

## **USING THE SPREADSHEET VERSION OF THE NCSU FORAGE BUDGETS**

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There are three types of forage enterprise budgets:

- Harvesting costs for hay and haylage with no forage production costs included. These budgets calculate the harvesting costs per ton of dry matter harvested.
- Annual forage crops, including summer and winter annuals for grazing or for silage.
- Perennial forage crops, including cool season and warm season perennials grown for pasture or hay.

For perennial crops there is an establishment year budget and one or more annual budgets for the crop once established. Annual budgets may include the costs of harvesting a crop for stored forage or the production costs for pasture. In the case of pasture budgets, there are no allowances for the cost of managing livestock on that pasture. Also, note that these are production budgets and there is no allowance for storage or feeding losses. Crop budgets are on a per acre basis.

Each spreadsheet budget consists of two worksheets, one worksheet is the main enterprise budget and the second worksheet contains tables for generating the fixed costs and some of the operating costs included in the main budget. Each spreadsheet is for a specific crop and may contain one, two or three enterprise budgets, depending on the type of crop and how it can be managed. For example, the Bermuda grass spreadsheet contains an establishment year budget and separate annual budgets for hay and for grazing. The establishment year cost is linked to the corresponding annual budgets and treated as an investment to be “depreciated” over the useful life of the stand, so it appears in the annual budget as a fixed cost.

The cost information in these enterprise budgets is intended as an example or guideline only and the spreadsheets should be used to develop one or more budgets for a specific farm situation. The example budgets are not intended to be used “as is” without being modified. They are developed by NCSU extension specialists to reflect a fairly typical farm situation, for an established farming operation, assuming somewhat above average performance and normal growing conditions. However, on a specific farm soil quality may be above or below average, which affects yields. Different production practices or equipment may be used or input costs may be

different, for example, because of different pest problems or when livestock manures are used instead of purchased commercial fertilizers.

Each spreadsheet has certain cells that are protected and others that the user can modify with his or her information. These cells are colored yellow or orange. The yellow highlighted cells contain descriptions or data only, the orange cells contain formulas or links to other worksheets that can be modified or overwritten with the user's data. More information and suggestions for modifying these budgets is provided below.

**CAUTION:** Every effort has been made to produce spreadsheets that work as intended but they are offered "as is" and the user must accept responsibility for any information generated and any decisions made based on that information.

### Costs and Returns

Each enterprise budget contains two categories of cost; operating and fixed. Operating costs are also known as variable or out-of-pocket costs and include such items as seed and fertilizer. Fixed costs are the costs associated with the investments in equipment and specialized facilities used in the production of the forage crop. These costs are sometimes called ownership costs or overhead costs. Because these investments last for several years, we calculate annual charges that consist of a depreciation allowance, interest on the investment, property taxes and insurance. Interest charges are included regardless of the source of the investment, i.e., debt financed or owner financed. Note that for the example provided, machinery costs are based on new equipment prices for spring 2008. Equipment that is purchased used has a shorter useful life and has higher annual repair and maintenance costs. Users should use the actual prices of their own equipment.

Labor expense requires additional explanation because farm work may be performed by employees, by the owner or by some combination of the two. In the situation where some or all labor is provided by the owner, we recommend including a labor charge to reflect one of the following; the cost of hiring someone to perform the work, the minimum return the owner wants for his or her time, or the value of his or her time in some other activity, including leisure. In economic terminology this is an attempt to measure the opportunity cost of the owner's labor.

As can be seen from this discussion, these budgets estimate the full economic cost of production. Profit measures include returns above operating expenses and returns above all specified costs (operating and fixed). These are only partial profit measures because the budgets do not include farm overhead costs or land charges. This is because, by definition, an enterprise budget refers to a particular farm enterprise, not the whole farm operation. Note that in some situations, particularly for large new enterprises, one or more annual budgets may be needed through the start-up period together with cash flow projections that include new borrowing and debt repayments.

The NCSU forage budgets estimate costs and returns based on dry matter produced. The dry matter content of a forage crop contains the nutrients that livestock use and this approach makes it easier to compare the costs of forages with different moisture

content in a meaningful way. Costs from the budgets can easily be converted to an “as fed” basis if the moisture content of the forage is known: Multiply the dry matter cost by the percentage dry matter in the forage (as a decimal). For example, if hay production cost is \$100 per ton of dry matter and hay is 85% dry matter then the cost per ton of hay as fed is  $(100 * 0.85) = \$85$  per ton of hay.

### Modifying the budget

Each spreadsheet has certain cells that are protected and others that the user can modify with his or her information. These cells are colored yellow or orange. The yellow highlighted cells contain data or descriptions only, the orange cells contain formulas or links to other spreadsheets that can be modified or overwritten with data. The following discussion indicates some of the structure and workings of the budgets. Specific budgets may include footnotes that help explain individual items in that budget.

For each of the main budget worksheets:

- The header describes the crop and activity relating to that budget. It may be useful to modify this to describe the specific farm situation the customized budget refers to.
- All of the operating expense items may be changed with the exception of:
  - Machinery Labor and Machinery Fuel, Maintenance and Repairs, which are both calculated from information contained in Tables 1 and 2 in the second worksheet of each budget and transferred to the main budget worksheet automatically, and
  - Interest charge on Annual Working Capital.
- Fixed costs are calculated from information contained in Tables 1 and 2 in the second budget worksheet and transfer automatically.

The second worksheet for each budget contains three items:

- Table 1 with a list of the equipment used to produce the crop and calculations of the fixed or ownership costs to be allocated to each crop acre,
- Table 2 that is linked to Table 1 and contains calculations of the estimated operating expenses for each item of equipment and the machinery labor requirement,
- A sensitivity analysis that shows the effect of changes in the assumptions about costs, yields, or stand life.

The following changes can be made in Table 1.

- Interest rate. This is used to calculate the annual interest charge on the average value of the investment in equipment. The rate used should reflect the cost of capital for the farm.
- Tax and insurance rate. This rate is used to calculate these cost items based on the average value of the equipment used to produce the crop.
- Individual equipment items are listed. Tractor drawn equipment is shown linked to the tractor providing the power. The following items, identified in the column headings, should be evaluated for each piece of equipment and changed if warranted:

- Tractor horse power. This is linked to table 2 and is used to estimate fuel consumption and cost.
- The expected life of the equipment (or the planning horizon or economic life if less), the initial cost (purchase price including the value of any trade-in) and the estimated salvage value. These values are used to calculate the annual depreciation charges. The example initial cost figures are Spring 2008 estimated prices. Example salvage values are calculated by formula as a percentage of the initial cost using “book values” developed from agricultural engineering data.
- Annual hours of use. This figure is used to convert the annual fixed costs – depreciation, interest, tax and insurance – to a fixed cost per hour of use for a particular piece of equipment. Note that the annual hours of use are related to the expected life of the item measured in years – lower annual hours of use usually translates into a longer useful life measured in years.
- Acres per hour. This is a measure of the effective work rate for equipment, including an allowance for downtime for travel, setting up, clearing blockages, maneuvering, etc. This number is used to convert the fixed cost per hour figure to a cost per acre for the specified field operation.
- Times over. Some field operations may be performed more than once during the year, such as pasture clipping, turning hay, or making multiple cuttings of hay. The times over figure converts the fixed cost per acre to a fixed cost per acre per year.

Multiple pieces of equipment are listed in some of the budgets for convenience. **If a listed piece of equipment is not used for this crop on this farm, the cost can be set to zero by setting the “Initial Cost” figure to zero or by setting the “Times Over” figure to zero in Table 1.** Failure to do this will cause costs to be overstated. The total cost calculated in Table 1 is the estimated fixed cost per acre per year for this crop. This cost transfers over to the main budget worksheet.

The following changes can be made in Table 2. The equipment list and tractor horsepower figures transfer automatically from Table 1.

- Fuel price per gallon. This figure is used to calculate the fuel cost per hour for all self-propelled equipment listed.
- Labor cost per hour. This figure is used to calculate the machinery labor cost per hour for all equipment listed. The actual labor cost per acre includes a percentage to cover additional time spent, for example, traveling, setting up and cleaning up equipment. Any additional hand labor required should be shown directly on the budget as “Other Labor.”
- Repairs and maintenance. The annual cost figure is calculated as a percentage of the initial cost (purchase price). The percentages shown are “book values” based on new equipment prices and reflect the average annual cost over the life of the piece of equipment. These percentages are applied to the initial cost figures shown in table 1. If used equipment is purchased and priced in Table 1, the repairs and maintenance percentages will be higher than those shown in the example.

- Fuel use. For tractors and self-propelled equipment this is calculated from the horsepower rating listed in Table 1. For trucks, the fuel use per hour can be entered in the appropriate cell.
- Fuel and lube. This is based on the calculated fuel cost plus a percentage.
- Acres per hour and Times Over information is transferred automatically from Table 1.

Total operating expense per acre includes repairs and maintenance, fuel and lube, and machinery labor. This figure transfers automatically to the main enterprise budget.

Table 3 is a sensitivity analysis. Depending on the budget, the effects of specified percentage increases or reductions in cost, yield, or stand life on production costs are shown, singly and in combination. The percentage change can be modified by the user. This provides a simple way of evaluating alternative scenarios without re-running the entire budget. However, if the results are very sensitive to these changes, it is important to review the entire budget carefully and verify these results by making more detailed changes to the original assumptions in the base budget.

### Other Resources

North Carolina agriculture is very diverse and it is not possible to cover all the various enterprises. Enterprise budgets from many other states and agencies can be located through a searchable budget database located on a USDA Risk Management Agency web site at <http://www.agrisk.umn.edu/Budgets/>

The following items provide more information on the machinery and equipment costs and calculations:

"Estimating Farm Machinery Costs," Ag Decision Maker A3-29, Iowa State University, University Extension, April 2002 is a useful publication explaining machinery costs that can be found on-line at <http://www.extension.iastate.edu/agdm/crops/html/a3-29.html>

"Estimating Field Capacity of Farm Machines," PM 696, Iowa State University, University Extension, April 2001, can be found on-line at <http://www.extension.iastate.edu/Publications/PM696.pdf>

"Farm Machinery Economic Cost Estimates," William F. Lazarus and Roger Selley, Department of Applied Economics, University of Minnesota, August, 2005, can be found on line at <http://www.apec.umn.edu/faculty/wlazarus/mf2005late.pdf>

"Agricultural Machinery Management Data," ASAE Standards, ASAE D497.4 FEB03, American Society of Agricultural Engineers.