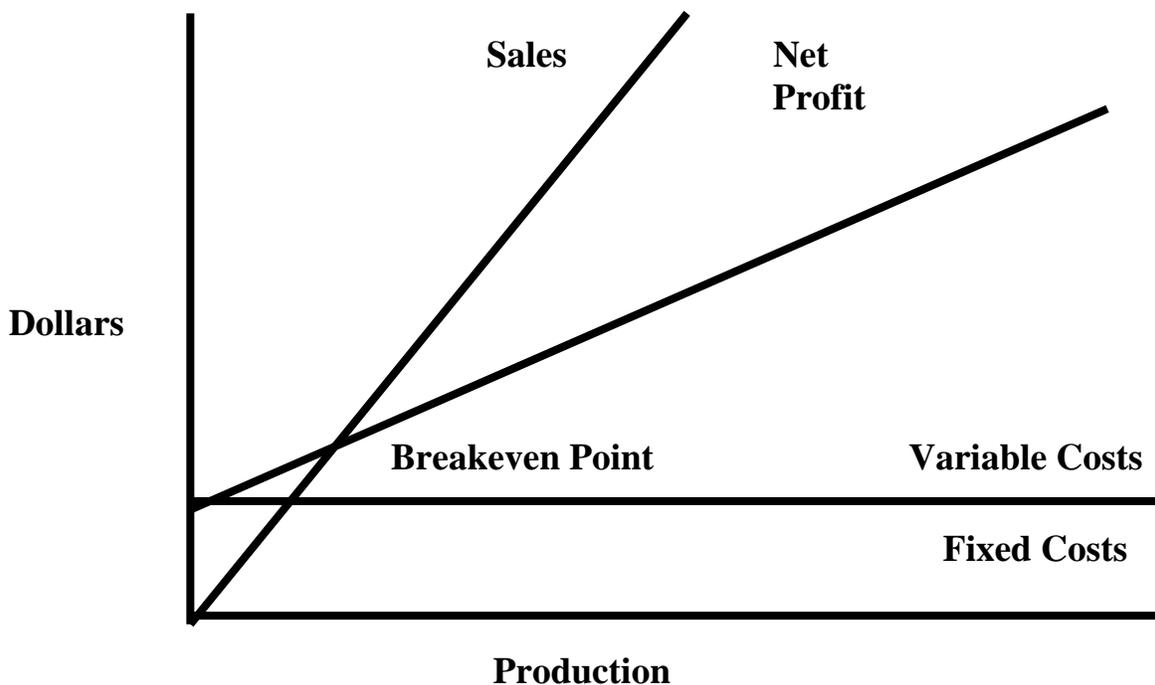


Breakeven Analysis

Breakeven analysis provides useful information when small changes in specific conservation situations are being evaluated. Breakeven techniques are used to calculate the point at which net returns just cover expenses. Breakeven's are easy to calculate. They relate specifically to a single farm, rather than state averages. Most important, breakeven prices reflect the current state of the market rather than long-term generalizations. A breakeven can be diagrammed, as in the graph below:



On the graph the Breakeven Point, where the revenue from sales is equal to the cost of production, is the where net income becomes positive. When analyzing the breakeven it is important to look at variable cost such as seed, labor and other inputs into production and fixed cost such as land. It is important to note that variable costs and sales change yearly and fixed costs stay relatively the same in each year. Breakeven analysis can be done yearly to show impacts and “what ifs” of conservation practice implementation. By performing a breakeven analysis and then varying the assumptions regarding sales levels and variable and fixed costs, the real factors behind the profit potential (or lack thereof) of a business become more clear.

Key Breakeven Factors

Fixed Costs. These costs remain constant (or nearly so) within the projected range of sales levels. These can include facilities costs, certain general and administrative costs, and interest and depreciation expense.

Variable Costs. These costs vary in proportion to sales levels. They can include direct material and labor costs, the variable part of manufacturing overhead, and transportation and sales commission expenses.

Breakeven analysis helps producers answer questions like: How much can I afford to spend? How long will it take to get my money back? What rate of return will I get? How much net gain do I need to justify spending the money to install the alternative?

Each of the above questions involves solving for an unknown variable, i.e. cost, time, interest rate, and benefits, respectively. Each question can be answered if the other three variables are known. Three of the following four pieces of information must be known in order to solve for the other:

1. Cost – cost of installation and application of the conservation practice (including operation and maintenance),
2. Time – the life span or useful life of the practice,
3. Interest Rate – producer's borrowing rate or rate of return desired,

Benefits – the change in yield or net returns created by conservation.

Breakeven value (benefit) needed to replace an acre of production with another alternative or practice.¹

Example 1

First solve for value of production per acre = income – expenses. Then solve for the portion of that crop in the rotation and sum the values for all crops to get the average value of production per acre. The alternative use needs to have net returns equal to or greater than the current use.

Calculations:

Crop rotation over 3 years is 1 year wheat, 1 year soybean, and 1 year of corn grain (1/3 of time in wheat, 1/3 of the time soybean and 1/3 of time in corn grain).

Wheat = 70 Bu/Acre x \$2.60/bu - \$97.20 operating expense x 1/3 of rotation time
= \$182.00 – \$97.20 x .33 = \$27.95 per acre return

Soybean = 40 Bu/Acre x \$5.00/bu – \$92.76 operating expense x 1/3 of the rotation time
= \$200.00 - \$92.76 x .33 = \$35.39

Corn Grain = 120 Bu/Acre x \$2.10/bu - \$194.83 operating expense x 1/3 of rotation time
= \$252.00 - \$194.83 x .33 = \$18.87

Average per acre value of production is \$27.95 + 35.39 + \$18.87 = \$ 82.21 per year

The Alternative for that acre needs to provide returns or benefits of \$82.21 or more per acre for the producer to profit from the change.

¹ All prices, operating expenses per acre and yields are taken from the Michigan State University AgEcon 2001 Crop and livestock budget estimates.

If the farm were looking at using an acre of land for a wastewater treatment facility, they would be losing the income from that land to install the filter area. They would need to have benefits from the filter greater than the loss of production. For a dairy farm, they might go into a further level of analysis with the details to convert the crop to feed on a dry matter basis to calculate the milk production per acre of land to determine the milk income per acre.

Example 2

Suppose a farm is considering a Riparian Forest Buffer that would take part of a field. The time value of money needs to be considered, so we look at a 7% rate of return over 20 years.

First solve for value of production per acre = income – expenses. Then solve for the portion of that crop in the rotation and sum the values for all crops to get the average value of production per acre. The alternative use needs to have net returns equal to or greater than the current use.

Calculations:

Same as Example 1

Average per acre value of production is $\$27.95 + 35.39 + \$18.87 = \$82.21$ per year

The Alternative for that acre needs to provide returns or benefits of \$82.21 or more per acre for the producer to profit from the change. The present value of an annuity at 7% for 20 years is 10.594, so this factor times the average annual net returns can be used to calculate the total returns needed over the 20 year time frame.

To find the Present Value of an Annuity use the formula
$$= \frac{(1 + I)^n - 1}{I (1 + I)^n}$$

Where I is the rate of interest and n is the number of years.

The present value of an annuity at 7% for 20 years = $\frac{(1 + 0.07)^{20} - 1}{0.07 (1 + 0.07)^{20}} = \frac{2.8697}{0.2709} = 10.594$

$\$82.21$ average annual net return x 10.594 PV of an annuity = \$870.93. If we want to harvest timber off the buffer in year 20 we need a net return (income – expenses for the timber) of \$870.93 or more to make the buffer economically justified.

What breakeven yield do I need?

If operating expenses for corn grain are \$195 / Acre and the corn price is \$2.10 / bushel then $\$195 \div \$2.10 = 93$ bushels per acre breakeven yield. At yields below breakeven, there are net losses and the farmer needs to reduce expenses or look for another alternative use for that land.

For example if yield is 80 bushels / acre then income is $\$2.10 \times 80 = \$168 - \$195$ expenses = \$27 net loss per acre. The forested buffer would save \$27 per acre.

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