PERFORMANCE VERSUS COST

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ABSTRACT

Canadian pork producers have had a quadruple whammy in recent years: corn going into ethanol driving up corn price, a global economic depression, nH1N1 influenza, and the Canadian / US exchange rate. Is maintaining top performance cost effective? What strategies should producers take in good and bad times? What tools are available to help make these business decisions? In this paper, we review the importance of having financial records to supplement production records. We need financial records for reporting and monitoring our financial well-being, for managing our costs and profitability and for making decisions that will impact the business. In the presentation, we will review cost of production and examples of effective decision making. The message is to first, know your cost of production, benchmark and look for ways to keep it low. Secondly, be an efficient top producer. Thirdly, manage your margin through effective hedging. And fourthly, maintain a strong balance sheet.

INTRODUCTION

A herd could be weaning 30 pigs / sow / year for an entire year and go broke. How? It could be a lack of inventory control, and therefore, too few sows bred, too few pigs weaned and fixed costs are spread over too few pigs. That is, the cost of production is too high. This is an example of a commonly accepted performance measure being overly simplistic and by itself, inadequate. We have adopted a second biologic measure to account for this inadequacy, and that is pigs weaned per week. We calculate the capacity of a sow facility and set a goal for throughput. This is a definite improvement. But I am guessing we all know farms where they are meeting throughput goals and yet are in financial trouble. In such a case, the problem may rest in the balance sheet, but might be made worse by income statement problems. That is, the cost of production could be too high and / or income too low, thereby increasing indebtedness on the balance sheet. So, while performance records are important to understand the biologic operation of the farm, financial records and their use in making decisions represent the "bottom line".

FINANCIAL ACCOUNTING

Financial statements serve three important economic functions:

- They provide information to the owners and creditors of the farm about the current status and past financial performance.

- They provide a convenient way for owners and creditors to set performance targets and impose restrictions on the managers of the farm.
- They provide convenient templates for financial planning.

Chart of Accounts is used to classify data as it is accumulated in the general ledger for all financial reporting. The National Pork Board (NPB) recommends that producers keep at least the first level of accounts that include major income, expenses assets, liabilities and equity categories. The chart of accounts can be taken to three basic levels of production – breeding / gestation, nursery, finishing.

Balance Sheet

The balance sheet (BS) presents a snapshot at a point in time.

- Assets – items that have the ability or potential to provide future benefits to the firm. For example, cash, inventory and equipment.
    - Current = cash and convertible within 1 year
    - Non current = Property, plant & equipment (PPE)
      = original cost – cumulative depreciation
- Liabilities – creditors' claims on the assets of the firm
    - Current – due within 1 year
    - Noncurrent
- Equity or net worth – is the difference
    - Paid in capital – funds invested by shareholders for an ownership interest
    - Retained earnings – earnings realized by the firm; assets reinvested in the firm

- Assets = Liabilities + Shareholders' equity

Market Value vs. Book (cost) Value. Farm financial statements will generally give both cost and market value for long term assets. Cost represents the purchase price minus accumulated depreciation. Market value is the value of the asset on the open market minus any selling commissions and potential taxes due to capital gains.

Inventory can be valued as "cost" or "value". NPB recommends using cost of production as value. Costs associated with inventory should be carried on the balance sheet as pig inventory asset. Home raised corn inventory can be valued at market price. After transfer to production, it should be valued at cost.

Regarding depreciation, breeding stock should be depreciated over the estimated life of the animal; 2-2.5 years for sows and 2 yrs for boars at straight line. Salvage value is cull value. First-in, first-out cost flow. Buildings are 15 year at declining balance (150%) until straight line is greater. Salvage value for shell and concrete if at all. Equipment is depreciated over the useful life with declining balance method. Salvage value is scrap value.

Income Statement

The income statement (IS) has three parts:

- Revenue (pig sales and other pork revenues)
- Expenses (feed, labor, utilities, vet, etc),
- Profit (production profit, operating profit and net income)

The IS represents the results of operating activities for a period of time. The IS links the BS at the beginning to the BS at the end of the period of time. Net income usually does not equal net cash flow.

Accounts can be kept as accrual (recorded as production occurs or as expenses are committed) as or cash (recorded when received or paid, except for machinery, equipment of breeding stock which can be depreciated over time). Accrual more accurately reflects income generated during the period.

Cash Flow Statement

This statement shows cash flow into and out of the farm during a period of time. It is a useful supplement to the IS because it focuses attention on the farm's cash position, and does not require judgment on what is a revenue item versus an expense (only cash flow). It shows how operations affected cash for the period. It has 3 sections:

- Operating activities
    - Cash inflows – cash outflows
- Investing activities
- Financing activities
    - Dividends, new loans

ANALYZE PERFORMANCE USING FINANCIAL RATIOS

Analysts use financial ratios as one mode of analysis to better understand the farm's strengths and weaknesses, whether its fortunes are improving, and what its prospects are. These ratios are often compared with the ratios of a comparable set of companies and to ratios of recent past periods. The five types of ratios are profitability, turnover, financial leverage, liquidity, and market value ratios. Finally, it is helpful to organize the analysis of these ratios in a way that reveals the logical connections among them and their relation to the underlying operations of the firm.

5 measures of a farm's performance:

1. Profitability
    - use assets or equity as the denominator; use average of beginning and ending value for denominator.

    - ROA = Earnings Before Interest Taxes / Total Assets (avg)
    - ROE = Net income / Equity (avg)

2. Asset performance
    - farm's ability to use the assets
        - Asset turnover = Sales / Avg Total Assets

3. Financial leverage (solvency)
    - a farm's capital structure and debt burden
        - Debt ratio = Total debt / Total assets
        - Interest Coverage = EBIT / Interest expense

4. Liquidity
    - a farm's ability to meet short term obligations and remain solvent
        - Current ratio = current assets / current liabilities
        - Quick or Acid test = (Cash + receivables) / Current liabilities
        - Working capital = CA - CL

5. Market value ratios
    - Used for publicly traded firms.
        - PE = Price per share / earnings per share
        - Market to Book = Price per share / Book value per share

Return on equity (ROE) is the ultimate measure of economic return of an investment. This is because ROE reflects the financial return on the amount the owners have invested. ROE can be compared to other potential investments of similar risk to determine if the return is adequate.

Return on Equity (ROE) has three determinants:

- Return on invested capital (composed of net fixed assets + working capital)
- Use of financial leverage (Interest Bearing Debt / Equity)
    - relative amount of debt
    - interest rate
- Tax policy

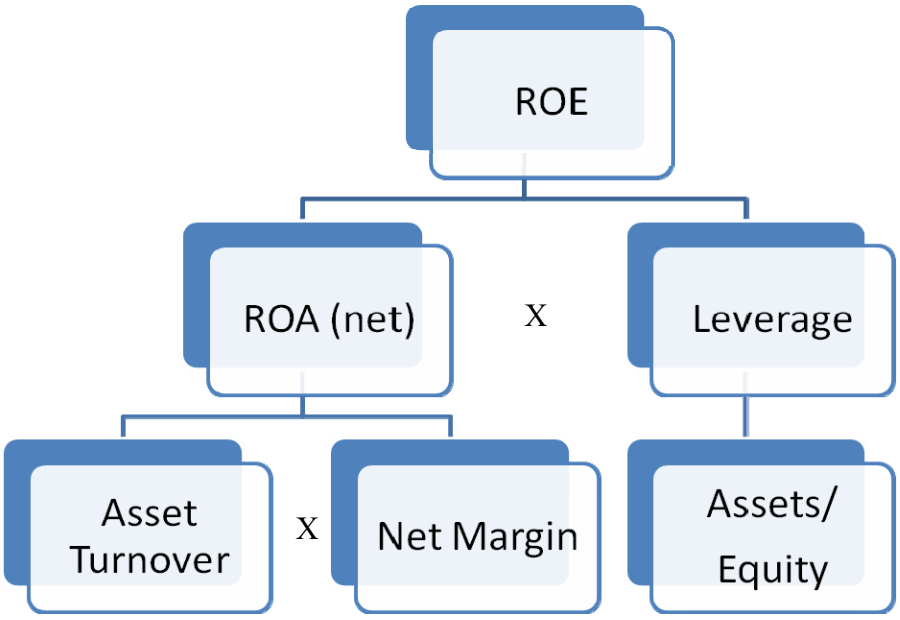
Note that effective use of leverage occurs when return on invested capital exceeds cost of debt (interest rate). There is a balance between increased risk when using debt financing and increased potential profitability.

Return on Assets (ROA) is a measure of how well the business is functioning independent of how it is financed. Use of debt (leverage) is a function of how one chooses to finance the business.

The ROE model was first developed and used in the early 1920s at the DuPont Corporation as a tool to help them manage their business. Accordingly, it is often referred to as the DuPont

formula or the DuPont system of financial management (Figure 1). Since its early use at DuPont, it has become a commonly used tool in the non-agricultural business arena.

Figure 1. DuPont formula.



The goal is to maximize ROA by effectively managing and balancing profit margin and asset turnover. Consider a farm with annual sales of $1,000,000, asset value of $500,000, and a net profit margin after tax of 7%. This would give the business a ROA for the year of 14%.

ROA (net) = asset turnover x net profit margin
= (total sales / asset value) x net profit margin
= ($1,000,000 / $500,000) x 7%
= 14%

The strength of the model is that it helps the owner understand the importance of managing profit margin at the same time as asset turnover (throughput). The manager can also appreciate that it is possible to trade margin for turnover and maintain the same ROA (Figure 2; Table 1). Pork producers intuitively use the DuPont formula when making management decisions. Examples include changing wean age, feeding strategy and market weight.

To improve ROA, the manager needs to improve margin, turnover or both. Margin can be improved by:

- cutting costs, both variable and fixed,
- increasing per unit sales price (e.g. quality or quantity premium, futures).

Figure 2. Asset turnover and net profit margin of 14% ROA.

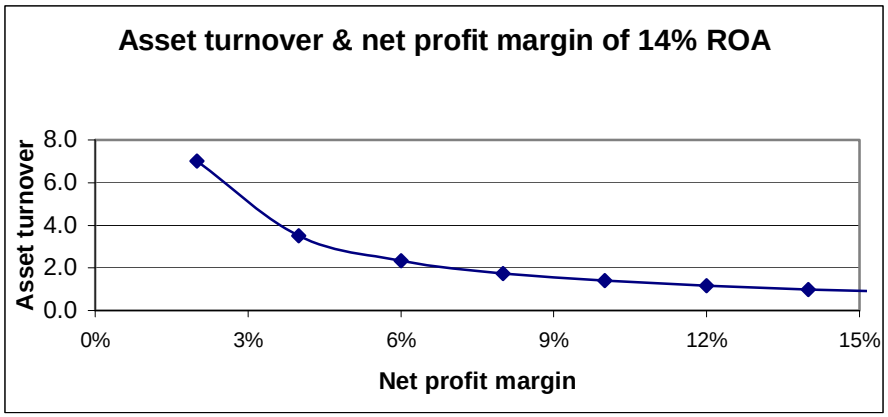


Table 1. Effect of net profit margin (%) and asset turnover on return on assets (%).

	Asset Turnover Ratio							
Margin	**0.25**	**0.5**	**0.75**	**1**	**1.25**	**1.5**	**1.75**	**2**
2%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%
4%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%
6%	1.5%	3.0%	4.5%	6.0%	7.5%	9.0%	10.5%	12.0%
8%	2.0%	4.0%	6.0%	8.0%	10.0%	12.0%	14.0%	16.0%
10%	2.5%	5.0%	7.5%	10.0%	12.5%	15.0%	17.5%	20.0%
12%	3.0%	6.0%	9.0%	12.0%	15.0%	18.0%	21.0%	24.0%
14%	3.5%	7.0%	10.5%	14.0%	17.5%	21.0%	24.5%	28.0%
16%	4.0%	8.0%	12.0%	16.0%	20.0%	24.0%	28.0%	32.0%
18%	4.5%	9.0%	13.5%	18.0%	22.5%	27.0%	31.5%	36.0%
20%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%

Turnover can be increased by:

- increasing sales volume,
- disposing of obsolete or unneeded inventory,
- identifying and dispose unused fixed assets, and
- speeding up collection of receivables; evaluate credit terms.

ROE is a function of three major drivers; return on assets, use of debt (leverage) and taxes. A firm may also increase ROE by increasing ROA, but also by increasing the percentage of total assets financed by debt. This third component of the ROE tree is sometimes referred to as the equity multiplier (assets / equity). Increasing debt will increase the ROE as long as the gross ROA exceeds the cost of the debt. However, as debt increases, the risk position of the enterprise also increases.

Effective use of financial leverage is a management practice that many producers, and their lenders, have not mastered. In agriculture, the commodity risk that results from large variance in cash flow and profitability typically causes the belief that use of debt is not conducive to

profitability. Agricultural lenders tend to be more conservative than non-agricultural lenders because of this large variance in producers' cash flows.

It is important to understand that use of debt, up to a point, is, in fact, conducive to profitability. But the proper measure of profitability should be in terms of ROE, which is where the DuPont Model again becomes very useful. Also, what makes debt conducive to profitability is that debt is a cheaper form of capital than equity. But again, up to a point. All capital is either debt capital or equity capital. And debt capital is cheaper (all else being equal) because the interest payments on debt are tax deductible. Also, payments on debt take priority over payments on equity so risk to the lender is typically less than the risk to the owner.

Therefore, use of debt is cheaper than equity as long as the risks to the lender are not so great that the lender requires a premium (higher rates to generate higher returns) to have the incentive to make the loan. This is the risk - reward trade-off. But if the debt levels are too high and/or profitability is highly volatile (and there is a correlation between low equity and volatile profitability), the lender begins to take on the same risks as the owner. In reality, if the lender perceives the risks as high, the loan is not made at any rate because the lender does not want to take the same risks as the owner even with premiums.

In agriculture, the commodity risks tend to dictate that financial leverage needs to be low to keep the risks to the lender satisfactory without causing the lender to require a premium. However, if the producer implements proper risk management measures, the risks to the lender are reduced and the lender can allow higher leverage. Proper risk management measures stabilize profitability. When this is done properly, the risks taken by the lender due to the higher leverage are more than offset by the risk management measures implemented by the producer. Therefore, the lender allows higher leverage without requiring a premium. The higher leverage then can result in a higher ROE.

Table 2. Underwriting guidelines (from Lee Fuchs at AgStar).

	All owned	Contract barn
Equity / Asset	>50%	>25%
Current assets / current liabilities	>1.3	>1.0
Loan / Appraised value	<65%	<80%

BUDGETING & COST CONTROL

Dr. Gary Dial describes a 6-step approach to controlling costs:

- Set performance budgets that accurately project throughput,
- Establish unit-use budgets to predict line-item costs for all inputs for the income statement,
- Identify cost variances (differences in budgeted vs. actual) as they occur,
- Use compliance reports to identify input wastage,
- Link production and line-item variances to identify financial opportunities,
- Empower farm staff to drive out costs.

Forecasting sales is relatively easy to do if we understand our farm. Suppose we want to forecast sales 10 months from now. We know the number of sows in lactation that are to be weaned next week. Knowing our historical cull rate, gilts available, and farrowing rate, we can forecast farrowings 4 months from now. If we have reasonable data on growth and mortality, we can estimate pigs available for sale in 6 months. Add consecutive weeks of data and we have the beginnings of an annual budget.

To quote Dr. Dial, "*for cost management to be effective, a 'low-cost culture' must be created. This usually requires that biological endpoints, at least initially, be de-emphasized at the expense of financial endpoints.*" What is your break-even cost? Or, what is your cost / weaned pig? And just as important, where are your opportunities for decreasing this cost?

Production costs are usually classified as **fixed or variable**. Fixed costs do not change with the level of output and typically include depreciation, taxes, insurance, and interest. Variable costs change with output and include feed, propane, veterinary and health expenses. As the planning horizon lengthens, more costs become variable such that in the long run, all costs are variable.

Only variable costs should be considered in deciding how much to produce in the short run. A production function expresses the relationship between use of inputs and products produced. It will show the **marginal productivity** as inputs are increased. The optimum production level is where marginal cost equals the marginal value of product (where MOVC = $0).

We strike a balance between shooting for maximum productivity and achieving low cost. The decisions involved in achieving optimum performance can be difficult. For example, how does the cost of feed and market price influence our decision to euthanize some pigs because they are noncompetitive and will cost substantially more to grow out than we will earn? Should we cut back the sow herd so that we can increase wean age by 10%? What is the optimum slaughter weight for a farm? Should we feed growth promotants in the nursery to improve feed efficiency? When prices are particularly low, at what point should we not breed sows? The answers will vary across farms, but all farms could benefit by analyzing these questions.

Prices have been incredibly volatile over the last 12-18 months. This makes benchmarking difficult because differences among farms may reflect productivity and/or effectiveness of managing the input costs and margin. Prairie Swine Center recently published some cost and productivity numbers to use for benchmarking.

PRAIRIE SWINE CENTRE

Electronic Newsletter

Volume 1 Issue 7

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Productivity and Cost of Production

Last week at Banff Pork Seminar the productivity awards sponsored by PIC recognized Kyle Colony in Saskatchewan with 30.3 pigs weaned per mated female. This is a tremendous accomplishment and a reminder of how our industry has ramped up productivity consistently over the past quarter century. All too often the complexity of benchmarking cost of production, the next natural step in comparing production units, does not receive the same attention as productivity. There is good reason for this since the age of assets, debt load, labour costs and accounting practices make comparisons difficult if not impossible. That however shouldn't dissuade us from trying to benchmark cost of production, because the power of having that information is indeed worth the effort.

Take for example a survey of western Canadian mid-sized farrow to finish producers that was recently shared with me. The top 10% of producers demonstrated significant productivity measure improvements over the average and bottom 10% for key measures such as:

	Top 10%	Avg	Bottom 10%
Sow mortality rate	4.40%	6.70%	10.50%
Marketed / mated female / yr	24.0	22.3	20.6
Whole herd FCR	2.98	3.25	3.44
Revenue / hog marketed	$154.75	$145.28	$134.47
Margin over recorded cost *	$34.74	$25.62	$12.75

* note that labour, depreciation, interest removed to allow for comparison of variable costs only

Although the variation is impressive and motivational to try to raise the productivity bar, it pales in comparison to the variation in financial performance seen between these same farms (all financial measures taken for same time period as productivity data above).

Accepting the inaccuracies that come with such comparisons there is significant opportunity to improve productivity and profitability through comparison (benchmarking) to other similar farms.
Below are a few articles to assist in our pursuit of improved profitability, and one article that encourages the use of statistical control charts to detect changes in herd productivity.

Profit Sensitivities to Feed Price and Pig Price with Varying Production Levels (Banff Pork Seminar 2009)

http://www.prairieswine.com/database/details.php?id=39200
Top 10 Cost Cutters and Revenue Generators (Centred on Swine, 2004)
http://www.prairieswine.com/database/details.php?id=1847
Control charts applied to simulated sow herd datasets (Germany, 2009)
http://www.prairieswine.com/database/details.php?id=39056

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Table 3. Goals for economic and production measures (Lee Fuchs, 2009).

Farm performance	Very good
Asset turnover	> 0.9
Feed cost / cwt	< $28
Non feed cost / cwt	< $9
Fixed costs / cwt	< $11
Breakeven / cwt	< $48
Production measures	
Pig weaned / litter	> 11
P/S/Y	> 25
Nursery FCR	< 1.6
Nursery ADG	> 0.9
Nursery mortality	< 3%
Finish FCR	< 2.75
Finish ADG	> 1.75
Finish mortality	< 4%
W-F FCR	< 2.55
W-F ADG	> 1.7
W-F mortality	< 6%

And currently, Lee says that their strongest clients have good liquidity, control volatility, low cost and a strong balance sheet.

MAKING DECISIONS

Some decisions are major with an impact for many years and involving major investment and often capital expenditures. For example, should we construct a gilt development barn? Or,

should we sell the pigs at weaning on contract or construct facilities to market them ourselves? On the other hand, many decisions are relatively narrow in impact and short term in nature. For example, should we hire another person for farrowing? Or, should we vaccinate for influenza? A partial budget is an economic analytic method for simple decisions where the time period is relatively short term and the outcome does not have a high degree of uncertainty. Partial budgets are relatively simple because they are restricted to estimating the change or **incremental** effect of the decision.

Every partial budget uses the same basic equation:

increased revenues associated with the decision
+ decreased costs
- increased costs
- decreased revenues
= change in revenue

For example, should we pay a bonus to staff if they achieve certain levels of performance? Some think of this as a profit share and others as an incentive. Regardless, a frequent example is to pay a bonus for quality pigs weaned above standard expectation. Aside from the economic considerations, there are strong feelings on both sides of the "bonus" issue.

Another example is whether to vaccinate pigs for PCV-2 to reduce the mortality. As we work through this example, we need to first understand how to quantify cost of mortality. We might see the cost of mortality reported as:

- income not received. This approach will over estimate the true cost.
- costs incurred in the pig before it died. This approach will likely underestimate the true cost.
- income not received for that pig (that died), minus the variable costs that it didn't incur because it died. This is the best method and is also referred to as the margin over variable costs.

The analysis (below) might be conservative as no advantage was attributed to feed efficiency (could not be measured with trial design). If feed efficiency is improved, this would be included as reduced total feed cost in the vaccinated group. Improved average daily gain is slightly more complex because the economic benefit depends on which of two space / time capacity scenarios is present at the farm. If the farm has limited finishing space or time and the reduced average daily gain (ADG) results in having to sell the pigs at a lighter weight, then the cost of reduced ADG is lower income / pig. If, on the other hand, ample space and time is available, then the producer can wait until the pigs achieve the desired weight and the cost of reduced ADG is only the time value of money (not getting paid as soon) plus the possibility that one of the pigs may die or get sick in the added days needed to reach market weight. Estimating the value of reduced variability in weight gain is more complex and beyond this presentation, but can have substantial impact. Finally, if carcass attributes are affected such as % lean, this would be fairly easy to include – however, there is little data on impact of vaccination on carcass quality. Whereas King et al. (2009) detected a difference when comparing carcass composition of PCV-2 vaccinated vs.

non-vaccinated controls, Venegas-Vargas et al. (2009 - Leman Swine Conference Proceedings) did not.

Table 4. Effects of PCV-2 vaccination on growing pig performance (King et al., 2009 – Proceedings, AASV).

	Vaccinated	Control	P value
Number pigs	600	600	
d0 starting weights, lbs	11.66	11.78	0.48
d0-131 ADG, lbs/day	1.57	1.52	< 0.0001
Nursery & finish mortality, %	5.18	7.07	0.19
Finishing cull rate, %	5.16	10.24	0.001
Pigs assessed at slaughter	509	474	0.09
Hot carcass weight, lbs	194.23	190.76	0.01
Economic assumptions			
> 255 live base price / cwt	$51.00	$51.00	
≤ 255 live base price / cwt	$31.00	$31.00	
Yield, %	74	74	
Income / pig target market	$133.86	$131.47	
Live weight of light pigs	180	180	
Income / pig light market	$55.80	$55.80	
Income good pigs	$70,012	$65,227	
Income cull pigs	$1,728	$3,428	
Total income	$73,740	$68,656	
Feed consumed	$43,775	$41,635	
Margin over variable costs	$29,964	$27,021	
Difference		$2,943	
Benefit / pig placed		$4.91	
Cost to vaccinate		$1.12	
Benefit / cost ratio		4.38	

Sensitivity analysis is a tool that allows us to assess the impact of the model's assumptions on the outcome. In a sensitivity analysis, we change one parameter (such as price) over a possible range of values while holding the rest of the variables in the analysis constant. In so doing, we explore the robustness of a partial budget outcome--i.e., how sensitive are the results of partial budgets to the assumptions in the analysis?

MANAGING THE MARGIN

John Lawrence (Iowa State University) does a nice job explaining what is meant by managing the crush margin. For wean-to-finish pigs, the margin is the value of the market hog less the cost of the pig and the corn and SBM to raise it. It focuses attention on the most volatile components that drive profitability and that are hedgeable. The margin represents the remaining revenue to pay all other costs and, hopefully, return a profit.

More information on this is available at:
http://www.econ.iastate.edu/outreach/agriculture/periodicals/ifo/margins/WFcrushDefinition.pdf

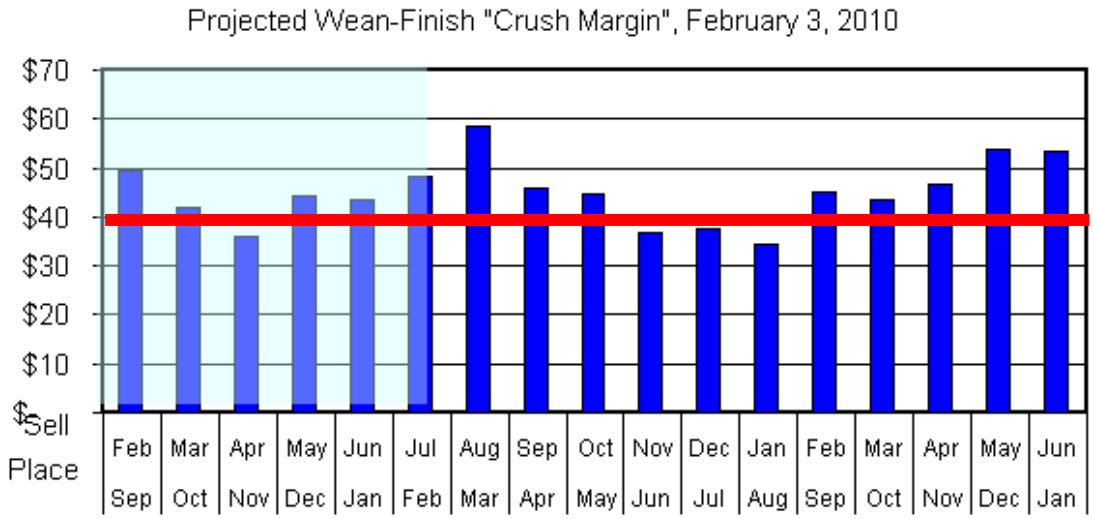
Margin $_{T-5}$ = 2 x Lean Hog Future $_{T}$ – weaned pig price $_{T-5}$ – (10 x Corn futures /bu)$_{T-5}$ - .075 x SBM future/ton $_{T-5}$

T = when hog will be sold at market
T-5 = 5 months earlier

Assumptions are a 200 lb carcass, 560 lbs corn, 150 soybean meal (SBM), & 5 months wean to finish. We make the decision to sell the hog 5 months from now, and buy the pig, corn and SBM on the same day at basis adjusted futures prices. The purchased pig is priced at 50% of the lean hog futures price, 5 months out. Individual farms will differ on amounts of corn, SBM, weights of pigs etc.

What is not included?

	$ / head
Vit, min & complete feeds	$11.35
G, M & D	$3.62
Animal health / vet med	$4.15
Labor / admin	$5.67
Oper int	$2.67
Utilities	$2.57
Transport	$2.00
Facilities	$8.45
Total, beyond pig, corn, SBM	$40.48



This analysis is used to manage risk. In other words, if a reasonable opportunity exists, sell the lean hog futures while buying the corn and SBM needed to finish these pigs.

CONCLUSIONS

Having production records, without financial, is a recipe for failure. Our nature is to tend to improve whatever we are focused on. Therefore, it is imperative that we focus on the right measures. Managing costs, optimizing productivity, maintaining inventories, and effective marketing will lead to profitability. This requires us to have good financial records to complement our production records.