grown declined from 49% to 19%

Key and McBride, 2007

Net income by region and size of feeder-to-finish operation

<table>
<thead>
<tr>
<th>Region</th>
<th>Mkt hog, $/cwt</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Corn belt</td>
<td>45.22</td>
<td>-2,653</td>
<td>-513</td>
<td>778</td>
</tr>
<tr>
<td>W. Corn belt</td>
<td>44.90</td>
<td>-2,750</td>
<td>-232</td>
<td>1,005</td>
</tr>
<tr>
<td>South</td>
<td>43.27</td>
<td>-2,495</td>
<td>-337</td>
<td>734</td>
</tr>
<tr>
<td>Northwest</td>
<td>42.11</td>
<td>-4,466</td>
<td>-2,667</td>
<td>-1,638</td>
</tr>
<tr>
<td>West</td>
<td>49.66</td>
<td>-4,592</td>
<td>-1,681</td>
<td>-333</td>
</tr>
</tbody>
</table>

Net income = revenue less total cost of production; budget based per 100 hogs
Corn priced at $2.54, $2.45, $2.79, $2.84 and $2.99 per bushel for the ECB, WCB, S, NE and W, respectively.

Source: Adhikari et al., 2004

An evolving U.S. pork industry: 1992 to 2004

- Feeder-to-finish farms
  - improved feed conversion by 4.7% per year
  - improved labor efficiency by 13.8% per year
  - “Total factor productivity” increased an average of 6.3% per year
    - Attributed to two factors: scale of production and adoption of new technology. Technological change drove 50% of the improvement
  - 3X historical increases in productivity in agriculture as a whole
- These increases in productivity contributed to a 30% decline in farm gate prices for pigs

Key and McBride, 2007

Energy utilization in the weanling pig

Source: Adhikari et al., 2004

Adapted from Ewan, 2001
Adapted from Oresanya et al., 2005
**Protein utilization in the weanling pig**

- **Fate of ingested protein**
  - 35% Retained
  - 35% Maintenance
  - 18% Other
  - 12% Fecal losses

**Conclusions**

1. Measures of efficiency have changed because the pig industry has changed.
2. The correct measures of efficiency can only be determined after a farm’s definition(s) of success have been clearly defined.
3. Monitoring the wrong indicators of efficiency may take an organization in the direction very different from that intended.

"By three methods we may learn wisdom:
First, by reflection, which is noblest;
Second, by imitation, which is easiest;
third by experience, which is the bitterest."
- Confucius