CENTER FOR AGRICULTURAL PROFITABILITY
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Using Breakeven Analysis for Better Decisions

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One of the merits of enterprise budgeting is the value of statistics obtained by producers as they engage in decision-making activities. Some of the easiest and most useful computations that can be obtained from enterprise data are breakeven values. As the name suggests, a breakeven gives the price or yield required for the revenue obtained from the enterprise to equal the costs encumbered to produce that revenue.

How to calculate breakeven prices and yields

For example, a breakeven price, assuming a particular yield, can be used in developing a marketing plan as it presents the price the producer must receive to cover all costs. When all costs are included in the enterprise budget, including opportunity costs of using the producer's capital and time, a breakeven price will provide a return to all contributions to the production process. When not all costs are included, the breakeven value will provide a return to cover whatever costs are included. A breakeven yield, assuming a particular price, identifies the yield the producer must obtain to cover costs involved in producing the enterprise.

The formulas to determine these breakeven values are:

(1) Breakeven Price = Total Cost/Expected Yield

or

(2) Breakeven Yield = Total Cost/Expected Price.

Applying breakeven analysis: winter wheat example

For example, using data from a 2023 winter wheat budget for the Nebraska Panhandle (Klein and McClure), breakeven prices and yields are presented in Table 1 for total operating and total costs, including overhead.

Table 1. Breakeven Selling Prices and Yields for Irrigated Hard Red Winter Wheat in the Nebraska Panhandle.

	Cost Per Acre	Breakeven Price ($/bu)	Breakeven Yield (bu)
	$	(@90 bu)	(@ $9.00/bu)
1. Total Operating Costs	$491.45	$5.46	54.61
2. Total Economic Costs	$658.46	$7.32	73.16

The per acre total operating costs (including seed, fertilizer, pesticides, custom services, paid labor, fuel and energy, repairs and maintenance, and interest of operative capital) total $491.45 per acre. Adding

general overhead, equipment depreciation and opportunity cost, and land opportunity cost, brings the total economic costs to $658.46. Note that opportunity cost for the producer's time is not included. The breakeven wheat price to cover operating expenses is $5.46 ($491.45/90 bu), while the breakeven wheat yield is 54.61 bushels ($491.45/$9.00). Likewise, the breakeven price to cover total economic costs ($658.46/90 bu) is $7.32 and the breakeven wheat yield is 73.16 bushels ($658.46/$9.00).

Profitability goals and breakeven analysis

The formulas for breakeven price and yield are derived from the economic identity:

(3) Profit = Price x Yield – Costs

Setting profit = 0 (*price x yield – costs = 0*) and solving for price gives the breakeven price given in equation (1). This formula can be useful in finding the breakeven price or yield when profit equals a specified number other than zero, such as a profit that includes living expenses. For example, to determine a breakeven price that not only covers the cost of production, but also includes a family living expense of $100 per acre, profit in equation (3) would be set equal to $100, and solving for breakeven price, would give:

(4) Breakeven Price = (Total Cost + 100)/Expected Yield

In the above wheat example, breakeven price given total economic costs would be $8.43.

Using breakeven analysis for input decisions

This same breakeven concept can be used to assist in other decision-making activities, such as the additional yield required to break even when adding an additional amount of nitrogen to a wheat field at varying prices of nitrogen and at varying prices of wheat. For example, in the wheat enterprise budget being used in this article, 125 pounds of 32-0-0 is applied to the field by pivot. To determine the increased yield that must be obtained to cover the marginal cost of applying an additional 25 pounds nitrogen, the following formula may be used:

(5) (additional pounds of N x price of N per pound) / Price of wheat per bushel

Doing this calculation for varying prices of N and wheat produces a decision chart similar to Table 2.

Table 2. Increase in Yield Required to Breakeven Adding 25 Additional Pournds of Nitrogen (32-0-0) at Varying Prices of Nitrogen.

		Price of Wheat ($/bu)								
		$8.00	$8.50	$9.00	$9.50	$10.00	$10.50	$11.00	$11.50	$12.00
Price of Nitrogen ($/lb.)	$0.70	2.2	2.1	1.9	1.8	1.8	1.7	1.6	1.5	1.5
	$0.80	2.5	2.4	2.2	2.1	2.0	1.9	1.8	1.7	1.7
	$0.90	2.8	2.6	2.5	2.4	2.3	2.1	2.0	2.0	1.9
	$1.00	3.1	2.9	2.8	2.6	2.5	2.4	2.3	2.2	2.1
	$1.10	3.4	3.2	3.1	2.9	2.8	2.6	2.5	2.4	2.3
	$1.20	3.8	3.5	3.3	3.2	3.0	2.9	2.7	2.6	2.5
	$1.30	4.1	3.8	3.6	3.4	3.3	3.1	3.0	2.8	2.7

If nitrogen is priced at $1 per pound, increasing nitrogen by 25 pounds per acre requires an additional wheat yield of 2.8 bushels per acre assuming the price of wheat was $9 per bushel. As the price of nitrogen increases, a greater yield must be obtained to break even. As the price of wheat increases, a lower yield is required to make the additional fertilizer break even at any given price of nitrogen. These results mirror the economic principles that say when the price of an input increases, less should be used in the production process, and, as the price of the output increases, more inputs should be used to maximize profit.

Enterprise budgeting and breakeven analysis made simpler

To create the enterprise budget necessary to determine breakeven prices and yields requires time and effort. Fortunately, the Center for Agricultural Profitability (CAP) has developed the Agricultural Budget Calculator (ABC) to make this process much easier. ABC can be accessed free of charge at https://agbudget.unl.edu/. Online and in-person training sessions can be accessed at https://cap.unl.edu/. The base ABC program guides the user in developing economic and cash enterprise budgets. Breakeven tables and several reports useful in decision-making are available from completed enterprise budgets in ABC.

References

Klein, Robert and Glennis McClure. 2023 Budget 82-Wheat-Winter, Panhandle, No Till, in Rotation, 90-bushel Yield, Pivot Irrigated Electric, 800 GPM 35 PSI, 6 acre/inches. https://cap.unl.edu/budgets/crops-2022/2023-nebraska-crop-budgets-112122-final.pdf, page 94.

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