

Abstract

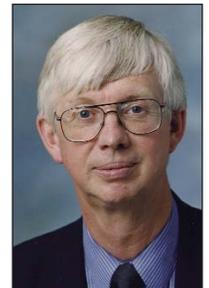
This paper discusses a farm financial analysis program, along with four features of the program that have facilitated its use by farm managers. The four features that appear to increase farm manager interest in the program are Performance-based, Accrual-adjusted income statement, System of financial analysis, and Simple to use. We illustrate this program with application to a farm firm case study.

A Financial Analysis Program That Will PASS the Farm Manager “Interest Test”

By Christine Wilson, Freddie Barnard, and Michael Boehlje

Background

Effective financial management is essential to the success of an agricultural business, so farm managers, whether professional fee for hire managers, entrepreneurs managing their own farm businesses, or salaried managers of farming businesses, should be interested in programs that analyze the financial aspects of their businesses without encouragement from lenders, consultants, and others. However, anyone who has worked with farm managers can relate to how difficult it is to get some of them to not only use, but to even express an interest in, such programs. Farm managers seem to have an internal “interest test” that is administered when weighing the benefits and costs of using, and in some cases even considering, such programs.



Christine Wilson is an associate professor in the Department of Agricultural Economics at Purdue University. She teaches undergraduate courses in marketing management and accounting/finance for farm business planning. Dr. Wilson’s research and Extension interests include the areas of farm and agribusiness marketing and management and agricultural finance.

Freddie Barnard is a professor and Extension economist in the Department of Agricultural Economics at Purdue University. He is also a member of the Technical Committee of the Farm Financial Standards Council. Dr. Barnard is involved in teaching and Extension in agricultural finance, farm and agribusiness management.

Michael Boehlje is a professor in the Department of Agricultural Economics and the Center for Food and Agricultural Business (CAB) at Purdue University. Dr. Boehlje is involved in teaching and research in agricultural finance, farm and business strategy and management and structural change in the agricultural industries.

At least four program features appear to be included in the “interest test.” The four can be represented by the acronym PASS, which stands for Performance-based analysis, Accrual-adjusted income statement, System of financial analysis, and Simple to use. These features refer to the capability of a farm financial analysis program to evaluate the financial performance of the business by using information reported on an accrual-adjusted income statement to calculate the financial ratios recommended by the Farm Financial Standards Council (FFSC). Once that has been accomplished, the program should have the capability to compare those financial measures to comparative data for the industry, identify the strengths and weaknesses of the business, determine causes of the weaknesses, and identify alternatives to address those weaknesses. The program should then have the capability to evaluate production, marketing, and financing alternatives that are identified as possible solutions. Furthermore, the program should be simple to use and have the capability to generate the outputs listed above using data the manager currently has in his/her possession. This last feature may be the most important for many farm managers.

The above list of features can be difficult to satisfy. However, a financial analysis program available from Purdue University appears to satisfy the list for at least some farm managers. The remainder of this article discusses the features of the program that have helped it PASS the “interest test” given by some farm managers.

Performance-based Analysis

Performance-based analysis includes not only the preparation of the basic financial statements (balance sheet and income statement), but also how to use data reported on those statements to calculate financial performance measures that can then be compared to industry averages for farms with similar characteristics. The program available from Purdue University is discussed in an Extension publication *Farm Business Management for the 21st Century: Measuring and Assessing Farm Financial Performance* (EC-712). Guidelines provided by the FFSC are used to prepare the financial statements and calculate the financial measures. The financial measures for an individual farm are then compared to either benchmarks or industry averages. Comparative industry data are available from state record-keeping programs in Illinois, Iowa, Kentucky, and Minnesota.

Accrual-adjusted Income Statement

The benefits of using financial data reported on an accrual-adjusted income statement for purposes of farm financial analysis are well documented. The magnitude of the difference between net farm income calculated using a cash basis income statement and net farm income calculated using an accrual-adjusted income statement is reported in two studies conducted at the University of Illinois for Farm Business and Farm Management (FBFM) data (Lins and Ellinger, Ellinger). The first study found an average 69.7 annual percentage difference between the two net income figures for 369 farms over a seven-year period (1984-1990). The second study, conducted in 2004, reported that three-year average income tax return measures deviate 24 percent from three-year average accrual-based profitability measures.

Although farm managers usually acknowledge the benefits associated with using an accrual-adjusted income statement for financial analyses, the challenge for many is the preparation of that statement. The program discussed in this article prepares it automatically after the user inputs data from three or four documents he/she should possess.

To use the program, producers need a balance sheet that is prepared at the same time each year, the Schedule F, and, if applicable, the Form 4797 of the income tax return. The date of the balance sheet is determined by the tax reporting period for the business. For many agricultural businesses, that date is the end of the calendar year or December 31st. If a business is on a fiscal year that is different from the calendar year, then the balance sheet should be prepared as of the start and end of the fiscal year.

Data required by the computer program include data reported on the beginning and end-of-year balance sheets to make accrual adjustments in order to prepare an accrual-adjusted income statement (i.e., beginning and ending inventories, accounts receivable, accounts payable, accrued expenses, etc.). The cash transactions and the depreciation expense are taken from the Schedule F, and the gain or loss from the disposal of capital assets is taken from the Form 4797, if applicable. Of course, tax basis depreciation is usually taken at an accelerated rate and can result in overstating the economic depreciation. Farm managers can either use the tax basis depreciation or an

estimate of economic depreciation as calculated by the manager. Once that information has been entered, an accrual-adjusted income statement is automatically generated by the computer program.

System of Financial Analysis

A systems approach to evaluate performance, including financial performance, is used throughout agriculture. The DuPont Financial Analysis System, which is also known as the profitability linkage model, is a financial analysis system that can link production, marketing, and financing decisions to financial performance through financial ratios. Various production, marketing, and financing alternatives can be identified using the financial ratios calculated and comparative data for the industry, and the likely causes and possible alternatives for addressing business weaknesses can be identified. The impact of each alternative can then be evaluated using the DuPont Financial Analysis System. The analysis is based on the relationship that exists among three key financial ratios: operating profit margin; asset turnover; and leverage (total farm assets/owner's equity).

When the three ratios are multiplied together, and the interest cost adjustment is made, the result is the rate of return on farm equity (Barnard and Boehlje, 2004).

Simple to Use

The program includes a set of four worksheets (1-4) that provide a simple, step-by-step procedure for entering financial data (Barnard and Boehlje, 2003). Worksheet 1 is used to collect and organize information from beginning and end-of-year balance sheets, Schedule F, and if filed, Form 4797 from the income tax return. Each line on Worksheet 1 is labeled with a letter. For example, the first line is labeled with an A and reports the cost of livestock sold. Next, instructions are provided to assist users in locating the information (i.e., Schedule F, line 2). Lines A through F are used to input data collected from the Schedule F, with instructions for locating each number on the Schedule F. Other lines collect information reported on the beginning and end-of-year balance sheets as well as other information (i.e., sale of breeding livestock from Form 4797, family living expenses, and number of full-time employees).

Worksheet 2 is used to calculate the financial measures recommended by the FFSC. It uses information reported on Worksheet 1 to perform the calculations automatically. Also provided on Worksheet 2 are industry benchmarks or averages. Industry averages are available from various farm records programs (i.e., Illinois FBFM, Iowa State Farm Records Program, etc.) for selected financial performance measures. The computer program automatically compares the financial measures calculated for an individual business to the industry average. The strengths and weaknesses for the business are automatically highlighted. The possible courses of action available to address areas identified as weaknesses are available from a list provided in the EC-712 publication (Table 1) and discussed by Barnard and Boehlje (1998-1999). Managers can then formulate production, marketing and financing alternatives to address weaknesses, and improve financial performance.

Worksheet 3 is used to calculate the repayment capacity measures recommended by the FFSC. The calculations for the measures are simplified, because the numbers are transferred from Worksheet 1 and the producer only provides a limited number of entries (i.e., scheduled principal and interest payments on term debt and capital leases and cash purchases for capital replacement). In addition, when the term debt repayment margin is calculated, participants can estimate the amount of additional debt that could be serviced by that margin. An amortization table is provided in the program. When the term debt repayment margin is divided by the amortization factor corresponding to the interest rate and number of years being considered for an additional loan request, the result is the maximum amount of additional debt the operation could service.

The DuPont Financial Analysis Program, which is embedded in Worksheet 4, enables the producer to evaluate the impact on the return on equity (ROE) of each of the alternatives being considered. The numbers used for Worksheet 4 are transferred from the previous worksheets. Revised numbers for each alternative evaluated are then entered and the result is available immediately. Worksheet 4 is designed so that numerous alternatives can be evaluated in a very short period of time.

Case Example

A case example farm, MBC Farms, is used to illustrate how to complete and use the program. MBC Farms is a dairy-crop

operation and has beginning (12/31/20X4) and end-of-year (12/31/20X5) balance sheets, a Schedule F for 20X5, and a Form 4797 that reports the gain from the sale of cull cows received during 20X5. Information taken from those four forms is entered onto Worksheet 1, along with the number of full-time employees (8) and the combined amount of family living expenses withdrawn from the farm (\$141,087) during 20X5. The accrual-adjusted gross revenues, interest expense, other expenses and net farm income amounts are automatically calculated by the spreadsheet and shown on lines W-Z.

Next, eleven financial measures are automatically calculated using the numbers from Worksheet 1. The results are shown on Worksheet 2, along with benchmarks for the dairy enterprise. The benchmarks used in the worksheet are the median values for Illinois dairy farms for 2004 and reported in the *2004 Financial Characteristics of Illinois Farms*. Of course, the benchmarks could come from other farm record-keeping programs and other sources as the user desires. The program automatically compares the eleven financial measures for MBC Farms to the benchmarks and indicates whether the measure is strong or weak compared to the benchmark. As can be seen by reviewing Worksheet 2, the return on assets and asset turnover measures are strong compared to the benchmarks and all other measures are weak. Hence, the troubleshooting procedure will focus on operating efficiency rather than on the intensity of asset use. So, the user can then use the list of possible courses of action from Table 1 to identify possible alternatives to evaluate.

The numbers used to complete Worksheet 3 are automatically transferred from Worksheet 1, except for the cash used for capital replacement and the scheduled principal and interest payments on term debt, which come from the farm records for MBC Farms. The term debt coverage ratio (1.558) and the term debt repayment margin (\$95,355) are calculated automatically by the spreadsheet. At the bottom of Worksheet 3, the interest rate and years to repay term debt are entered for a loan request being considered in order to calculate the additional term debt that the term debt margin (\$95,355) could service, which was calculated to be \$370,898. The user can use the entire amount of the term debt repayment margin in the calculation or a portion of the margin if they desire to maintain a cushion for debt service.

Two charts are also available in the program. The first chart presents operating expenses, depreciation expense, interest expense, and net farm income as a percentage of gross revenue. When all four components are summed, the total equals 100 percent. Also, presented on the chart are the benchmarks for each of those four components of revenue. This presentation of the data enables the user to visually compare each component of revenue to benchmarks for that measure.

The second chart compares profitability measures, actual to a benchmark. If the actual profitability measure equals the benchmark, the comparison is 100 percent. If the actual exceeds the benchmark, the percentage the actual exceeds the benchmark is presented as a percentage greater than 100 percent. If the actual is lower than the benchmark, the bar chart indicates the percentage actual is lower than the benchmark.

The profitability linkage model for MBC Farms is automatically calculated and reported as the actual column on Worksheet 4. To illustrate how to use the profitability linkage model, two alternatives are evaluated for MBC Farms: early planting and a reduction in the interest cost. The expected impact of planting earlier is an increase in yield, which is expected to increase gross revenues. The increase in gross revenues is entered in the projected column, while the other entries remain the same as the original situation. The results of planting earlier are shown in the projected column, which are to increase both operating profit margin and asset turnover compared to the original situation. The increases in those two measures increase the rate of return on assets and ultimately the rate of return on equity from 10.8 to 13.6 percent, or a 2.8 percentage point increase.

A second alternative, reducing the interest cost, is evaluated next and the results are reported in Worksheet 4. For this alternative, only the interest cost is changed from \$98,716 to \$89,744, which decreases fixed costs by \$8,972. None of the other entries need to be changed from the original situation to evaluate the impact of reducing the interest cost. The effect of reducing the interest cost is to decrease the interest cost adjustment (line D, Worksheet 4). The result is 11.5 percent return on equity, which is only 0.7 percentage point higher than the original situation. Hence, the manager for MBC Farms knows the impact of planting earlier will likely have a more measurable impact than trying to reduce the interest cost.

Additional alternatives can be evaluated by changing a limited number of entries and the impacts compared to the original situation. It should be noted that two alternatives were evaluated for MBC Farms by changing only two data entries: one for alternative 1 and one for alternative 2. A desirable feature of this program is that a number of alternatives can be evaluated with few data entries and in a short period of time.

Final Comments

Several farm financial analysis programs are available and provide a comprehensive and thorough analysis of an agricultural business. However, one of the greatest challenges faced by farm managers is to find a program that provides a thorough analysis, uses data managers have in their possession, and is simple to use. In other words, a program that will PASS the farm manager “interest test.” A farm financial analysis program that has PASSEd the “interest test” administered by some farm managers is available at <http://www.agecon.purdue.edu/extension/programs/fbm21/perform.htm>. The program can be downloaded at no charge.

References

Barnard, F. L. and M. Boehlje. “The Financial Troubleshooting of Farm Businesses: A Diagnostic and Evaluation System (DES).” *Journal of the American Society of Farm Managers and Rural Appraisers*. (1998-1999): 6-14.

Barnard, F. L. and M. Boehlje. “Using Farm Financial Standards Council Recommendations in the Profitability Linkage Model: The ROA Dilemma.” *Journal of the American Society of Farm Managers and Rural Appraisers*. (2004): 7-11 .

Barnard, F. L., and M. Boehlje. “Worksheets That Work for Measuring and Assessing Farm Financial Performance.” *Journal of Extension*. Volume 41, Number 6 (December 2003).

Boehlje, M., C. Dobbins, A. Miller, D. Miller, and F. Barnard. *Farm Business Management for the 21st Century: Measuring and Analyzing Farm Financial Performance*. Department of Agricultural Economics, Purdue University Cooperative Extension Service EC-712. (October 1999).

Ellinger, P. “Benchmarking Part 3: Profitability and Profitability Components.” *Ag Lender*. Volume 8, Issue 7 (July 2004): 12-13.

Financial Characteristics of Illinois Farms. The Center for Farm and Rural Business Finance, University of Illinois at Urbana-Champaign. (2003-2004).

Financial Guidelines for Agricultural Producers: Recommendations of the Farm Financial Council (Revised). (July 1997).

Lins, D. and Ellinger P. “Establishing Norms for Financial Performance Measures,” *Agri Finance*. (January, 1992): 5-6.

Table 1. Possible courses of action to improve profit performance¹

<p>Scale</p> <ol style="list-style-type: none"> 1. Expand by adding an enterprise or expanding existing enterprises. Use demonstrated results (records) to make expansion decisions. 2. Use fixed resources (machinery and labor) fully. 3. Identify low-cost ways to expand, such as renting additional land or facilities, custom feeding livestock, crop-share renting, or custom farming. 4. Examine whether your management ability and emotional stability are sufficient to handle the additional stress of expansion. 5. Increase off-farm employment, but assess its effect on efficiency. 6. Scale back your farm business to allow a significant increase in off-farm income. 7. Consider retiring, if appropriate. 8. Consider merging with another farming unit. <p>Employment</p> <ol style="list-style-type: none"> 1. Eliminate hired family employees. 2. Obtain an off-farm job. 3. Move to part-time farming status. 4. Add labor-intensive enterprises with low-capital requirements. 5. Expand operations to increase labor use. 6. Increase intensity of operations (thruput) to increase labor productivity. 7. Reduce family withdrawals to a level that is consistent with efficiency or level of farm employment. <p>Efficiency</p> <ol style="list-style-type: none"> 1. Reduce family living expenditures and operating costs. 2. Focus on productivity and thruput. 3. Improve enterprise record keeping and analysis. 4. Reorient priorities; spend more time on management. 5. Use advisory services. Don't do things that others can do cheaper and better. 6. Improve marketing skill and performance. 7. Evaluate whether the operation is too large to manage efficiently. <p>Leverage</p> <ol style="list-style-type: none"> 1. Establish minimum standards for the financial performance of new investments. 2. Evaluate the costs and returns associated with every investment considered. 3. Don't use cash flow or operating loan proceeds to finance capital purchases. 4. Use retained earnings to finance the equity component of capital purchases. 5. Maintain adequate financial reserves. 6. Structure debt in order to maintain balance between assets' useful lives and repayment periods. Don't abdicate your role in negotiating repayment terms. 7. Never give more collateral than is absolutely necessary. 8. Avoid high-cost borrowing, such as overdrafts and credit card debt. 9. Estimate how much you can afford to owe based on expected future income. 10. Identify and sell unproductive/unprofitable assets; reduce and restructure debts. 11. Don't own what you can control through leases; sell and lease-back. 12. Evaluate the rate of return expected from capital investments, and compare to the interest rate of borrowed debt.

¹ Adapted from Jolly, Robert and Alan Vontalge. *Financial Troubleshooting*, Iowa State University Extension Publication, Pm-1618, May, 1995

Figure 1. Worksheet 1, Input information

Schedule F Data		Taxable Year:	
Cost of livestock sold (Schedule F, line 2 ¹)	A	\$	-
Gross income (Schedule F, line 11 ²)	B	\$	1,432,549
Depreciation (Schedule F, line 16)	C	\$	136,922
Mortgage interest (Schedule F, line 23a)	D	\$	89,808
Other interest paid (Schedule F, line 23b)	E	\$	11,788
Total expenses (Schedule F, line 35)	F	\$	1,517,050

Balance Sheet		Beginning		Ending		
Balance sheet date		12/31/20X4		12/31/20X5		
Cash	G	\$	157,689	L	\$	5,016
Total current farm assets	H	\$	337,747	M	\$	485,376
Total current farm liabilities	I	\$	252,136	N	\$	321,867
Accrued Interest	J	\$	16,968	O	\$	14,088
Farm accounts payable and accrued exp.	K	\$	4,169	P	\$	6,131
Total farm assets				Q	\$	2,408,799
Total farm liabilities				R	\$	1,121,439
Owner's equity				S	\$	1,287,360

Miscellaneous Data			
Breeding stock sales (Form 4797)	T	\$	63,800
Number of operators and employees (annual full-time equiv.)	U		8
Family living expenses (all families supported by the farm) ³	V	\$	141,087

Net Farm Income			
Gross revenues [A+B+T+(M-L)-(H-G)]	W	\$	1,796,651
Interest expense [D+E+(O-J)]	X	\$	98,716
Other expenses [A+F-(D+E)+(P-K)]	Y	\$	1,417,416
Net farm income [W-X-Y]	Z	\$	280,519

¹ If included in total cash operating expenses set to zero.

² Remove from this number the revenue received from the sale of items that are not part of the the ordinary business operations. These might include the sale of machinery, land, or other capital assets.

³ This number is used to approximate the value of unpaid family and operator labor. University of Illinois research indicates that 2000 total living expenses for the average three person farm family were \$47,526. Do not include a value here if the operator and family members are paid a reasonable wage by the business and those wages are already included in the value on line F.

Figure 2. Worksheet 2, Financial performance measures

	Your Farm	Benchmark	Strong/Weak
Profitability			
Return on Assets $[(Z+X-V)/Q]*100$	9.9%	9.6%	strong
Return on Equity $[(Z-V)/S]*100$	10.8%	11.4%	weak
Operating Profit Margin $[(Z+X-V)/W]*100$	13.3%	22.2%	weak
Liquidity			
Current Ratio $[M/N]$	1.51	1.73	weak
Solvency			
Debt-to-Asset Ratio $[R/Q]*100$	46.6%	31.6%	weak
Financial Efficiency			
Asset Turnover Ratio $[W/Q]*100$	74.6%	38.0%	strong
Revenue per Full Time Laborer $[W/U]$	\$ 224,581	\$ 227,518	weak
Operating Expense Ratio $[(Y-C)/W]*100$	71.3%	57.5%	weak
Depreciation Expense Ratio $[C/W]*100$	7.6%	4.9%	weak
Interest Expense Ratio $[X/W]*100$	5.5%	4.8%	weak
Net Farm Income Ratio $[Z/W]*100$	15.6%	33.5%	weak

Figure 3. Worksheet 3, Repayment capacity ratios and measures

Current Ratio			
Current assets (Item M)	1	\$	485,376
Current liabilities (Item N)	2	\$	321,867
Current ratio [1/2]			1.508
Working Capital			
Current assets (Item M)	3	\$	485,376
Current liabilities (Item N)	4	\$	321,867
Working capital [3-4]		\$	163,509
Term Debt Coverage Ratio			
Net farm income (Item Z)	5	\$	280,519
Interest (Item X minus operating interest)	6	\$	89,808
Depreciation (Item C)	7	\$	136,922
Family living expenses and taxes (Item V)	8	\$	141,087
Income for debt servicing and capital replacement [5+6+7-8]	9	\$	366,162
Cash used for capital replacement (from your records)	10	\$	100,000
Term debt repayment capacity [9-10]	11	\$	266,162
Scheduled principal and interest payments on term debt (from your records)	12	\$	170,807
Term Debt Coverage Ratio [11/12]	13		1.558
Term Debt Repayment Capacity			
Net farm income (Item z)	14	\$	280,519
Interest (Item x minus operating interest)	15	\$	89,808
Depreciation (Item c)	16	\$	136,922
Family Living Expenses (Item v)	17	\$	141,087
Income for debt servicing and capital replacement [14+15+16-17]	18	\$	366,162
Cash used for capital replacement (from your records)	19	\$	100,000
Term debt repayment capacity [18-19]	20	\$	266,162
Scheduled principal and interest payments on term debt (from your records)	21	\$	170,807
Term debt repayment margin [20-21]	22	\$	95,355
Term debt repayment margin [20-21]	23	\$	95,355
Interest rate			9.00%
Years to repay term debt			5.0
Amortization factor	24		0.25709
Additional term debt the margin would service [23/24]	25	\$	370,898

Figure 4. Worksheet 4, Assessing the effect of a change on rates of return early planting

Financial Data		Actual	Projected
1 Gross Revenues (Item W)	\$	1,796,651	\$ 1,832,087
2 Fixed Costs (Items C+X+V) (Depreciation, interest, family living and income taxes)	\$	376,725	\$ 376,725
3 Variable Costs (Item Y-C) (Other expenses minus depreciation)	\$	1,280,494	\$ 1,280,494
4 Net Income (1-2-3)	\$	139,432	\$ 174,868
5 Total Farm Assets (Item Q)	\$	2,408,799	\$ 2,408,799
6 Owner's Equity (Item S)	\$	1,287,360	\$ 1,287,360
7 Interest Expense (Item X)	\$	98,716	\$ 98,716
A Operating Profit Margin [(4+7)/1]		13.3%	14.9%
B Asset Turnover Ratio [1/5]		74.6%	76.1%
C Return on Assets [(A*B)*100]		9.9%	11.4%
D Interest Cost Adjustment [7/5]		0.041	0.041
E Financial Structure [5/6]		1.871	1.871
F Return on Equity [((C/100)-D)*E]*100]		10.8%	13.6%