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ENTERPRISE RISK ANALYSIS

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ENTERPRISE RISK ANALYSIS

Abstract

United States farm policy enacted since 1996 has created a need for agricultural producers to better understand and manage risk. However, risk is a difficult concept to address because the ideas are challenging and the breadth of solutions is wide. Even where the concept is well understood, few have mastery of the tools and skills needed to properly evaluate alternatives.

RightRisk has been involved in developing teaching simulations, online courses, and risk decision tools since 2001. The team's Enterprise Risk Analyzer (ERA) tool provides farm and ranch managers much-needed assistance in evaluating risk management alternatives. The ERA tool utilizes an Internal Revenue Service (IRS) Schedule F and a series of other schedules as the basis for evaluating enterprise risk, including enterprise net income and break-even analysis. From these, the manager is in good position to evaluate each enterprise on its own merit, compare it to other enterprises, and to do so with a better understanding of the uncertainty involved with the outcomes.

The Enterprise Risk Analyzer tool enhances the manager's understanding of how breakeven prices and yields are likely to vary over time. Using the risk-estimates provided by the user as most likely, minimum, and maximum estimated yields and prices for each enterprise, the tool provides tabular and graphical information for the probability of breaking even over a range of values. The ERA tool describes possible outcomes using a cumulative distribution graph that indicates the probability of earning a net return at or below a given value.

Keywords: Risk Analytics, Decision Analysis, Farm Management

Introduction

Today, more than ever, active farm and ranch managers are looking for ways to evaluate the profitability of their businesses, including the underlying enterprise structure. In order to remain nimble and quickly-respond to rapid changes in the risk environment, this assessment is best where it allows for a quick, accurate review and enhances the capacity of management to compare alternative strategies.

Strategic management decisions involve the allocation of resources across business activities, the timing of the application of those resources, and the level of resource use. At this higher level, management also decides which enterprise activities to engage in. Put in another way, these decisions include which crops to grow, which stage to sell at, whether to diversify or vertically integrate, whether to sell direct to consumers or to contract with wholesalers. Such decisions represent “big picture” or macro-level decisions about the business and its activities. Management decisions made at the strategic level of a business have the potential to influence profitability and long-term sustainability of the operation to a larger degree.

However, managers of agricultural businesses are often more comfortable and, therefore, more likely to implement management changes at the enterprise level. This approach represents a risk management strategy in itself, where the balance of the farm or ranch is left to operate according to the more tried-and-true strategies used in the past, while adjustments are made in just a few areas in a particular year. In this way, any mistakes made, or negative consequences that result from a newly adopted strategy, do not threaten the entire business, as they might if changes were made more aggressively across more than one enterprise or the entire operation.

Enterprise budgets are one approach for organizing financial and economic information that managers find useful when attempting to evaluate how their business is performing on-the-fly during a production year. In addition, this approach is often used when budgeting for future production cycles. Evaluating enterprise costs and returns is helpful when management considers minor adjustments to the production schedule for an enterprise. For example, a manager might ask, “Should we apply

another 10 pounds of fertilizer to this crop?" or "Would our net return increase if we hold these animals for another 30 days of gain?"

These questions can be analyzed fairly easily using an enterprise budgeting approach. However, in order to develop the budgets, the manager must make estimates for prices, yields, and costs. What happens if those numbers are uncertain? What happens if the go/no-go answer to the question changes within the range of this uncertainty? In addition, when considering the profitability of the entire operation, how easy is it to compare projections in enterprise costs and returns across enterprises, especially where those projections include multiple sources of risk?

When a farm or ranch manager contemplates making changes to business operations, they often do so with some intuition for the future; the change is based on a forecast for what the future holds. Uncertainty is almost always present when these decisions are taken and with it comes anxiety.

There are a number of ways to handle this dilemma but what most managers appear to do is make a "best guess" for the uncertain variables and enter those into the budget. The "best guess" can be an estimate of the most likely outcome or it may be an average of all of the possible outcomes. Either way, it serves as an estimate for the uncertain number. However, the proxy nature of this value is often forgotten as the decision-making process unfolds.

What began as an estimate often evolves into a certain value when a decision is made about whether the management change is worth pursuing. A better way to handle the uncertainty is to think in terms of distributions when estimating uncertain values. Managers should take the time to think of the range of possible values the variable might take in the future, instead of making a "best guess" estimate.

In a simplistic sense, this is simply providing a series of estimates as possible answers to the "what if" question. In a slightly more sophisticated sense, this might be called scenario planning or risk analysis. The idea is to embrace the uncertainty and include it in the decision-making process to create a more robust answer to the question at hand, rather than attempt to estimate the uncertain number as a single "certain" value.

Enterprise Risk Analysis

In general terms, enterprise analysis is a process for estimating the net returns for a given enterprise. Most farms and ranches include more than one enterprise in the mix of business activities they attempt, hence a need to separate the expenses and revenue for each.

Enterprise analysis is not well-understood by many farm/ranch managers. When completed accurately, the manager will assign all business expenses and revenue to one or more enterprise activities. This allocation process is relatively easy when considering direct expenses and revenue, such as seed, fertilizer, chemicals, feed, trucking expenses, etc. The task becomes much more challenging when considering cost categories such as: liability or fire insurance, fuel, interest, taxes, etc. Finally, to obtain the most accurate understanding of the profitability of each enterprise activity, the manager will also need to allocate depreciation, owner labor, management, return on equity, and other non-cash expense adjustments.

With an accurate and completely-allocated set of business expenses and revenues in hand, the manager is in a good position to evaluate: 1) How profitable each enterprise activity is on its own merit, 2) How profitable one enterprise activity is compared to others, and 3) What are the largest expense categories for each enterprise. This information is extremely helpful when identifying adjustments to enterprises activities with the goal of improving either enterprise profitability or the profitability of the entire farm/ranch. It is important to remember that the overall profitability of any farm or ranch arises from the ability of each enterprise activity to employ resources in such a way as to earn a greater return from those activities than the accumulated production expenses.

In addition to this mission-critical management information, a manager armed with such enterprise cost and return information may begin to accurately assess breakeven prices and yields for each enterprise activity. This provides the active manager with the detailed understanding required to make mid-year corrections to marketing plans, as well as production strategies.

Enterprise Risk Analyzer Tool

The RightRisk *Enterprise Risk Analyzer* (ERA) tool takes basic enterprise analysis one step further. After developing net return estimates by allocating all business expenses and revenue to the appropriate enterprise, breakeven analysis is completed for both prices and yields. Breakeven data are presented in both tabular, as well as graphical form using probability density functions generated using the risk-estimates.

User estimates for minimum, most likely, and maximum values are utilized to fit beta distributions describing price and yield expectations. The RSP tool then uses a bootstrap approach to create probability estimates. This produces a more robust analysis of the expected performance for each enterprise, as well as for the whole farm. In addition, it provides a more complete understanding of the possible range of outcomes, reported as the probability of breaking even over a range of projected values.

Most likely it is easiest to understand the usefulness of the ERA tool by seeing it applied to analyze data from an example agricultural operation. We have prepared an example evaluating the current crop mix, as well as the relative profitability of an irrigated wheat enterprise compared to another forage crop.

Entering ERA Example Farm Information

Consider the example of a diversified crop operation. This farm runs a commercial cowherd of 180 head (160 cow-calf pairs, 15 replacement heifers, and 5 bulls) and irrigated farming enterprises raising alfalfa, corn for silage, and wheat. Most of their raised forage goes to feeding the cattle. In addition, the operation has been backgrounding their calves after weaning for four months before selling them over the past several years.

Managers have two main concerns at this point: First, they would like to determine if their cropping mix is efficient for their needs: is it profitable to produce their own feed or should they be buying it? Second, is the irrigated wheat enterprise profitable on its own, or should they consider switching to a forage crop following silage corn?

We begin by entering the general farm information under the ERA General Tab. The crop mix is 80.9 hectares (200 acres) of alfalfa hay, 20.2 hectares (50 acres) of corn

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silage, 20.2 hectares (50 acres) of wheat following silage, and the cow-calf and backgrounding livestock enterprises, Table 1.

Table 1 ERA Enterprise List for the Example Farm.

Enterprise Titles	Enterprise Description	Number of Units	Enterprise Units *(acres/head/cow)*	Enterprise Type *(crop or livestock)*
Enterprise #1	Alfalfa Hay	200	acres	crop
Enterprise #2	Corn Silage	50	acres	crop
Enterprise #3	Wheat	50	acres	crop
Enterprise #4	Cow-calf	180	head	livestock
Enterprise #5	Calf Backgrounding	160	head	livestock

Next, we enter the expected prices and yields for each enterprise, in the form of expected value (most likely) and maximum and minimum values for each enterprise price and yield, Table 2. Crop yields are based on yield history contingent on the level of irrigation water available. Alternatively, calf weights are dependent on rainfall and other weather-related factors. For the livestock enterprises, we focus on calf values at weaning (pounds/head) under the cow-calf enterprise and the gain per head for the calves under the backgrounding enterprise. The ERA tool calculates an expected value per unit for each enterprise, based on the most likely value for yields and price.

Table 2 ERA Enterprise Yields and Prices for the Example Farm.

Stochastic Elements	Estimate	Yield per Enterprise Unit	Units (bu/ton/lbs)	Price per Unit	Expected Revenue per Enterprise Unit *(most likely)*
Alfalfa Hay	*Minimum*	3	tons/acre	$ 65.00	$ 425.00
	Most Likely	5		$ 85.00	
	Maximum	6		$ 120.00	
Corn Silage	*Minimum*	15	tons/acre	$ 22.00	$ 750.00
	Most Likely	25		$ 30.00	
	Maximum	30		$ 45.00	
Wheat	*Minimum*	50	bushels/acre	$ 2.85	$ 300.00
	Most Likely	80		$ 3.75	
	Maximum	100		$ 4.50	
Cow-calf	*Minimum*	400	pounds/head	$ 1.45	$ 875.00
	Most Likely	500		$ 1.75	
	Maximum	625		$ 2.00	
Calf Backgrounding	*Minimum*	100	gain/head	$ 1.25	$ 280.00
	Most Likely	200		$ 1.40	
	Maximum	300		$ 1.50	

The next step is to enter information into the IRS Schedule F[3] tab of the ERA tool, Table 3. The tool automatically enters the revenue items on line 1a and on line 2a based on the information entered under the General tab. In addition, on line 1b, we enter $10,000 for the sale of cull cows and bulls throughout the year and on line 1d the cost basis of $5,000. The farm also reported a dividend of $1,500 and government payments of $4,000. On the expense side, we enter general expenses in Schedule F PART – II. The farm has no employees, other than part-time harvest help ($5,000) and leases some machinery ($12,500) in addition to the other expenses entered.

[3] The United States Department of Treasury Internal Revenue Service (IRS) advises that "Individuals, trusts, partnerships, and sole members of a domestic LLC engaged in the business of farming report farm income on Schedule F (Form 1040)." (*Farmer's Tax Guide*. IRS Pub.225) U.S. farmer's use this schedule to calculate net profit or loss from regular farming operations. Schedule F farming profit or loss is then transferred to the owner's tax return, where it may be combined with the other non-farming income and increases or reduces the owner's taxable income.

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Table 3 ERA Schedule F Income and Expenses for the Example Farm.

SCHEDULE F (Form 1040) - Profit or Loss From Farming **2011**

PART - I	**Farm Income - Cash Method.**				
1a	Specified sales of livestock and other resale items	1a	202,300.00		
b	Sales of livestock and other resale items not reported on line 1a	1b	10,000.00		
c	*Total of lines 1a and 1b*	1c	212,300.00		
d	Cost or other basis of livestock or other items reported on line 1c	1d	5,000.00		
e	*Subtract line 1d from line 1c*			1e	207,300.00
2a	Specified sales of products you raised			2a	137,500.00
b	Sales of products you raised not reported on line 2a			2b	
3b	Cooperative distributions (Form(s) 1099-PATR) - taxable amount			3b	1,500.00
4b	Agricultural program payments - taxable amount			4b	4,000.00
5a	Commodity Credit Corporation (CCC) loans reported under election			5a	
c	CCC loans forfeited - taxable amount			5c	
6	**Crop insurance proceeds and federal crop disaster payments**				
b	Amount received in 2011 - taxable amount			6b	
d	Amount deferred from 2010			6d	
7a	Specified custom hire (machine work) income			7a	
7b	Custom hire income not reported on line 7a			7b	
8a	Specified other income			8a	
8b	Other income not reported on line 8a			8b	
9	**Gross income. Add amounts in the right column (lines 1e, 2a, 2b, 3b, 4b, 5a, 5c, 6b, 6d, 7a, 7b, 8a, and 8b)**			9	350,300.00

PART - II	**Farm Expenses - Cash and Accrual Method.**		
10	Car and truck expenses (see instructions). Also attach Form 4562	10	3,500.00
11	Chemicals	11	10,000.00
12	Conservation expenses	12	
13	Custom hire (machine work)	13	12,500.00
14	Depreciation and section 179 expense		*see schedules*
15	Employee benefit programs other than on line 2	15	
16	Feed	16	112,000.00
17	Fertilizers and lime	17	15,000.00
18	Freight and trucking	18	5,000.00
19	Gasoline, fuel, and oil	19	12,500.00
20	Insurance (other than health)	20	8,500.00
21	**Interest**		*see schedules*
a	Mortgage (paid to banks, etc.)		*see schedules*
b	Other		*see schedules*
22	Labor hired (less employment credits)	22	5,000.00
23	Pension and profit-sharing plans	23	
24	**Rent or lease**		
a	Vehicles, machinery, equipment	24a	10,000.00
b	Other (land, animals, etc.)	24b	
25	Repairs and maintenance	25	20,000.00
26	Seeds and plants	26	12,000.00
27	Storage and warehousing	27	1,000.00
28	Supplies	28	5,000.00
29	Taxes	29	10,000.00
30	Utilities	30	15,000.00
31	Veterinary, breeding, and medicine	31	7,500.00
32	**Other expenses (specify):**		
a	Breeding bulls	32a	7,000.00
b	Irrigation water taxes	32b	7,500.00
c	Replacements	32c	17,500.00
d		32d	
e		32e	
f		32f	
33	**Total expenses. Add lines 10 through 32f.**	33	296,500.00

We next enter information under the Schedules tab, including: non-cash revenue and expense items, as well as all asset and liability data, Table 4. The example farm has some prepaid expenses (seed $3,375), along with a coming wheat crop that is accounted for in this section. In addition, we have last year's calves on feed accounted for in Schedule E, and the cowherd is listed under Schedule F (note: this not IRS Schedule F described in footnote 1, above). Schedule G contains the machinery and equipment information including cost basis, annual depreciation, accumulated

depreciation, and book value. Real estate and improvements are accounted for in Schedule H.

Table 4 ERA Schedules Tab.

Schedules		NOTE: Versions 1.10 and higher use the same values in both beginning and ending schedules.	
Click the button to the right of the schedule name to toggle on/off schedules needed for non-cash revenue and expense items.			
Prepaid Expenses and Supplies	Schedule A	Farm Accounts Payable	Schedule I
Investment in Growing Crops	Schedule B	Notes Payable	Schedule J
Receivables Accounts, Notes, etc.	Schedule C	Intermediate Loans	Schedule K
Crops Held for Sale or Feed	Schedule D	Long Term Loans	Schedule L
Livestock Held for Sale (all)	Schedule E	Taxes- Real Estate, Property, etc.	Schedule M
Breeding Livestock (all)	Schedule F		
Machinery, Trucks, Pickups, etc.	Schedule G		
Real Estate (all)	Schedule H		

Enterprise Allocation with the ERA Tool

We allocate all previously-listed cash and non-cash income and expenses to the various enterprises under the Allocation tab, including changes in inventories, depreciation expense, as well as owner labor and management, among others. Opportunity cost of capital was not included for the example, although a blank for Return on Equity Capital is provided at the end of the non-cash expense adjustments.

The ERA tool summarizes the revenue and expense categories and lists any unallocated amount in red in a separate column. Most revenue categories are easily allocated; for example, wheat sales at $15,000 and alfalfa hay sales at $120,000. Revenue items, such as a cooperative dividend or the like, may not be as easy to allocate. One way to handle such categories is to allocate them equally across all five enterprises. In another case, we assume that the government payment revenue is for the corn and wheat acres and assign the revenue accordingly.

In the expense section, it is important to be as accurate as possible when allocating expenses to the various enterprises. In other words, if it is possible to link indirect expenses with a specific enterprise, it likely is worth taking time to do so. Otherwise, use another method such as allocating the expense equally across the enterprises. Taking time to refine estimates will provide for more accurate breakeven analysis further on. The fertilizer, seed and repair bills are easily allocated to the alfalfa and crop enterprises, as are the veterinary and feed bills to the livestock enterprises.

Depreciation, taxes, and interest expenses are more difficult to assign to an enterprise. We chose to allocate these expenses according to the proportion that the respective

enterprise contributes to gross farm revenue. We might also have weighted the distribution on the number of hectares (acres) or number of head, on a percentage of total cash expenses, or another approach to assign these expenses.

ERA Net Income Analysis

The ERA tool generates a series of analyses for net income, both on an enterprise and whole-farm level, based on the data entered. The tool generates a value for minimum, most likely and maximum net income, using the range of prices and yields entered under the General tab. Results are summarized under the Net Income Analysis tab. For our example, Net Enterprise Revenue (gross revenue minus gross expenses) for the Whole Farm ranges from a negative $230,021 to a positive $113,954, with the most likely net income at a negative $77,246 across all enterprises, Table 5.

Table 5 ERA Net Income Analysis for the Example Farm.

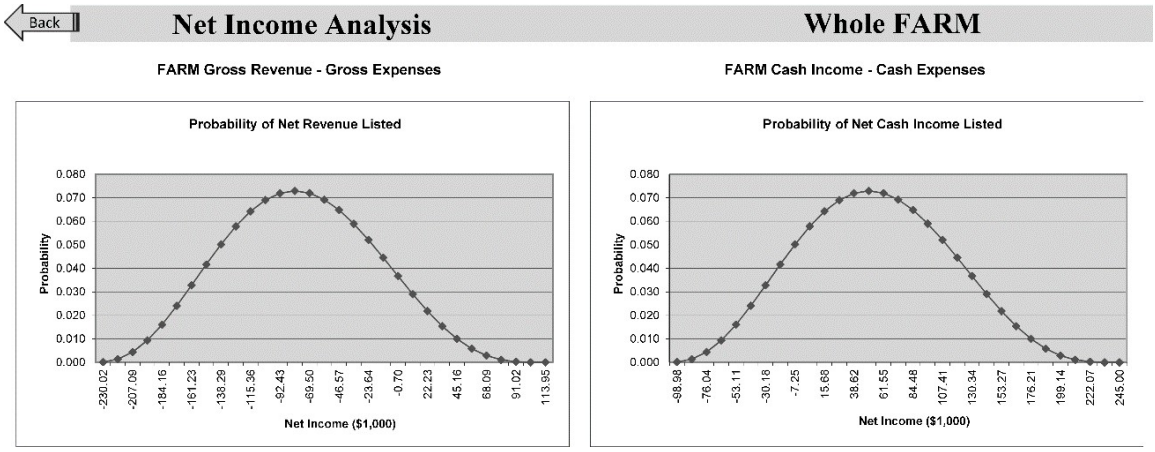
	WHOLE FARM	Alfalfa Hay	Corn Silage	Wheat	Cow-calf	Background Calves
FARM REVENUE						
TOTAL FARM INCOME - CASH	350,300.00	85,300.00	40,300.00	16,800.00	162,800.00	45,100.00
TOTAL NON-CASH INCOME ADJUSTMENTS						
GROSS FARM REVENUE	350,300.00	85,300.00	40,300.00	16,800.00	162,800.00	45,100.00
FARM EXPENSES						
FARM EXPENSES - CASH	296,500.00	52,335.00	39,300.00	20,130.00	112,548.00	72,187.00
FARM EXPENSES - NON-CASH EXPENSE ADJUSTMENTS	131,046.00	39,735.00	14,324.00	4,867.00	49,665.00	22,455.00
GROSS FARM EXPENSES	427,546.00	92,070.00	53,624.00	24,997.00	162,213.00	94,642.00
NET FARM INCOME FROM OPERATIONS	**(77,246.00)**	**(6,770.00)**	**(13,324.00)**	**(8,197.00)**	**587.00**	**(49,542.00)**

Net Income RISK Analysis	WHOLE FARM	Alfalfa Hay	Corn Silage	Wheat	Cow-calf	Background Calves
NET Enterprise CASH INCOME (cash income - cash expenses)						
Minimum	(98,975.00)	(13,035.00)	(20,000.00)	(11,205.00)	(2,848.00)	(51,887.00)
Most Likely	**53,800.00**	**32,965.00**	**1,000.00**	**(3,330.00)**	**50,252.00**	**(27,087.00)**
Maximum	245,000.00	91,965.00	31,000.00	4,170.00	117,752.00	113.00
NET Enterprise REVENUE (gross revenue - gross expenses)						
Minimum	(230,021.00)	(52,770.00)	(34,324.00)	(16,072.00)	(52,513.00)	(74,342.00)
Most Likely	**(77,246.00)**	**(6,770.00)**	**(13,324.00)**	**(8,197.00)**	**587.00**	**(49,542.00)**
Maximum	113,954.00	52,230.00	16,676.00	(697.00)	68,087.00	(22,342.00)
Probability Analysis (*click button at right*)	Graph	Graph	Graph	Graph	Graph	Graph

Cow-calf is the only enterprise that results in a positive net income for the most likely outcome with an estimate of $587. All of the enterprises report negative minimum estimates. For the maximum estimates, two of the five enterprises result in negative net income, while three have positive values. Where a positive value for the most likely estimate may be encouraging, keep in mind that the information entered describes a wide variation when we consider the range between the minimum and maximum values.

Clicking the graph button for each enterprise provides the associated probability analysis. On a whole farm basis, the example farm is most likely to earn a net return somewhere between a negative $92,430 and a negative $69,500 on a net revenue-basis and between a positive $38,620 and a positive $61,550 on a net cash-basis, Table 6.

Table 6 ERA Net Income Analysis Graph for the Example Farm.



Enterprise Risk Analysis Using the ERA Tool

Next consider how the ERA tool provides results for the estimate of the most likely price ($85/ton) for alfalfa hay: Would net income and break-even calculations change if this price went up or down significantly? With the ERA tool, we are not locking ourselves into a single estimate for price or yield and are able to describe a more accurate picture of the potential profit (or loss) for each enterprise by using a range of values.

The potential net income for the alfalfa hay enterprise ranges between a loss of $52,770 to a potential gain of $52,230, with a most likely estimate of a negative $6,770, after covering all costs (cash and non-cash), Table 7. Net cash income for alfalfa hay ranges from a loss of $13,035 to a gain of $91,965, with the most likely outcome estimated at a positive $32,965.

Table 7 ERA Net Income Analysis for the Example Farm Alfalfa Hay Enterprise.

Net Income RISK Analysis	WHOLE FARM	Alfalfa Hay
NET Enterprise CASH INCOME (cash income - cash expenses)		
Minimum	(98,975.00)	(13,035.00)
Most Likely	**53,800.00**	**32,965.00**
Maximum	245,000.00	91,965.00
NET Enterprise REVENUE (gross revenue - gross expenses)		
Minimum	(230,021.00)	(52,770.00)
Most Likely	**(77,246.00)**	**(6,770.00)**
Maximum	113,954.00	52,230.00

Evaluating Break-even Analysis Using the ERA Tool

Break-even analysis is presented on both a Net Cash (cash-only) and Net Revenue (cash and non-cash) basis. These results provide even deeper insight into the profitability (or loss) for each enterprise. The previous Net Income Analysis (Table 5) revealed that alfalfa hay and cow-calf were the two, better-performing enterprises. The most likely break-even price for alfalfa per ton is $92.07 to cover all (gross) expenses and $52.34 to cover only cash expenses, Table 8. The break-even calf price (per pound) is $1.80 to cover all (gross) expenses and $1.25 to cover only cash expenses. The wheat and backgrounding enterprises show a fairly large range of break-even prices. The most likely break-even price for backgrounding is estimated at $2.26 per head just to cover cash expenses, almost $1.00 per pound higher than the expected price range.

Table 8 ERA Break-even Price Analysis for the Example Farm.

Break-Even PRICE Analysis					
YIELD PER ENTERPRISE UNIT	Alfalfa Hay	Corn Silage	Wheat	Cow-calf	Background Calves
Minimum	3	15	50	400	100
Most Likely	**5**	**25**	**80**	**500**	**200**
Maximum	6	30	100	625	300
BREAK-EVEN PRICE - CASH EXPENSES					
Minimum	43.61	26.20	4.03	1.00	1.50
Most Likely	**52.34**	**31.44**	**5.03**	**1.25**	**2.26**
Maximum	87.23	52.40	8.05	1.56	4.51
BREAK-EVEN PRICE - GROSS EXPENSES					
Minimum	76.73	35.75	5.00	1.44	1.97
Most Likely	**92.07**	**42.90**	**6.25**	**1.80**	**2.96**
Maximum	153.45	71.50	10.00	2.25	5.92

Scrolling further down under the Break-even Analysis tab, reveals the break-even yield analysis. Table 9 provides a picture similar to the break-even price analysis, where backgrounding calves and wheat have a wider range of yields than the expected range

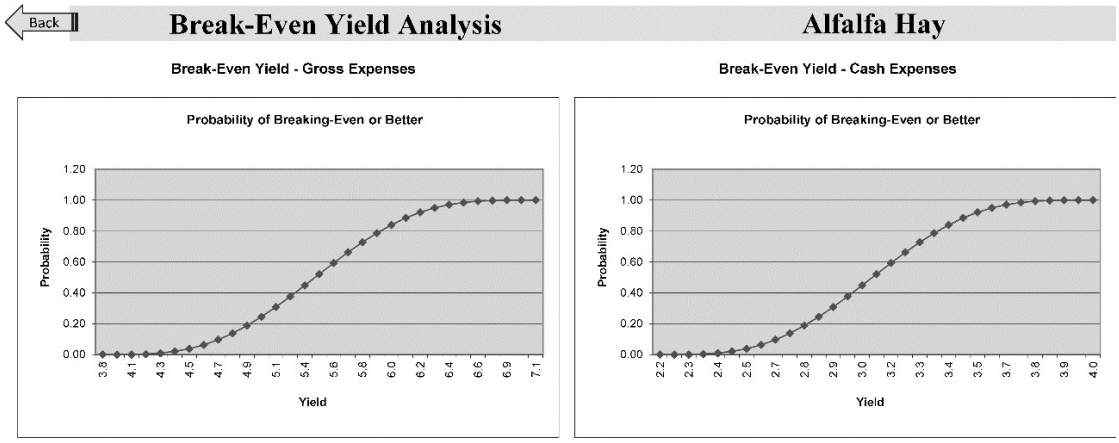
entered on the General tab. When we examine gross expenses, only the alfalfa hay and cow-calf enterprises result in yields that approach levels we might reasonably expect.

Table 9 ERA Break-even Yield Analysis for the Example Farm.

Break-Even YIELD Analysis					
PRICE PER ENTERPRISE UNIT	**Alfalfa Hay**	**Corn Silage**	**Wheat**	**Cow-calf**	**Background Calves**
Minimum	65	22	2.85	1.45	1.25
Most Likely	**85**	**30**	**3.75**	**1.75**	**1.4**
Maximum	120	45	4.5	2	1.5
BREAK-EVEN YIELD - CASH EXPENSES					
Minimum	2.18	17.47	89.47	312.63	300.78
Most Likely	**3.08**	**26.20**	**107.36**	**357.30**	**322.26**
Maximum	4.03	35.73	141.26	431.22	360.94
BREAK-EVEN YIELD - GROSS EXPENSES					
Minimum	3.84	23.83	111.10	450.59	394.34
Most Likely	**5.42**	**35.75**	**133.32**	**514.96**	**422.51**
Maximum	7.08	48.75	175.42	621.51	473.21

Probability analysis is another important ERA feature for evaluating enterprise performance, allowing the user to examine the likelihood of various price and yield levels to cover either cash-only or gross (cash and non-cash) expenses. Probability curves show the probability of breaking even at a given price (or yield) for each enterprise. One or more risk management strategies could be developed from this data. For example, increasing insurance coverage or adjusting the level of production across the enterprise mix may improve the chances of breaking even. Examining the alfalfa hay enterprise, reveals there is a 50-percent probability of breaking even at approximately $98/ton for gross expenses and $56/ton for cash expenses, Table 10.

Table 10 ERA Break-even Alfalfa Hay Price Analyses for the Example Farm.



Decision Making Using the ERA Tool

Information provided by the ERA tool could help managers determine if the enterprise mix is the best use of available resources or if changes might be needed. The example farm is a high-cost business. Potential profitability is heavily influenced by the relatively high costs compared to the potential revenue, even for the more profitable enterprises such as cow-calf. The wheat enterprise shows almost zero chance for turning a profit, with only a 50-percent chance of breaking even at 44.5 bushels per hectare (110 bu/acre) to cover just the cash expenses. This yield is beyond the reasonably expected maximum. The farm would likely be better off planting an alternative crop if one would fit into the rotation. That alternative might be one that produces a feed input for existing livestock enterprises.

The backgrounding enterprise should also be further evaluated to determine whether cost savings could be realized and if the strategy of taking the calves to just 850 pounds is the most feasible. Alternatives might be to sell the calves sooner or feed them longer. The wheat and corn silage enterprises might be viewed as less likely to be profitable; however, we might also evaluate them from the perspective of providing feed to "sell" at market prices to the current livestock enterprises. In such a case, they may contribute to overall farm profitability, which must be the ultimate goal of the entire enterprise portfolio.

The ERA tool could be of help in considering such alternatives through revised entries under the General Tab, by adjusting and saving/loading alternative farm assumptions, or via revised entries under the Allocation Tab. Not only could this produce revised estimates of net farm income but could also provide estimates of alternative probabilities for breaking even under various alternative price/yield scenarios.

Conclusion

The *Enterprise Risk Analyzer* tool is designed to provide an accurate description of enterprise profitability, enterprise contributions to overall business profitability, and to offer risk analytics to help evaluate alternative strategies and courses of action to improve that performance over time under conditions of uncertainty.

In this paper, one case example was presented using the ERA tool to evaluate whole-farm and enterprise profitability, as well as potential for improvement. The ERA tool

represents a better way to address the presence of uncertainty by describing results in terms of distributions, rather than using a "best guess" single estimate for an uncertain variable. In this way, the tool embraces the uncertainty involved and brings it into the decision-making process to create a more robust approach to evaluating whole-farm and enterprise profitability, as well as evaluate the potential to achieve break even prices or yields. The result should be a more informed decision-making process and better risk management decisions in the future.

RightRisk is a multi-state team of risk management educators that has designed and posted a series of online risk analytics tools, self-study courses, and associated facilitator materials over the past several years. For more information or to access the online risk analytics, risk management courses, newsletters and more, visit the RightRisk web site at http://RightRisk.org.

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