

Break-even Pricing, Revenue and Units

For a value-added agricultural business, break-even pricing informs how to price a value-added product. If a product's market-accepted sales price is greater than its break-even price, then the business can feel more confident in the financial feasibility of offering the given product. This publication shows how to determine a value-added agricultural product's break-even price, revenue and unit sales from a cost perspective.

Note, the need to understand your break-even point also applies when producing farm commodities. However, commodity producers are price-takers, not price-makers. Producer-owned, value-added businesses should operate as price-makers. As a result, they can better anticipate a product's sales price and decide whether the difference between the sales price and the break-even price provides an acceptable return for their investment and the risk they assume when producing a product.

Determining the cost of production

Value-added agricultural business owners assess a business' financial potential by computing production costs, establishing an expected sales price based on substitute goods and determining whether they can produce a product for that price.

Typically, value-added businesses incur two types of production costs: variable costs and fixed costs.

- *Variable costs:* These costs change directly in proportion to production volume changes. In other words, a one-unit increase in production would mean a one-unit increase in variable costs. Some examples are costs of direct materials or supplies used to make a product, shipping charges, delivery charges and part-time employee wages.
- *Fixed costs:* These costs don't change in response to production volume changes. In other words, production volumes can increase or decrease, but fixed costs stay the same. Some examples include rent, interest on debt, insurance, equipment, business licenses and full-time employee salaries.

Note, for a business that substantially increases its production output, its variable costs per unit may change if it can purchase larger input volumes and receive quantity discounts. Similarly, if a business substantially increases its production output, then it may require added property or equipment and, therefore, increase its total fixed costs. For illustrative purposes, this publication assumes that variable costs per unit and total fixed costs don't change.

Estimating variable and fixed costs is just one step involved in computing a break-even price. A value-added business must also project the number of units it will sell. Forecasting sales can be tricky, however. Businesses typically overestimate demand. Selling fewer units than expected results in a per-unit cost that's more than expected. When value-added businesses make this error, many producer-owners reduce the salary they earn, and outside income, such as farm income, must subsidize the value-added business. To gauge how production costs per unit would vary in different scenarios, a value-added business may develop a sensitivity analysis table. The table would show the expected break-even price and revenue given varying unit sales, costs or other decision variables. Creating a sensitivity analysis allows the value-added business owner to determine best- and worst-case scenarios.

Estimating a break-even price

A value-added agricultural business operates as a price-maker. It sets a product's price after calculating the product's break-even price. This makes value-added agricultural businesses different from commodity-driven businesses.

In commodity agriculture, the break-even price refers to the per-unit cost of production. As commodity price-takers, farmers develop marketing plans to obtain a price that is higher than their per-unit cost of production. For instance, if a farmer produces 20,000 bushels of corn, then knowing the variable and fixed costs of production easily provides the per-unit cost of production. The producer would sell when revenue potential (market

price plus government subsidies) is more than the per-unit production cost.

Defining your assumptions

The following example for Soy Candles LLC — a fictitious value-added business that uses soybean oil to make candles — shows how to define the break-even point assumptions and calculate a product's break-even price. As a first step, the business estimates its variable and fixed costs. Using the assumptions in Table 1, the per-unit variable cost totals \$1.45. Fixed costs sum to \$42,588.

Table 1. Determining break-even price assumptions for soybean candles made by Soy Candles LLC.

Item	Explanation	
Variable costs per unit		
Soy oil	Candle creation	\$0.25
Wicks	Candle creation	\$0.05
Wax	Candle creation	\$0.15
Jars	Candle packaging	\$0.30
Lids	Candle packaging	\$0.05
Labels	Candle marketing	\$0.10
Boxes	Candle shipping	\$0.45
Miscellaneous		\$0.10
Total variable costs per unit		\$1.45
Total fixed costs		
Insurance	Liability insurance	\$1,000
Advertising	Promotion, web presence, and radio spots	\$4,000
Utilities	Lights, phones, heating, and cooling	\$2,500
Buildings ¹	Principal paid in first year on purchased building where candle production occurs	\$493
Equipment ²	Principal paid in the first year on equipment used in the production of candles	\$1,285
Interest paid ³	Interest payment for first year of operation (\$814 for buildings + \$496 for equipment)	\$1,310
Salary	Owner target salary of \$25,000 annually, plus fringe benefits	\$32,000
Total fixed cost		\$42,588

¹ Based on an initial purchase price of \$22,000 with a 20-year payback period.

² Based on an initial purchase price of \$14,000 with a 7-year payback period.

³ Based on a 20-year loan for buildings and 7-year loan for equipment with 25% down and a 5% interest rate.

Next, the business must project the number of units sold. For this example, Soy Candles LLC projects it will sell 20,000 units next year.

Finding the break-even price

With assumptions in place, use the following equation to calculate the break-even price. For Soy Candles LLC, its break-even price is \$3.58, given the \$1.45 per unit in variable costs, \$42,588 in fixed costs and sales of 20,000 units.

- Variable cost per unit + (Total fixed cost/Projected unit sales)
- \$1.45 + (\$42,588/20,000)
- \$3.58 = break-even price

Table 2 provides a sensitivity analysis. It shows how the break-even price changes for different unit sales projections. If the business projects it will sell 20,000 units, then the break-even price is \$3.58 per candle. Soy Candles LLC can use this information to set a price for its candles. To cover all of its fixed and variable costs, the price per unit would need to be at least \$3.58 if the business sells 20,000 units.

Suppose actual unit sales reach only 18,000 units. In that case, the break-even price should have been \$3.82 to cover all variable and fixed costs. If Soy Candles LLC sold 18,000 candles at \$3.58 per unit instead of \$3.82 per unit, then its revenue would decline by \$4,320 (18,000 units x \$0.24 per unit). The sensitivity analysis illustrates that even small differences between expected unit sales and actual unit sales cause notable changes in the break-even price.

Table 2. Sensitivity of break-even price to changes in annual projected unit sales.

Projected unit sales	18,000	19,000	20,000	21,000	22,000
Variable cost per unit	\$1.45	\$1.45	\$1.45	\$1.45	\$1.45
Total fixed cost	\$42,588	\$42,588	\$42,588	\$42,588	\$42,588
Fixed cost per unit	\$2.37	\$2.24	\$2.13	\$2.03	\$1.94
Break-even price	\$3.82	\$3.69	\$3.58	\$3.48	\$3.39

Using break-even price to set a product's price

After a business projects a product's break-even price, it must set a markup pricing strategy. The price premium added to a break-even price depends on end-user demand and the business' profit goals. To identify an appropriate sales price, a value-added agricultural business should conduct market research and assess the prices of substitute goods. Once a producer-owner has projected a sales price, he or she can determine break-even revenue and units.

Projecting break-even revenue

Break-even revenue equals the amount of revenue a business needs to earn so it neither makes nor losses money. To compute break-even revenue, a value-added agricultural business must know its product's selling price and variable and fixed costs.

The following example assumes Soy Candles LLC sells 20,000 soybean candles, and it assumes the variable cost per unit totals \$1.45, fixed costs sum to \$42,588 and the selling price per unit equals \$5.

- Fixed costs/[1 - (Variable cost per unit/Selling price per unit)]
- \$42,588/[1 - (\$1.45/\$5)]
- \$59,983

Soy Candles LLC must annually earn \$59,983 in revenue to break even. The sensitivity analysis in Table 3 shares how break-even revenue changes given alternative sales prices.

Table 3. Sensitivity of break-even revenue to changes in sales price.

Projected selling price	\$4.50	\$4.75	\$5.00	\$5.25	\$5.50
Variable cost per unit	\$1.45	\$1.45	\$1.45	\$1.45	\$1.45
Total fixed cost	\$42,588	\$42,588	\$42,588	\$42,588	\$42,588
Break-even revenue	\$62,835	\$61,301	\$59,983	\$58,839	\$57,836

Forecasting break-even sales units

To determine the number of units a business must sell to neither make nor lose money, it can calculate break-even sales. Break-even sales considers a product's sales price and its variable and fixed costs. Again, collecting information about the price of substitute goods can help businesses choose an appropriate sales price.

For soybean candles made by Soy Candles LLC, suppose the variable cost per unit is \$1.45, fixed costs sum to \$42,588 and the selling price per unit is \$5. Applying this information to the following formula will project break-even sales units. Given these assumptions, Soy Candles LLC would need to sell 11,997 units annually to break even.

- Fixed costs/(Selling price per unit - Variable cost per unit)
- \$42,588/(\$5 - \$1.45)
- 11,997

For alternative sales prices, Table 4 shows a sensitivity table for break-even units. If Soy Candles LLC increases the sales price to \$5.50 per unit, then it would need to sell 10,516 units per year to break even. If it were to discount the candle unit sales price to \$4.50 each, then it would need to sell 13,963 units to break even.

Table 4. Sensitivity of break-even sales units to changes in selling price.

Projected selling price	\$4.50	\$4.75	\$5.00	\$5.25	\$5.50
Variable cost per unit	\$1.45	\$1.45	\$1.45	\$1.45	\$1.45
Total fixed cost	\$42,589	\$42,589	\$42,589	\$42,589	\$42,589
Break-even units	13,963	12,905	11,997	11,207	10,516

Keys to break-even estimations

To establish break-even revenue, units sold and price, a value-added agricultural business must know its production costs. Knowing your break-even price and realistically projecting your costs, sales price and unit sales will help your value-added agricultural business operate profitably.

Producer-owned, value-added businesses face a unique challenge in that the producers must manage and operate two businesses: the farm business and the value-added business. Thus, they may not easily be able to allocate costs between the farm and the value-added business. Ideally, charge market prices, not the cost of production, for all inputs the value-added business uses. Careful management and financial planning will ensure the long-term success of both businesses.

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