

# Partial Budgeting as a Dairy Consultation Tool

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## Abstract

The objectives of this presentation will be to define partial budgeting and to demonstrate its use in dairy health management decision making. Strained profit margins, trends toward increasing herd size, and volatile milk prices have led to an increased emphasis on the economics of dairy health management, and increased opportunities to provide dairy production medicine services. Management recommendations with major economic consequences should be based on a thorough understanding of the farm's business plan, the farm's current financial status, and the expected impact of suggested management changes. Partial budgets are a useful tool for evaluating the expected financial impact of proposed changes in management, but they should only be used in light of the farm's mission, goals, and objectives. In addition, familiarity with the farm's current financial situation (as can be achieved through evaluation of the net worth statement, income statement, and cash flow analysis) is critical. From that point, partial budgets can be constructed to estimate the net changes in revenues and expenses that are expected to result from potential management changes. Partial budgets project changes in profitability in a relatively straightforward approach that facilitates comparison of alternative resource uses. Sensitivity analysis is always recommended to evaluate the importance of biological and price/quantity assumptions, and is enhanced through computerization. Without exception, results from partial budgeting exercises should be interpreted in light of decision maker objectives, in addition to cash flow, net worth, and profitability issues. In that regard, partial budgets offer the dairy practitioner a useful approach for identifying management opportunities, and for prioritizing management efforts. Examples will be presented.

## Introduction

Strained profit margins, trends toward increasing herd size, and volatile milk prices have led to increased emphasis on the economics of dairy health management, and increased opportunities to provide dairy production medicine services (Hady and Lloyd, 1992 a,b). In a competitive market where innovative producers reap the benefits of new technology, progressive health management is critical to maintain productivity, enhance efficiency, manage risk, and yield a high quality product. Management recommendations with major economic consequences should be based on a thorough understanding of the farm's business plan, current financial status, and current productivity. From this foundation,

the expected impact of suggested management changes can be fully evaluated.

Partial budgets are a useful tool for evaluating the expected financial impact of proposed changes in management (Harsh *et al*, 1981), but they should only be used in light of the farm's business plan, including mission, goals, and objectives (Hady and Lloyd, 1993; Toombs *et al*, 1993b). In addition, familiarity with the farm's current financial situation and production efficiency is critical (Toombs *et al*, 1993a). This information can be achieved through evaluation of the current net worth statement, income statement, cash flow analysis, and production records. From that point, partial budgets can be constructed to estimate the net changes in revenues and expenses that are expected to result from potential management changes. The objective of this paper is to define the partial budgeting technique and to demonstrate its use in dairy health management decision making.

## Preparation for Partial Budgeting

Veterinarians develop and recommend health management programs for dairy producers, but dairy farm managers are responsible for implementation and, therefore, determine program success or failure. For this reason, the initial step in economic analysis of dairy health management must be to define the producer's goals and objectives (Hady and Lloyd, 1993). Beyond this starting point, the current health of the farm business is also important. Financing the suggested health management programs with either debt or equity must be possible, so the current balance sheet should be reviewed. Key indices such as the current and debt-to-asset ratios provide useful indicators of the farm's liquidity and solvency.

In addition to the farm's current financial position, sustained profitability is important and can be assessed from the income statement (Toombs *et al*, 1993a), where ratios that indicate financial efficiency are critical. Also, existing variable and fixed cost structures and historical patterns of revenue generation provide the best source of information to use as a basis for predicting changes in

profitability.

Even if a proposed change can be financed and is expected to improve profitability, resulting cash revenues may not be realized until a considerable time lag has elapsed since the initial cash required for implementation, and a thorough cash flow analysis becomes crucial. This is especially true for farms that may have an accelerated debt amortization or those that are increasing herd size.

Finally, economic analysis of dairy health management programs is impossible without a solid understanding of current productivity and production efficiency; in other words, "It's not possible to know where you're going if you don't know where you are now." The evaluation of production efficiency should provide a comprehensive integration of biological and financial analyses, and for the dairy farm business it should include calculation of milk per cow, debt per cow, and milk per worker.

### Partial Budgeting

Partial budgets project changes in profitability in a relatively straightforward approach that facilitates comparison of alternative resource uses (Harsh et al, 1981 and Eleveld, 1989). Once a proposed management change is defined, the partial budget is used to assess the potential impact of the change on profitability. Projected increases and decreases in revenues and expenses are systematically estimated, and the net expected result is calculated (Figure 1). The analysis is static, assumes perfect information, and covers a single time period (usually one year).

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#### PARTIAL BUDGET COMPONENTS

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(1) INCREASED REVENUES

(2) DECREASED EXPENSES

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(3) DECREASED REVENUES

(4) INCREASED EXPENSES

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$$[(1)+(2)] - [(3)+(4)] =$$

Net Expected Change in Annual Profitability

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**Figure 1.** Structure for partial budget analysis

Partial budgeting for dairy health management appears quite commonly in the literature. For example, the approach has been applied, either alone or in combination with decision analysis, to reproduction (Hady, 1992; Lafi *et al*, 1992; Fetrow and Blanchard, 1987; Williamson, 1986), udder health (DeGraves and Fetrow, 1991; Fetrow and Anderson, 1987), internal parasitism (Brown, 1990), displaced abomasum (Ruegg and Carpenter, 1989), and nutritional programs (Galligan, 1991). Other examples are also likely to exist.

When constructing partial budgets for dairy health management, it is necessary to first succinctly define the proposed change in health management as a viable solution to an identified problem. Then, the changes in production that are expected to result from the proposed management change must be predicted. Obviously, the process cannot even be initiated without a solid foundation in clinical science. Further, the quality of the information obtained from the budgeting exercise is directly related to the quality of these fundamental predictions. Useful results cannot be expected if the analysis is based on faulty biological and/or clinical assumptions.

Ideally, partial budgets should be built using farm-specific data, and prediction of revenues and expenses requires price and quantity information for both outputs and inputs. Useful sources to consider for obtaining this information include a recent income statement and current production records. Key variables to consider include specific disease rates, milk production levels, culling rates, feed costs, labor costs, heifer rearing costs, and heifer mortality. Other data may also be necessary, depending on the problem being analyzed. In the absence of complete farm-specific data, published reports offer a useful starting point (Nott *et al*, 1992). However, these values generally require farm-specific modifications.

Sometimes health problems are identified whose solutions require multiperiod capital investments. For example, a heifer morbidity and mortality problem might be solved by construction of a new heifer barn. To appropriately analyze this type of question requires capital budgeting techniques and includes considerations for the time value of money and income taxes (Harsh *et al*, 1981). As a prelude to capital budgeting, however, the partial budget can provide useful information if the one-year analysis is conducted without including any cost estimate for the capital investment. The result of this analysis is interpreted as an annual "maximum bid" for correcting this particular health problem, rather than a projection for changed profitability. The "maximum bid" provides an initial guideline for the greatest amount a producer should be willing to pay per year to remedy the problem identified. However, the partial budgeting exercise must be recognized as a

broad-brush, ballpark estimate in this case because income tax implications and net present values are not included.

Other potential limitations of partial budgeting must also be recognized. Because the technique only considers budgetary items that change, it is possible to omit important factors from the analysis based either on a faulty, no-change assumption or on simple oversight. Pertinent examples include failure to change marketing costs (which are incurred on a per-hundredweight basis for milk shipped) or accompanying feed costs when predicting changes in milk production, and failure to change labor expenses (according to opportunity cost of unpaid labor) when an increase or decrease occurs in the labor requirement. In addition, it is often difficult to place a reasonable monetary value on all factors that are expected to change. For example, it is not easy to estimate the monetary value associated with decreasing forced culling and concurrently increasing the capacity for discretionary culling. Such factors are often categorized as "intangibles," and can be used to sway interpretation of borderline partial budgeting results.

Based on the assumption of perfect information, sensitivity analysis is always recommended with partial budgeting to evaluate the importance of biological, price, and quantity assumptions. This process involves repeating the analysis over a range of possible values for variables of interest, and is enhanced through computerization. At a minimum, the analysis should be repeated using the lowest possible, most likely, and highest possible values for feed costs, milk price, milk quantity, and/or other scenario-specific variables of interest.

### Application of Partial Budgeting Results

Without exception, results from partial budgeting exercises should be viewed as estimates, and greater emphasis should be placed on the order of magnitude for expected profitability changes than on specific dollar amounts. Successful use of partial budgeting results requires a return to the farm's big picture: producer goals and objectives; net worth statement; income statement; cash flow analysis; and current productivity. Before recommending a management change based on partial budget results, the following questions need to be answered:

1. Will this management change help the producer make progress on the business plan? Are other changes possible that would help make even greater progress?
2. Can this management change be financed with either equity or debt, and how will it ultimately affect the farm's net worth?
3. How certain is the expected change in profitability,

- and what is the producer's attitude toward risk?
4. How will this management change impact the farm's cash flow?
5. Will the farm's current production efficiency be increased, decreased, or unaffected by the proposed change?

Honest answers to these questions will determine the final success or failure of a recommended management change. Decision analysis techniques should be employed to choose between alternatives with uncertain outcomes (Anderson *et al*, 1985).

### Case Example

A mid-Michigan dairy producer's business plan included the objectives of improving milk quality and increasing profitability. Consequently, this producer was interested in the possibility of switching from two to three times-a-day milking. The business was fundamentally sound with regard to debt load, profitability, and cash flow, but the producer was looking for ways to improve.

Herd size was 115 cows, RHA was 19,000 lbs., SCC was 300,000, milk price was \$13.00/cwt., and average feed costs for lactating cows were \$4.00/head/day. Total daily milking time was two hours for two people (four person-hours), and these individuals earned \$10.50 and \$7.50 per hour, respectively. Milking supplies (towels, teat dip, and sanitizer) cost \$8.53 per day; inflations cost \$537 per year; and the annual utility bill was \$9,329.

To perform the partial budgeting exercise, the following assumptions were made: 1) milk production would increase by 12%; 2) daily labor requirement for milking would increase to five person-hours (split evenly); 3) expenses for supplies and inflations would increase by 50%; 4) cost of utilities would increase by 5%; 5) feed costs for the lactating cows would increase by 12%; 6) increased frequency of milking would decrease SCC to 150,000 and result in \$0.15/cwt. premium; and 7) cows would maintain current levels of reproductive performance. The results of the initial partial budget are shown in Table 1.

Sensitivity analysis indicated that the net expected increase in profitability would be only \$8352 per year if the \$0.15/cwt. premium was not obtained. Also, if milk production and feed costs only increased by 8% each, the net expected increase in profitability would be only \$7,246 per year. However, if milk production increased by 12% while feed costs increased by only 8%, the net increase would be \$18,739. Finally, if reproductive failure followed the management change (as might happen if nutrition was not adequately managed for three times-a-day milking), the partial budget projected a decrease in profitability from current levels.

Labor was available in sufficient quantities and better management opportunities were not identified, so this farm implemented the change. Though specific follow-up data are not available, the producer is pleased with the new management scheme and its impact on profits.

Table 1. Partial budget results for switching to three times-a-day milking, Case Farm #1

A. Increased Revenues	
Milk	\$37,757
B. Decreased Expenses	
None	0
C. Decreased Revenues	
None	0
D. Increased Expenses	
Labor	3,285
Feed	20,148
Supplies and utilities	2,301
Net Annual Expected Change	\$12,023

### Summary

The example illustrates the partial budgeting technique and its data requirements. Though this example focussed on one relatively small part of the dairy farm business, broader analyses are also possible. Often, partial budgeting is useful for identifying and ranking opportunities across the entire dairy enterprise. As mentioned previously, results should always be interpreted in light of decision maker objectives, in addition to cash flow, net worth, profitability, and productivity issues. In that regard, partial budgets offer the dairy practitioner a useful approach for identifying management opportunities, and for prioritizing management efforts.

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