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Understanding budgets and the budgeting process

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As a business owner, the primary problem you face is a limited supply of resources — land, labor, and capital available to accomplish your goals. Allocating these scarce resources entails making many decisions. Specific decisions might include: What should I grow this year? How much fertilizer should I apply? Should I replace my worn-out tractor? Should I expand by purchasing or renting additional land? The answers to these questions could influence the profitability of your operation for years to come.

Regardless of the scope of the issue being considered, you must sit down with pencil and paper and analyze the question. Budgeting does just that; budgeting coordinates resources, production, and expenditures. It is implementing a business on paper before any resources are committed to production; it helps you predict the consequences of an adjustment in your operation before ever making the adjustment. While farm records serve as a record of the past, budgets are an anticipation of the future. After budgets are done, they become a standard for monitoring what actually happens in the operation.

The usefulness of a budget depends on the reliability of the information used to create the budget. Unrealistic estimates of prices, yields, or input quantities would lessen the accuracy of the budget and could possibly lead to a faulty decision. Sound management decisions can be made using budgets, but care must be exercised in using only reliable information.

Types of budgets

There are four types of budgets that will be discussed here, each playing a different role in decision making. The budgets most commonly used by agricultural producers are whole farm, partial, cash flow, and enterprise.

Whole farm budget

This budget is a summary of expected income, expenses, and profit for the entire farm; it measures the physical and financial aspects of the whole farm. Its uses include comparing profitability of several farm plans; determining income potential, debt repayment capacity and value of the farm or ranch; providing lenders and others with a detailed farm plan for the next year; and helping the operator analyze major adjustments in the farm operation.

Partial budget

In contrast to the whole farm budget, the partial budget measures only returns and expenses that result from an adjustment in the farm plan. Those aspects of the farm plan not affected by the adjustment are left alone in the partial budget analysis. Ignoring the constant factors in the overall operation of your business simplifies the analysis greatly. You might use the partial budget to help decide what crop to grow on a small amount of acreage. The partial budget could also help you decide whether or not to buy or custom-hire machinery for harvest. The partial budget is far quicker and easier to construct than a whole farm budget because it measures only a change in the farm plan.

Cash flow budget

This budget is a projection of cash receipts and expenses for the total business spread over some future time period, usually 12 months. The purpose of this budget is to determine if available cash and expected receipts will be sufficient to meet projected disbursements. If projected disbursements exceed cash available, then borrowed funds will be necessary to meet these future demands. The cash flow budget is needed in negotiating a line of operating credit with your banker.

Enterprise budget

The last budget, the enterprise budget, is an estimation of all revenues and expenses for a farm or ranch enterprise during one cycle of production. The enterprise budget is usually developed on a per-acre or per-head basis to allow comparisons among alternative enterprises. This budget can be used to compare the profitability of alternative enterprises, assist in development of a marketing plan, negotiate with the sources of credit, and plan adjustments to the operation. The enterprise budget also provides base information to construct the whole farm, partial and cash flow budgets. The enterprise budget will be discussed in greater detail in the following sections because of its importance in creating other budgets.

Developing an enterprise budget

The University of Idaho Cooperative Extension System publishes enterprise budgets for the major crops and livestock produced in Idaho. These budgets are based on production and input data collected from Idaho farmers and ranchers and information from Extension agents, Extension specialists, and others familiar with commodity production.

The apple budget in Table 1, one of many crop budgets published by the University of Idaho College of Agriculture, shows how an enterprise budget should look. Costs in these budgets are categorized as fixed and variable costs. Variable costs are those items that occur annually and vary with different levels of production, such as fertilizer, chemicals, seed, and hired labor. Fixed costs, often referred to as ownership costs, remain the same regardless of the level of production. Once machinery and buildings are acquired, the costs associated with these items are incurred even if production stops. Machinery and buildings depreciate, taxes and insurance are still due, and interest on capital borrowed to purchase these assets must still be paid. These costs normally do not vary in one year or less.

Preparing an enterprise budget can be a formidable task because of the amount of information needed. A good set of farm records can make the task much easier. If records are not available, enterprise budgets can be obtained from most county Extension offices and modified to fit your situation. Costs of production will differ from one operation to another, so existing budgets should be used only as guidelines.

If you develop an enterprise budget from scratch, it is important to sit down and "pencil out" a schedule of what happens from the beginning of the production process to the end. It's very important to note the timing and number of operations, quantities of inputs applied, and estimates of machinery use devoted to the enterprise. Do this for each enterprise.

Variable costs

After a schedule or outline has been developed, it's time to quantify and categorize the costs. To estimate a variable cost, simply multiply the projected quantity of each variable input (fertilizer, chemicals, seed, etc.) by the anticipated price per unit. For example, Table 1 shows that 30 pounds of nitrogen will be applied to each acre of apples during the production year. This translates into \$7.50 per acre (30 lb x \$.25/lb).

Other variable costs include fuel, lubricants, and repair costs on machinery. These costs are not traditionally divided among crop enterprises, but are totalled at the end of the year for income tax reasons. These year-end totals can be allocated among enterprises. The trick is to estimate what percentage of your total machinery use is required for each crop enterprise. For example, if your tractor is used 400 hours each year and 100 of those hours pertain to the apple enterprise, then 25 percent of the tractor fuel, repairs, and lube costs should be allocated to the apple enterprise. For tillage equipment, hours of annual use may not be available, so times over the field would be another way of allocating use. If a piece of equipment is used solely for one enterprise, then 100 percent of the costs should be charged to that enterprise.

If you do not have a set of farm records containing repair and fuel costs, ask your local Extension agent for a copy of *The Costs of Owning and Operating Farm Machinery in the Pacific Northwest*, PNW 346, (or write Agricultural Publications, Idaho Street, University of Idaho, Moscow, Idaho 83843-4196). Some states also have worksheets or computer programs designed to help estimate these costs. Idaho has the *Enterprise Budget Worksheet* program and *Machine Cost* for MS/PC DOS operating systems.

Another important variable cost is interest on operating capital. An easy way to approximate this is to sum all variable cash expenses for one production period. The total, assuming this is the amount to be borrowed, is divided by the proportion of the year the funds are borrowed, then multiplied by the prevailing interest rate. Dividing total capital required by two would imply that the capital to cover cash variable costs is borrowed, or averaged, for one half of the year. Dividing by four would imply that the capital is borrowed for one-fourth of the year.

Be sure all hired labor is included under variable costs. Even though some of the labor is owner-supplied and doesn't involve a direct cash outlay, it should still be accounted for in the budgeting process.

Fixed costs

Fixed or ownership costs cover depreciation, interest on investment, taxes, and insurance expenses on capital items such as machinery, livestock, buildings, and land. Machinery and buildings lose value due to age, use, and obsolescence, and this loss is known as

depreciation. Annual depreciation can be calculated by using the following equation:

$$\frac{\text{Purchase price} - \text{salvage value}}{\text{useful life (yrs)}}$$

Annual interest on machinery investment takes into account the interest paid on borrowed capital or the opportunity cost of the owner's money invested in machinery. Opportunity cost can be defined as the value of an input (in this case, capital) in its most profitable alternative use. It can be calculated by multiplying the interest rate for investment capital by the average investment in a piece of machinery. Average investment can be calculated using the following equation:

$$\frac{\text{Purchase price} + \text{salvage value}}{2}$$

For property taxes, use the statement from the assessor or estimate using the tax rate multiplied by the estimated value of the machinery. Insurance costs can be obtained from your agent or calculated by multiplying the insurance rate (typically 0.4 to 1.5 percent, although some items can be much higher) times the market value of the machinery or equipment.

Fixed costs (depreciation, interest, taxes, and insurance) should be estimated for all machinery and buildings in use in your business, then totaled and allocated to the appropriate enterprises. For example, if 20 percent of the tractor's annual use is devoted to the apple enterprise, and annual fixed costs (depreciation, interest, taxes, and insurance) on the tractor are \$2,000 per year, then \$400 ($0.2 \times \$2,000$) should be allocated to the apple enterprise. Once fixed costs for all capital items have been allocated to appropriate enterprises in this way, then fixed costs per enterprise can be summed and divided by the number of acres in the enterprise to determine total fixed costs per acre as shown in Table 1.

An appropriate land charge should also be included as a fixed cost in the budget. If you rent the land you farm, then it would be appropriate to include the cost of the lease in your budget. If you own the land, then a charge should be included for interest on the capital invested in the land and for property taxes. The interest rate should reflect the rate that could be earned in the next best alternative. If the best alternative is putting the capital in a savings account, then the interest rate that could be earned on savings should be multiplied by the value of the land to estimate an interest cost. In this case, where land is owned, the interest charge is an opportunity cost.

Establishment costs

During the years it takes to establish a perennial crop, there are usually few or no receipts to offset your initial start-up costs. Therefore, it is necessary to prorate or amortize those costs over the full production years. In the apple budget (Table 1), it was assumed full production lasts for 25 years. The initial cost of establishing the apple crop and interest on

those costs over the establishment years (\$6,000 per acre) could be viewed as a loan to be paid back over the 25 production years. In this case, the annual installment is \$661 per year (\$6,000 amortized at 10 percent for 25 years) and is listed as a fixed cost in the budget.

Budget interpretations

The enterprise budget for apples in Table 1 shows a return above all costs of \$164.90 per acre. Although this return is positive, it may not be the maximum profit possible from an acre of apples. This enterprise budget simply represents one point on the production curve. There are many different combinations of inputs that will produce a given enterprise, some more or less profitable than others. The point is that each combination reflects a point on the production curve, not necessarily the most profitable point.

The \$164.90 per acre net return shown in Table 1 is often referred to as profit and can be compared to the estimated profit per acre for alternative crops. It can also be used to select the most profitable crops and/or crop combinations to grow.

A zero profit for an enterprise does not imply that the enterprise is a losing proposition. It must not be forgotten that a properly constructed budget like the one in Table 1 accounts for all production costs, including opportunity costs. Note that charges are included for all purchased variable inputs, all labor whether hired or owner-supplied, all capital whether borrowed or owner-supplied, and land whether rented or owned. Charges on all owner-supplied labor, capital, and land are opportunity costs.

The point to be made here is that even given a zero net return or profit on an enterprise, the operator would still be earning a return on his equity invested in land, labor, and capital to produce that enterprise. The only costs not included in the apple budget that are difficult to quantify are risk and management. Therefore, the net return or profit of \$164.90 per acre in the apple budget should be considered a return to risk and management.

Using the enterprise budget

The enterprise budget is an invaluable tool that provides a wealth of information to you as a business manager. Its uses, as mentioned earlier, include negotiating with the banker for capital financing, determining enterprise profitability, monitoring actual costs of production, and providing information for a marketing plan.

Marketing is an area many farmers pay far too little attention to. Market risks are a result of the variability and unpredictability of the prices farmers receive for their products and pay for their production inputs. Fluctuating supply and demand and market conditions result in price variations. The questions you

should be asking yourself are: What selling price per unit and/or yield do I need for my commodity to at least cover my costs of production? And what is the probability of obtaining that price or yield? Breakeven and sensitivity analysis are two steps that can be used to address these questions.

Breakeven analysis

Breakeven analysis is a process managers use to estimate price or yield levels necessary to recover costs of production. Calculating breakeven price or yield levels requires access to reliable enterprise budgets such as the apple budget in Table 1.

Breakeven price (Bep) can be calculated as follows:

$$\text{Bep} = \text{total costs} \div \text{expected yield.}$$

The following results were computed by substituting the appropriate information from the apple budget in Table 1 into the preceding breakeven formula.

$$\text{Bep} = \$3,235.10 \div 40 \text{ bins/acre} = \$80.88.$$

The results show, with an expected yield of 40 bins per acre, that it would take a selling price of \$80.88 per bin to exactly pay for the costs of producing the apples. The price necessary to cover variable costs (Bepv) can also be calculated simply by substituting total variable costs in place of total costs in the formula.

$$\text{Bepv} = \$1,998.10 \div 40 \text{ bins/acre} = \$49.95.$$

It would take a selling price of \$49.95 per bin to exactly pay for the variable costs of producing the apples. Inserting fixed costs into the equation reveals a breakeven price of \$30.93 per bin to cover these costs.

Breakeven information is helpful in making marketing and production decisions. If a contract is offered to the apple grower at the beginning of the year for \$90.00 per bin, he could expect a net return of \$9.12 per bin or \$364.80 per acre. This return, no matter how high, is only as reliable as the cost and yield estimates presented in the enterprise budget. If these estimates are based on current input prices and historic yield data, then the contract proposal would appear to be a profitable offer. If an offer of \$78.00 per bin is made, the grower would realize a net loss of -\$2.88 per bin or -\$115.20 per acre.

Breakeven yields can also be estimated. Yield analysis is especially useful if a crop is contracted at a certain price, and you want to determine the quantity you need to produce to cover your costs. Breakeven quantity (Beq) can be calculated as follows:

$$\text{Beq} = \text{total costs} \div \text{contract price.}$$

Breakeven quantity to cover variable and fixed costs

can be determined simply by substituting variable or fixed costs for total costs in the equation.

Sensitivity analysis

Neither commodity prices nor yields seldom stay the same from month to month and year to year; input prices also vary. What impact does variation in yield and price have on the profitability of an enterprise?

One way to measure the sensitivity of an enterprise to price and yield variations is to take your enterprise budget and calculate returns above costs at different prices and yields. Use the price and yields you think are likely, then look at some price and yield combinations that are both hopeful and pessimistic. Table 2 shows how sensitive net returns for apples are to different price and yield combinations.

Since both yield and output prices in an enterprise budget are estimated rather than actual values, breakeven and sensitivity analysis can aid you in your farm decision-making process. By exploring breakeven prices and various price/quantity combinations, you form your own expectations about the probability of obtaining a price and yield combination that would just cover your total costs of production.

Conclusion

Without the support of budgets, decision making is a guessing game. Whole farm, partial, cash flow, and enterprise budgets all play a distinct role in sound management.

For further reading

- MS 101 1991-92 Northern Idaho Crop Enterprise Budgets (35 cents)
- MS 102 1991-92 Southwestern Idaho Crop Enterprise Budgets (35 cents)
- MS 103 1991-92 Southcentral Idaho Crop Enterprise Budgets (35 cents)
- MS 104 1991-92 Southeastern Idaho Crop Enterprise Budgets (35 cents)
- PNW 346 Costs of Owning and Operating Farm Machinery in the Pacific Northwest (\$2.75)

To order copies of this or the above University of Idaho College of Agriculture publications, contact the University of Idaho Cooperative Extension System office in your county or write to Agricultural Publications, Idaho Street, University of Idaho, Moscow, Idaho 83843-4196 or call (208) 882-7982. Idaho residents add 5 percent sales tax.

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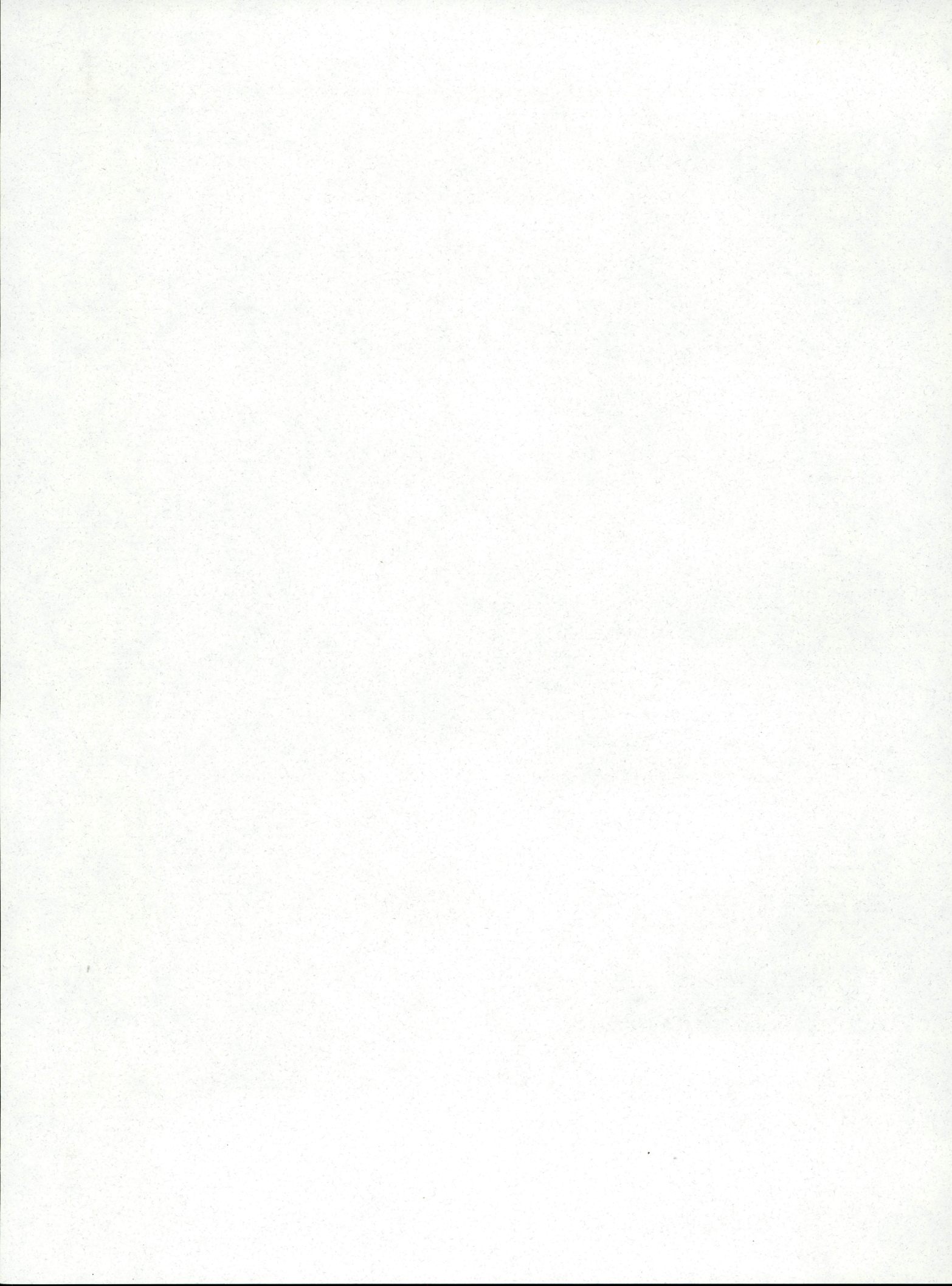
Table 1. 1990 estimated costs of producing red delicious apples in southwestern Idaho.

	Unit	Price or cost/unit (\$)	Quantity per acre	Value or cost/acre (\$)	Your value
Gross receipts from production	bins	85.00	40.00	3,400.00	_____
Total receipts				3,400.00	_____
Variable costs					
Tree replacement	tree	7.00	1.00	7.00	_____
Fertilizer:					
Nitrogen	lb	.25	30.00	7.50	_____
Phosphorus	lb	.19	20.00	3.80	_____
Potash	lb	.13	20.00	2.60	_____
Zinc	lb	1.00	8.00	8.00	_____
Other nutrients	acre	22.00	1.00	22.00	_____
Hive rental	hive	10.00	1.00	10.00	_____
Insecticides, fungicides, etc.	acre	136.57	1.00	136.57	_____
Water assessment	acre	47.50	1.00	47.50	_____
Strip maintenance (herbicide)	acre	18.00	1.00	18.00	_____
Bin rental	acre	26.68	1.00	26.68	_____
Rodent control	acre	5.00	1.00	5.00	_____
Labor:					
Pruning and training labor	hr	5.00	62.22	311.10	_____
Hand thinning labor	hr	5.00	54.92	274.60	_____
Irrigation labor	hr	5.00	14.42	72.10	_____
Harvest labor	hr	5.00	110.23	551.15	_____
Other labor	hr	5.00	11.68	58.40	_____
Crop insurance	acre	138.50	1.00	138.50	_____
Machinery	acre	140.85	1.00	140.85	_____
Tractor repair	acre	14.37	1.00	14.37	_____
Tractor/fuel/lube	acre	59.39	1.00	59.39	_____
Overhead	acre	50.00	1.00	50.00	_____
Interest on operating capital		275.00	.12	33.00	_____
Total variable costs				1,998.10	_____
Fixed costs					
Cash costs					
Machinery and equipment insurance	acre	7.44	1.00	7.44	_____
Property insurance, etc.	acre	32.00	1.00	32.00	_____
Personal property and real estate taxes	acre	18.00	1.00	18.00	_____
Noncash costs					
Machinery and equipment depreciation, interest, housing	acre	259.85	1.00	259.85	_____
Pickups, trucks depreciation, interest, housing	acre	108.70	1.00	108.70	_____
Land interest charge	acre	150.00	1.00	150.00	_____
Prorated establishment costs ¹	acre	661.00	1.00	661.00	_____
Total fixed costs				1,237.00	_____
Total costs				3,235.10	_____
Returns to risk and management (gross receipts – total costs)				164.90	_____
Breakeven price per bin, total variable cost:				\$49.95	
Breakeven price per bin, total cost:				\$80.88	

¹Establishment costs are amortized at 10% for 25 years.

Table 2. Sensitivity analysis.

Yield bins/acre	Price of apples \$/bin		
	76.50	85.00	93.50
	Per acre return over variable costs (\$)		
34	602.89	891.89	1,180.89
40	1,061.89	1,401.89	1,741.89
46	1,520.89	1,911.89	2,302.89
	Per acre return over all costs		
34	-634.10	-345.10	-56.10
40	-175.10	164.90	504.90
46	283.90	674.90	1,065.90



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