

## Using the Partial Budget To Analyze Farm Change

Many changes proposed by a manager on a farm affect only part of the business. Therefore, a complete farm budget is not needed to determine the profitability of these specific changes in the operation of the farm. As farm manager, you analyze only those costs and incomes that change with a proposed business adjustment. You can accomplish this in an organized fashion by using the *partial budget*, which means that only the relevant costs and incomes are included in the analysis. You can use the partial budget to analyze many practical farm management problems, such as substituting crop and livestock enterprises, changing input levels or types of inputs, changing the size of enterprises in the business and buying new or used machinery, equipment, buildings and facilities.

This fact sheet discusses the partial budget as a tool to determine the profitability of proposed changes in the operation of your farm business.

### What Is Partial Budgeting?

The partial budget analysis is best adapted to small changes that you consider in the business. If you analyze two alternatives, the analysis does not determine that these two are the most desirable enterprises for the farm. The budget only indicates that the change will increase, decrease or not change net income. The partial budget compares the positive and negative effects of the proposed change on net income. You then separate the positive and negative effects and list them in different sections of the partial budget.

### Sections in a Partial Budget

The partial budget is illustrated in Figure 1 as a balance which measures the positive and negative effects of a change in the business. The left side of the balance shows the positive effects on net income including additional income and reduced costs. To counterbalance this positive effect, the right side of the balance includes reduced income and additional costs or the negative effects of the proposed change.

The partial budget has four categorical parts: *additional income*, *reduced costs*, *reduced income* and *additional costs*.

**Additional income.** A proposed change may bring additional income from an enterprise if it is added or increased in size or if output is increased for the particular enterprise. For instance, if soybeans replace corn, the income from soybeans becomes an *additional income*. Likewise, if you feed and grow an animal to 1,200 pounds as opposed to selling it at 450 pounds, the income from the heavier animal is an additional income.

**Reduced costs.** If soybeans replace corn in the proposal, the expenses associated with not planting corn are *reduced costs*. Reduced costs are either *variable* or *fixed*. If you no longer use or if you use less of a variable input like fertilizer, you reduce fertilizer costs. You may be able to reduce the appropriate fixed costs of depreciation, interest on average value, some repairs, taxes and insurance, if there is a reduction or elimination of investments in land, buildings, equipment, machinery, fences or breeding animals. In some cases, you cannot reduce costs for buildings, fences and other fixed items, since the business will be stuck with them. This can also be true of labor when the change requires less labor, but the supply is fixed with operator and full-time salaried help. If labor time is reduced and there is a productive use for this labor, you would record the labor value as an additional income.

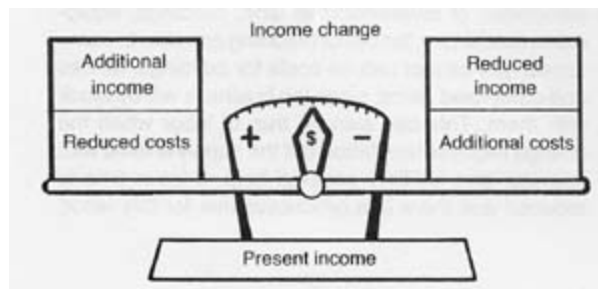
Total additional income and reduced costs have the same positive effect on net income.

**Reduced income.** A proposed change in the farm operation may reduce your farm income because of changes in production practices--enterprises being eliminated, reduced in size or output. For example, if you decide to reduce or eliminate corn and increase the acreage of soybeans, you would record the reduced income from corn in this section of the partial budget.

**Additional costs.** This portion of your partial budget includes any new costs associated with a proposed change. These costs can be *fixed* or *variable*. If you add a new crop or livestock enterprise to your business, calculate and include under additional costs variable cost items, such as seed, fertilizer, lime, fuel and oil, rent, hired labor, feed, veterinary services and medicine. You may also need additional investments for land, machinery, equipment, buildings, fences or breeding animals. Annual fixed costs, such as depreciation, interest on average value, some repairs, taxes and insurance, fall into this category. If an asset has a useful life of more than 1 year, prorate this investment over its useful life. If you can make a change without additional investments or more labor, do not enter these as additional cost.

Total reduced income and total additional costs have the same negative effect on net income.

**Net income.** Calculate the effect of the proposed change on net income by comparing the sum of additional income and reduced costs with the sum of reduced income and additional costs. In Figure 1, if the additional income and reduced costs are greater than the reduced income and additional costs, the needle on the balance will move into the positive area to indicate an increase in net income. While the increase in net income is positive, you should also compare the size of the net income increase with additional labor, investment and risk associated with the proposed change.



**Figure 1.** An illustration of the partial budget.

## How Is the Partial Budget Used?

This section discusses two sample problems that you, as farm manager, can solve by using the partial budget. This fact sheet also provides you with a blank partial budget form for your use. You can enter, in pencil, the positive and negative effects of the changes described in the sample problems.

## Substituting One Enterprise for Another

Assume that you have been planning your cropping program for next year and that you can grow corn or soybeans with existing equipment on the farm. After checking all available price information, you predict that soybean prices will be more favorable than corn prices for the coming year. Consequently, you want to consider reducing corn acreage by 100 acres and planting this land in soybeans. You will need to analyze corn and soybean costs, yields, prices, labor requirements and the like. For example, you project corn yield to be 100 bushels per acre, harvest price to be \$2.80 per bushel, and cash costs for seed, fertilizer, lime, herbicide, fuel and oil to be \$130 per acre. Corn labor requirements are 3 hours per acre and must be hired at \$5 per hour. For soybeans, your estimates include a yield of 35 bushels per acre at an estimated price of \$7 per bushel with cash costs for seed, fertilizer, lime, herbicide, fuel and oil at \$75 per acre. The labor requirements for soybeans are 2.5 hours per acre and must be hired at \$5 per hour.

Now, you are ready to put the above numbers into a partial budget form for the analysis (Table 1). Additional income will be the 35 bushels of soybeans x \$7 per bushel x 100 acres, or \$24,500. Reduced costs will be those associated with decreasing your corn production by 100 acres, or \$14,500, calculated as follows: [(100 acres x \$130 per acre) + (100 acres x 3 hours of labor x \$5 per hour)]. The additional income and reduced costs represent the positive side of the change and amount to \$39,000.

The negative side of the change will include the reduced income from 100 acres of corn x 100 bushels per acre x a price of \$2.80 per bushel, or \$28,000, along with increased cash costs for the soybeans of (100 acres x \$75 per acre) + (2.5 hours of labor x \$5 per hour of labor x 100 acres), or \$8,750. The negative aspects add up to \$36,750 for the change. When you subtract the negative side from the positive side in the partial budget, there is an increase in net income of \$2,250 to the operation. In short, the net gain of growing 100 additional acres of soybeans and 100 fewer acres of corn is \$22.50 per acre (\$2,250 - 100 acres). With this substantial increase in income, you should make the change as long as risk and other nonmonetary factors are negligible.

What happens if your estimates on yields and prices are off? By dividing the difference of \$22.50 per acre by the soybean price of \$7 per bushel ( $\$22.50 - \$7 = 3.2$  bushels), you see a decrease of only 3.2 bushels per acre in soybean yield, which would cause you to be indifferent to making the change in the operation. Similarly, by dividing the \$22.50 by 35 bushels of soybeans per acre ( $\$22.50 - 35 = \$0.64$ ), you see a decrease in the price of soybeans of only \$0.64 per bushel (from \$7.00 to \$6.36 per bushel), which would cause you to reconsider your decision to change the crop enterprise. You can do the same analysis for corn. The point is, you calculated an increase in net income but after further analysis, you see that small changes in yield or price could lead you to continue producing corn.

If the above proposal should require an additional piece of equipment, you would include the annual fixed costs as additional costs. For example, if the change is made, an additional investment would have to be made in equipment and would amount to \$5,000. Since the equipment would have a useful life of more than 1 year, the \$5,000 initial cost must be prorated over the useful life of the equipment to determine the amount charged each year. Use the DIRT-5<sup>1</sup> procedure to prorate the cost of investment over its useful life and for calculating the other costs of ownership:

<sup>1</sup>Depreciation, interest on average value, repairs, taxes and insurance.

**Depreciation:** (Original cost - salvage value) / useful life

**Interest on average value:** Average value x interest rate [average value is (original cost + salvage) - 2]

**Repairs:** Buildings: Replacement cost x 1 to 2 percent  
Machinery: Cost x 3 to 5 percent (Remember to include only fixed cost portion here.)

**Taxes:** Buildings: Assessed value x tax rate  
 Equipment and livestock: Not taxed in Maryland

**Insurance:** Buildings: Replacement cost or present value x 1 percent  
 Equipment: Average value x 1 percent

The annual fixed cost for the \$5,000 investment is calculated as follows:

<b>Depreciation:</b>	$(\$5,000 - \$1,000) \div 8 \text{ years} = \$500$	
<b>Interest on average value:</b>	$[(\$5,000 + \$1,000) \div 2] \times 0.12 = \$360$	
<b>Repairs:</b>	$\$5,000 \times 0.03 = \$150$	
<b>Taxes:</b>	Personal property not taxed in Maryland = \$0	
<b>Insurance:</b>	$\$3,000 \times 0.01 = \$30$	
<b>Total annual cost</b>		<b>\$1,040</b>

The \$1,040 would be included in additional costs and would reduce the net difference from \$2,250 down to only \$1,210. This lower net income change tells you to look more closely at yields, prices and costs before you make a decision to replace 100 acres of corn with 100 acres of soybeans.

If the change will enable you to sell a piece of equipment not needed in the change, the above process would be reversed. That is, you would recover some capital from the sale (less any taxes paid), which you could invest in some other activity for an annual return (investment x interest rate) that you would list as an additional income. Also, you would no longer incur depreciation, fixed repairs, taxes and insurance on the sold item. You would list these as reduced costs.

### **Custom Hiring or Owning a Combine**

You grow 800 acres of corn that you have custom harvested for \$23 per acre. You want to know if it would be more economical to buy a combine and harvest the corn on your own. You shop around and find a combine you can buy for \$110,000. The dealer states that it will harvest 5 acres per hour and that the combine consumes 9 gallons of fuel per hour. The price of fuel is \$1 per gallon. You know that oil and lubricant expenses run about 15 percent of fuel costs, and the going rate for skilled operator labor is \$8 per hour.

With the above information, you calculate fixed and variable costs for the combine and compare them with the custom cost of harvesting corn. Additional costs will be the DIRT-5 for the combine, plus variable costs for fuel, oil and lubricants, repairs and hired labor. Using the DIRT-5 method, enter the fixed costs plus variable costs in the partial budget under additional costs (Table 2).

There is no reduced income from the proposed change. Consequently, you put none under this section in the partial budget.

You decide that owning a combine would allow for a more timely and efficient harvest, and estimate that this would result in harvesting 5 more bushels of corn per acre when compared with custom harvesting. You value the corn at \$2.50 per bushel. Therefore, you list \$10,000 as additional income in the partial budget (800 acres x 5 bushels per acre x \$2.50 per bushel).

Reduced costs will include the custom charge expense that you no longer need by owning the combine. The amount listed is \$18,400 (\$23 per acre x 800 acres).

The positive side of the change (additional income of \$10,000 plus the reduced costs of \$18,400) amounts to \$28,400. The negative side of the change (additional costs of \$25,486 plus reduced income of \$0) amounts to \$25,486. When the positive aspects (\$28,400) are compared with the negative aspects (\$25,486), you find that there is a positive difference of \$2,914. In terms of the net income increase, you should purchase the combine. However, is this increase large enough to cover the investment risk? Also, \$10,000 was included as an additional income from increased corn harvested as a result of a timely and more efficient harvest. If you have not been doing the harvest, can this increase be expected? If not, the value should be left out. In such a case, the negative side of \$25,486 outweighs the positive side of \$18,400 by \$7,086. Therefore, you should continue to have the corn harvested on a custom basis.

## **Summary**

The partial budget is a useful tool for analyzing many farm management problems. It is also a powerful tool for analyzing practical problems that face farmers on a day-to-day basis. A blank partial budget worksheet is included in this fact sheet for your use in analyzing farm problems and opportunities.

## **Going for Help**

The Maryland Cooperative Extension Service offers a computer program for partial budgeting. It can be used on IBM compatible computers (MS-DOS) using the Lotus spreadsheet program. *Spreadsheet Template for Farm Management Application*, Information Series No. 208904, by Dale M. Johnson, Billy V. Lessley and James C. Hanson is available through your county Extension office or from the Department of Agricultural and Resource Economics, University of Maryland at College Park.

**Table 1. Partial budget for John Needhelp to analyze corn and soybean production**

**Partial Budget**                      **Name** John Needhelp                      **Date** 12/12/XX

Proposed change			
<i>Should I Replace 100 Acres of Corn With</i>			
<i>100 Acres of Soybeans?</i>			
Positive effects	Value	Negative effects	Value
Additional income		Reduced income	
<i>100 Acres of Soybeans</i>		<i>100 Acres of Corn</i>	
<i>x 35 Bushels/Acre</i>		<i>x 100 Bushels/Acre</i>	
<i>x \$7/Bushel</i>	\$24,500	<i>x \$2.80/Bushel</i>	\$28,000
Total additional income	\$24,500	Total reduced income	\$28,000
Reduced costs		Additional costs	
<i>100 Acres of Corn</i>		<i>100 Acres of Soybeans</i>	
<i>x \$130 Cost/Acre</i>	\$13,000	<i>x \$75 Cost/Acre</i>	\$7,500
<i>100 Acres of Corn</i>		<i>100 Acres of Soybeans</i>	
<i>x 3 Hours/Acre x \$5/Hour</i>	\$1,500	<i>x 2.5 Hours/Acre x \$5/Hour</i>	\$1,250
Total reduced costs	\$14,500	Total additional costs	\$8,750
Total additional income and reduced costs	\$39,000	Total reduced income and additional costs	\$36,750
Change in net income: (total additional income and reduced costs) minus (total reduced income and additional costs)			\$+2,250

**Table 2. Partial budget for John Harvest to analyze machinery problem**

**Partial Budget**                      Name John Harvest                      Date 12/12/XX

Proposed change			
<i>Should I Purchase a Combine and Harvest the Corn</i>			
<i>On My Own Or Continue to Have My Corn</i>			
<i>Harvested On a Custom Basis For \$23 Per Acre ?</i>			
Positive effects	Value	Negative effects	Value
Additional income		Reduced income	
<i>800 Acres x 5 Bushels/Acre</i>		<i>None</i>	<i>0</i>
<i>x \$2.50/Bushel</i>	<i>\$10,000</i>		
Total additional income	<i>\$10,000</i>	Total reduced income	<i>0</i>
Reduced costs		Additional costs	
<i>800 Acres x \$23/Acre</i>		<i>Fixed Costs: Depreciation</i>	<i>\$10,312</i>
<i>Custom Charge</i>	<i>\$18,400</i>	<i>Interest on Avg. Investments</i>	<i>8,250</i>
		<i>Fixed Repairs(1 Percent of Cost)</i>	<i>1,100</i>
		<i>Taxes</i>	<i>0</i>
		<i>Insurance</i>	<i>688</i>
		<i>Variable Costs:</i>	
		<i>Fuel</i>	<i>1,440</i>
		<i>Oil &amp; Lubricants (15% of fuel)</i>	<i>216</i>
		<i>Variable Repairs (2% of cost)</i>	<i>2,200</i>
		<i>Fuel</i>	<i>1,440</i>
Total reduced costs	<i>\$18,400</i>	Total additional costs	<i>25,486</i>
Total additional income and reduced costs	<i>\$28,400</i>	Total reduced income and additional costs	<i>25,486</i>
Change in net income: (total additional income and reduced costs) minus (total reduced income and additional costs)			<i>\$+2,914</i>

### Partial budget worksheet

**Partial  
Budget**

**Name** \_\_\_\_\_

**Date** \_\_\_\_\_

Proposed change			
Positive effects	Value	Negative effects	Value
Additional income		Reduced income	
Total additional income		Total reduced income	
Reduced costs		Additional costs	
Total reduced costs		Total additional costs	
Total additional income and reduced costs		Total reduced income and additional costs	
Change in net income: (total additional income and reduced costs) minus (total reduced income and additional costs)			



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