Staff Paper

Notes on an Analytical Framework for Enterprise Budgets in Financial and Economic Analysis

by
Eric W. Crawford

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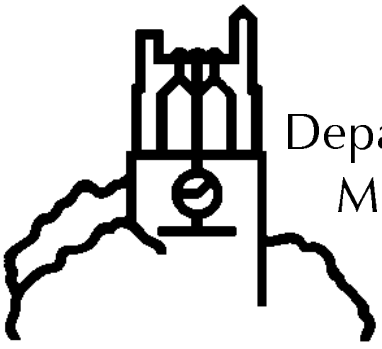

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Abstract

This paper presents brief notes on the format and use of budgets in both financial and economic analysis. The main emphasis in on enterprise budgets, with some mention of capital budgets. Alternative measures of profitability are defined and compared. Methods of estimating opportunity costs are briefly discussed.

14 pages

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Background and Acknowledgments

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Types of Budgets

The most common types of budgets are:

1. Enterprise budgets, which show costs and returns for a given production activity on a per-unit basis (e.g., per hectare).
2. Whole-farm budgets, which show costs and returns for an entire farm.
3. Partial budgets, which show the net gain (loss) resulting from a change in production activity, e.g., from the current crop or technology to a new one.
4. Capital budgets, which show the multiple-year costs and returns associated with an investment.

The focus in these notes is on **enterprise budgets**, which are used to determine whether a given production activity is desirable, or to compare the desirability of two or more enterprises. "Desirability" may be equated to "profitability," but as noted below other issues should also be considered.

Enterprise analysis can involve several elements:

1. A profitability calculation.
2. An assessment of the feasibility of the enterprise, in terms of resource requirements relative to the land, labor, and capital available to the farmer.
3. An assessment of other pros and cons of the enterprise that aren't captured in the budget, e.g., management complexity, risk, reliance on borrowed capital, cash flow problems, etc.

Enterprise budgets can be prepared using either financial or economic prices. As explained below, financial and economic analysis are used to answer somewhat different questions.

Financial analysis

The purpose of financial analysis is to assess the attractiveness of an enterprise to farmers. The budget is therefore calculated using market prices (prices paid or received by farmers). In-kind inputs and outputs should be included as well as those that are bought and sold in the market.

In-kind inputs or outputs that are consumed or used on the farm are generally valued using farm-gate purchase or sale equivalents based on market prices adjusted for transport and handling costs. The value of output can either be calculated based on a direct estimate of total output, or constructed for a given production period by adding sales, on-farm

use/consumption, and changes in inventory. The latter method requires hard-to-get data on inventory changes.

Conventional definitions of profitability or "bottom line" in an enterprise budget are:

1. Gross margin = value of output minus variable costs (seed, fertilizer and chemicals, hired labor, equipment maintenance and repairs, interest on short-term loans, etc.)
2. Net margin = value of output minus both variable and fixed costs, where fixed costs include depreciation, interest on medium- and long-term loans, maintenance and repairs on improvements (buildings and farm structures), taxes, and insurance (the latter two types of cost not usually being relevant in rural Africa). Several comments should be made about the calculation of net margin:
    a) How people calculate net margin varies a lot in terms of how many elements of fixed cost are deducted.
    b) A significant conceptual and practical issue is what share of the farm-level fixed cost (e.g., depreciation on equipment that is used on more than one crop) to allocate to a given enterprise. Often this is done in proportion to the area cultivated in the different enterprises.
    c) The opportunity costs of family land, labor, and capital are conventionally **not** deducted in calculating net margin.
    d) Net margin, like net farm income, therefore represents the return to family land, labor and capital.

3. Enterprise profit = net margin minus the estimated opportunity cost of family land, labor, and capital. Comments:

   a) As for net margin, there's a lot of variability in how far one goes in netting out these opportunity costs when calculating enterprise profit.

   b) The opportunity cost of equity capital is usually calculated by multiplying the value of variable costs by the appropriate interest rate. Conceptually, this is the rate of return on the farmer's best alternative investment. In practice, it is often taken to be the interest rate charged by the most common credit source in the area. While the opportunity cost of equity capital would be deducted explicitly in a single-year enterprise budget (if enterprise profit is calculated), that is not necessary in a multiple-year capital budget (investment analysis), since in that case the opportunity cost of capital is represented by the discount rate. This is true for both financial and economic analysis.

   c) The opportunity cost of family labor (OCL) is often calculated using the prevailing wage rate for unskilled agricultural labor. This may overestimate the OCL if few farm family members actually participate in the labor market, or if the wage rate chosen pertains to a peak period where the marginal productivity of labor is much higher than at other times of the year. An alternative is to base the opportunity cost of labor in a given enterprise (e.g., one involving a new technology) on the returns to labor in the best alternative to that enterprise, or in the typical farm plan overall. "Mutual" labor (labor

contributed by those outside the family with the expectation of reciprocity) could be valued like family labor. Hired labor paid in kind would be costed at the imputed value of the in-kind payments.

d) A common alternative to (c) is to not deduct anything for the opportunity cost of labor, but to report a net margin per day of family labor. (The usual rationale for this approach is that the opportunity cost of labor is hard to estimate, or that labor is the critical resource, so returns to labor are of most interest.) Net margin per day of labor represents the return to family land and capital per day of labor, unless the costs of family land and capital have been deducted (in which case the residual is returns to labor). Of course, you need at least some estimate of the opportunity cost of family labor to determine whether the enterprise is profitable in the sense of giving returns to labor that are higher than those from the best alternative activity.

In some cases, you may want to examine the effect of a particular enterprise at the farm level rather than on a per-hectare basis, e.g., to determine whether the aggregate output is sufficient to meet family food needs, whether the aggregate cash requirements can be financed by the household, etc. In such cases, it might be useful to prepare a whole-farm budget. If so, the common "bottom line" measures are:

1. Net farm income, which is analogous to net margin.
2. Returns to labor (or to land, or to equity capital), which are the residuals that result from subtracting from net farm income the opportunity costs of the other family

resources. (E.g., returns to labor = NFI - opportunity cost of land and equity capital.)

3. Net household income (NHI), which is NFI plus net nonfarm business income (receipts minus expenses).

4. Net household surplus (NHS), which is NHI minus estimated family consumption expenditures (including value of purchased and own-produced food consumed). NHS represents the amount available for savings and investment.

Table 1 below shows which costs are netted out in the different enterprise budget profitability measures.

In doing budgets, it is desirable to include as many types of cost as your data allow, unless some types of cost are not relevant to the analytical objective for which the budgets are being prepared.

Table 1. Definition of Profitability Measures

Budget Element	**Profitability Measure**		
Gross returns			
- Variable costs	= Gross Margin		
- Fixed costs		= Net Margin	
- Opportunity costs			= Enterprise Profit

There is no law that says you can't construct your own "bottom line" definition, which nets out a particular subset of the various types of cost. You would want to do any such

calculations consistently and be transparent about your method. The main drawback to a nonstandard bottom line is that it may make comparisons with other studies difficult, and people may misuse your work if they fail to understand how your numbers were calculated.

If you're using a consistent format, you're constructing your budgets from a given set of building blocks, in terms of categories of return and cost. You can arrange those blocks in different ways, but the overall set of blocks, and the information they embody, stays the same.

This is relevant to the issue of whether, for a given enterprise, you calculate enterprise profit, deducting an estimate for opportunity cost of family labor, or whether instead you calculate net margin per day of family labor, which is then compared to an estimate (which may be approximate) of the OCL. Since the identical information is being used, you will get the same answer in both cases.

For example, in column A of Table 2 (next page), enterprise profit (all costs deducted) is positive, and returns to labor (all costs except labor deducted) per day is greater than the OCL. Both indicate profitability. In column B, enterprise profit is negative, and returns to labor per day is less than the OCL, both indicating nonprofitability. If you calculate a benefit-cost ratio (all costs counted), that will give you the same answer as the other two measures.

If you're analyzing a single enterprise, the profitability question has a yes/no answer, i.e., net returns (however defined) are either positive or negative (or "nonnegative" and negative, if you want to count the case of net returns = zero). [Of course, you may want to take yield and price variability into account and estimate the probability distribution of net returns.]

Table 2. Sample Profitability Calculations for Three Hypothetical Enterprises

	Enterprise		
Values per hectare	**A**	**B**	**C**
1 return	100	100	100
2 variable cost	50	10	50
3 fixed cost	10	50	10
4 gross margin (1-2)	50	90	50
5 net margin (4-3)	40	40	40
6 labor days	3	8	2
7 opportunity cost of labor per day	5	5	5
8 opportunity cost of labor (6x7)	15	40	10
9 opportunity cost of land	10	10	15
10 opportunity cost of equity capital a/	5	1	5
11 enterprise profit (5-8-9-10)	10	-11	10
12 returns to labor (5-9-10)	25	29	20
13 returns to land (5-8-10)	20	-1	25
14 net margin/day (5/6)	13.3	5.0	20.0
15 returns to labor/day (12/6)	8.3	3.6	10.0
16 "benefit-cost" ratio (1/(2+3+8+9+10)	1.11	0.90	1.11

a/ 10% of variable cost

On the other hand, you may want to compare the profitability of two or more enterprises to decide which is best. In this case, you're interested in the magnitude of the net return, not just in whether it's positive. Again, if you take all categories of cost into account, it doesn't matter whether you use a net return concept (i.e., enterprise profit), or whether you use a benefit/cost ratio concept—both will give you the same answer. However, if the cost structure of the two enterprises differs and you are using a measure that does not explicitly incorporate all costs, then the relative ranking of the two enterprises may differ, as shown in

comparing cols. A and C of Table 2. Both have the same enterprise profit and benefit/cost ratio, but items 12-15 all differ, since all omit one of the cost categories (land for item 13, labor for items 12, 14, 15).

Economic Analysis

Here, the question is whether the enterprise is profitable in terms of providing net benefits to the national economy, or whether enterprise A is economically more profitable than enterprise B. In principle, this assessment involves the same elements—profitability, feasibility, and "other pros and cons"—as in financial analysis.

The broader perspective of economic analysis leads to two basic differences in the implementation of economic versus financial budgets. First, an economic analysis is likely to include categories of costs and benefits that are not included in financial analysis. Examples are:

1. The opportunity cost of resources, such as family land, labor, and capital, which are not purchased in the market and are therefore not associated with any financial payment. In the case of a whole-farm budget, this may be done by structuring the budget in a "with vs. without" format, in which case the net gain (loss) automatically incorporates the opportunity cost of family land, labor and capital (Gittinger, 1982).

2. Positive or negative externalities and indirect effects (backward/forward linkages). While important in principle, especially in project-level analysis, these effects are rarely if ever included in enterprise-level analysis.

Conversely, the economic analysis will exclude certain types of financial costs and benefits. The most common example is direct transfers such as taxes, subsidies, and loan receipts and repayment of principal and interest.[1] Direct transfers are excluded from economic analysis because they do not affect aggregate national income or involve the use of real resources in and of themselves.

Related to this, an economic analysis is more likely to be done at the aggregate program or project level, which is likely to differ from a per-hectare enterprise analysis in several ways:

1. The overhead costs of implementing the program or project (administrative staff, vehicles, extension program costs, etc.) would need to be included.
2. The time-phasing of project implementation would be reflected in the analysis, whereas an enterprise budget is more likely to reflect returns once development is complete, which might encourage the expectation of immediate payoffs.

[1]Interest payments on loans (borrowed capital) are deducted as costs in financial analysis. The opportunity cost of equity capital may not be deducted, unless enterprise profit is calculated or net margin is calculated so as to net out the opportunity cost of equity capital. In economic analysis, however, actual interest payments on loans are not deducted as costs, since they are transfers. However, the opportunity cost of all capital (borrowed and equity) should be deducted, either directly as an explicit cost item (if doing an enterprise budget), or indirectly through the discount rate (if doing a capital budget or discounted investment analysis). Therefore, the amount deducted for the cost of capital may differ between financial and economic analysis depending on (a) whether the cost of equity capital is accounted for in the financial analysis, and (b) whether different interest or discount rate(s) are used in the economic analysis versus the financial analysis.

3. The use of per-hectare enterprise budgets to draw conclusions about project profitability implicitly assumes constant returns to scale. An aggregate analysis, however, would (should) reflect any decreasing returns resulting from expansion of project activities into more marginal areas.
4. The aggregate analysis, by definition, indicates the magnitude of total (as opposed to per-hectare) benefits and costs, which may be of interest in some decision-making settings.

A second basic difference is that in economic analysis costs and returns are valued using economic or opportunity cost prices, which—because of taxes, subsidies, or other "distortions"—may differ from prices actually paid or received by farmers. Usually this just means:

1. Taking the elements of the financial budget and recasting them in economic prices where necessary.
2. Ensuring that value of unpriced inputs and outputs is included.
3. Using a discount rate that reflects the economic opportunity cost of capital (OCC). Conceptually, the OCC is the rate of return on the marginal investment in the economy, although other definitions such as the social rate of time preference are sometimes proposed. It is not straightforward to identify the OCC in practice. The OCC will tend to lie below the financial discount rate since the OCC is defined as a real (i.e., inflation-adjusted), risk-free rate of return. Gittinger notes (p. 314) that in World Bank project appraisals the OCC is typically assumed to lie in the 8-15%

range. The annual World Bank publication *World Development Indicators* includes data on real interest rates for many countries, which might be used in determining the OCC.

In terms of profitability measures, the most common ones for single-year enterprise budgets are net benefits and benefit/cost ratio.

1. Net benefits = benefits minus costs.
2. The benefit/cost ratio can be defined in various ways, depending on whether all costs are put in the denominator, or whether some costs (e.g., crop production costs) are netted out of the numerator.

Other variations of the benefit-cost ratio include:

1. The domestic resource cost ratio, which is actually a cost/benefit ratio (the cost of domestic resources required to produce the crop locally divided by the net foreign exchange savings or earnings gained through local production). A DRC < 1 is taken to indicate "comparative advantage." The opportunity cost of land is sometimes neglected in DRC calculations, but should be included since often this represents a significant proportion of total economic costs.
2. One could in theory define a benefit/cost ratio that is net benefits (excluding labor cost) divided by number of days of labor. This is not done, however, and would be difficult to interpret, since there is no empirical criterion to use to determine at what point the ratio is satisfactory, except by reference to some estimate of the

economic cost of labor. And if you have such an estimate, you might as well deduct labor costs and use net benefit as the profitability measure.

The same is true of using net economic returns to land as your measure. Even if you get a positive number, you don't know whether it's satisfactory unless you have some idea of the opportunity cost of land, in which case you might as well value land accordingly and deduct it as a cost.

How should these measures be used? Net benefit would be appropriate where you want to know whether a given enterprise is profitable, or which one of a set of mutually exclusive enterprises is best. DRC ratios are used to determine whether production of a given crop is economic as an export or as an import substitute. Some authors suggest that DRCs can be used for ranking (the lower the ratio, the better). However, you don't need to do ranking unless you're forced for some reason to invest in only one or a few of the total number of profitable enterprises. In that case, the best approach is to choose the enterprises which, collectively, give you the maximum net benefit. In any case, net benefit contains the same information as DRC, arranged in a different way (total benefits - total costs, instead of net domestic resource costs divided by foreign exchange benefits minus foreign exchange costs).

Sensitivity Analysis

Since the estimates of many budget elements will be approximate or subject to variability, it is useful to do sensitivity analysis to test the robustness of the profitability calculation. Alternative assumptions about yields, output prices, and the cost of major inputs (e.g., labor) are usually the most useful to analyze. If more thorough analysis of price and/or yield variability is desired, computer software such as @Risk[2] (an add-in for Lotus 1-2-3 or Microsoft Excel) makes sophisticated risk analysis relatively easy to conduct.

References

Gittinger, J. Price. *Economic Analysis of Agricultural Projects.* 2nd Ed. Baltimore: Johns Hopkins University Press, 1982.

[2]Palisade Corporation, 31 Decker Road, Newfield, NY 14867; http://www.palisade.com