



# BARNYARDS & BACKYARDS



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## Long-term risk assessment using the Multi-Temporal Risk Analyzer – part 3

We highlighted in previous articles northern Wyoming producer Bob Mills\* and his potential switch of 90 acres of flood irrigated alfalfa to center pivot irrigation.

We would like to evaluate his partial budget for the switch using the Multi-Temporal Risk Analyzer (MTRA) tool. MTRA entries differ from typical partial budgets where it allows a user to consider a range of values (max, min, and most likely) for each category. One of the most useful tool features is the option to select from one to 20 years for each revenue and expense category.

For our example, the annual pivot payment will be made over 10 years, while we select 20 years for the other budget categories to learn how this purchase decision might turn out over the longer run. Selecting RUN at the bottom of the screen causes the tool to perform a series of 1,000 simulated iterations to provide scenario results over the selected time period. The tool can generate a wide set of results, depending on the range of user-provided uncertainty estimates.

### MTRA TOOL ANALYSIS

Tool output includes results on both a cash- and net present value-basis. Cash-basis results suggest that making the switch to a pivot could provide a total net return of \$120,882 over 20 years. The simulation describes three years of negative returns within the first 10 years when the loan payment is being repaid, with a best year return of \$13,975 and worst year return at -\$2,966.

Keep in mind cash-basis results are calculated with an effective interest rate of 0 percent; the time value of money is zero. These results are not intended to suggest that machinery purchase loans with a zero interest

#### Projected returns cash basis

Interest Rate: 0.00%

CASH-basis analysis					
YEAR	Projected Total Added Returns	Projected Total Reduced Costs	Projected Total Added Costs	Projected Total Reduced Returns	Projected NET ANNUAL Return
	1	22,955	2,159	21,711	-
2	18,771	2,201	19,192	-	1,779
3	23,316	2,181	19,637	-	5,859
18	21,373	2,279	10,812	-	12,840
19	19,215	2,226	10,744	-	10,697
20	21,611	2,314	11,791	-	12,134

<b>Net Return:</b>	<b>120,882</b>
<b>MIN Rtn:</b>	<b>-2966</b>
<b>AVG. Rtn:</b>	<b>6044</b>
<b>MAX Rtn:</b>	<b>13975</b>

#### Projected returns net present value

Interest Rate: 4.50%

PRESENT VALUE-basis analysis					
YEAR	Projected PV-Total Added Returns	Projected PV-Total Reduced Costs	Projected PV-Total Added Costs	Projected PV-Total Reduced Returns	Projected PV-NET ANNUAL Return
	1	22,955	2,159	21,711	-
2	17,962	2,106	18,366	-	1,703
3	21,351	1,997	17,983	-	5,366
18	10,113	1,079	5,116	-	6,076
19	8,701	1,008	4,865	-	4,844
20	9,364	1,003	5,109	-	5,258

<b>Net Return:</b>	<b>70,082</b>
<b>MIN Rtn:</b>	<b>-2086</b>
<b>AVG. Rtn:</b>	<b>3504</b>
<b>MAX Rtn:</b>	<b>7546</b>

rates are realistic; rather, they serve as a benchmark to compare with loans reporting positive interest rates. Taking into account a positive time value of money is a key consideration when making long-term decisions. MTRA allows users to compare the cash- and net present value-basis (NPV) results.

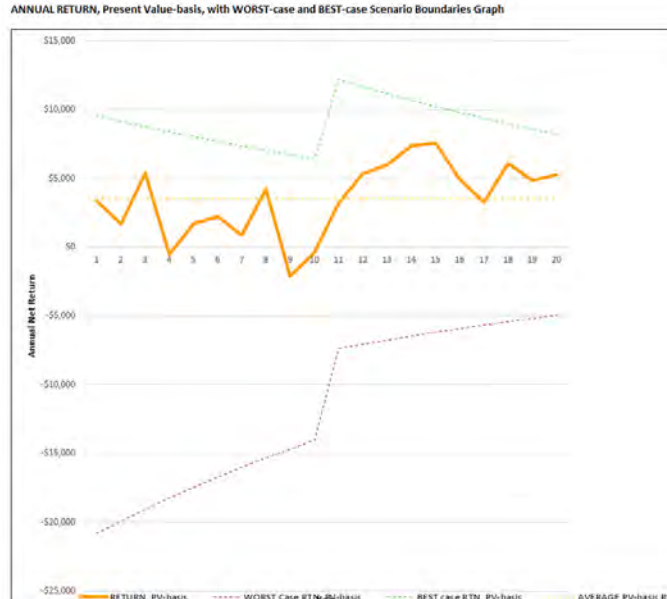
For our example, the NPV results describe a much more conservative total net return of \$70,082 over 20 years, due in part to the interest rate of 4.5 percent. These returns include the three years of negative returns within the first 10 years while the pivot purchase loan is repaid, the maximum annual return of \$7,546 and a minimum at -\$2,086.

### MTRA ANALYSIS RESULTS

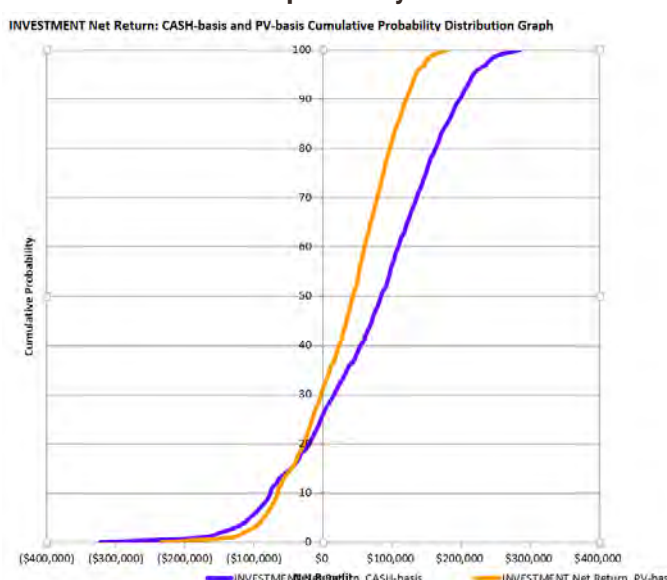
MTRA generates eight separate charts depicting results for one simulation run. These charts are extremely useful in comparing cash- and net present value-basis results, in addition to probability analyses based on single and multiple runs. For example, the Annual Return Graphs display best, worst, and average projected returns on a cash- and NPV-basis (see lower left). Following our example, the average net return is projected at \$3,504, with both the projected best and worst case scenarios improving significantly after year 10 (the last annual loan payment).

The MTRA Investment Net Return graph includes an orange curve representing the probability of overall net returns on a NPV-basis, while the purple curve outlines the cash-basis net returns over all possible simulation draws (below). Here we see there is an estimated 70 percent probability that Bob's pivot investment would generate a net return greater than zero (30 percent probability of net returns below zero), when we consider the NPV-basis results (orange curve). In addition, the chart reveals a 50/50 chance of a net return of \$43,468 for the investment (max: \$179,957; min: -\$233,186).

Annual return with worst and best case scenarios



Cash and PV cumulative probability distribution



Based on these results, Bob could reasonably expect the project to provide a positive net return and may be worth pursuing if his estimates for income and expense variation match-up with future reality.

*\*The Mills operation is a case study example created to demonstrate RightRisk tools and their applications. No identification with actual persons (living or deceased), places, or agricultural operation is intended nor should be inferred.*

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### FOR MORE INFORMATION

RightRisk.org offers risk management resources to agricultural producers and agribusinesses. Materials help better understand and manage risk no matter if you are just starting out or have 30 years of experience under your belt.