

Using *shiny* package to create web-based crop budget tool

Alan W. Leslie, Benjamin Beale, Shannon Dill

University of Maryland, Extension

Introduction

- Crop budget tools are important for calculating cost of production, especially in current volatile markets.
- Different land-grant universities have published crop budget tools mainly as Excel or paper-based worksheets.
- The *shiny* package in R can create a simple user interface with much more flexibility than typical budget tools.
- The goal of this project was to design a tool that would simplify comparing costs of different production inputs.

Methods

- We used UME crop budgets as a baseline for inputs to include
- We surveyed crop budgets from 29 states to compile typical inputs
- We expanded selections for soybean herbicide tolerance traits and pesticide applications
- We also designed a report feature to save inputs and budget analysis as a PDF for future reference

Table 1. Most common input variables in soybean crop budgets

Variables	Totals
Seed	23
Yield (Goal)	23
Harvest Price	22
Fertilizer	22
Labor	20
Insecticide	18
Insurance	17
Machinery Fuel	16
Machinery Repairs	16
Herbicide	16
Land	13
Interest	12
Fungicide	12
Drying	10

Figure 1. Screenshot of the UME Excel-based soybean crop budget tool

	A	B	C	D	E	F	G	H
1	SOYBEANS RR READY		PER ACRE FOR		2021			
2	ITEM	UNIT	QUANTITY	PRICE	TOTAL			
3	GROSS INCOME							
4	SOYBEANS	BUSHEL	60	\$11.72	\$703.20			
5	VARIABLE COSTS							
6	SEED	1000 SEEDS	150	\$0.33	\$49.50			
7	SOIL TESTING	ACRE	1	\$0.30	\$0.30			
8								
9	PHOSPHATE	POUND	45	\$0.58	\$26.10			
10	POTASH	POUND	40	\$0.33	\$13.20			
11	LIME	TON	0.5	\$36.00	\$18.00			
12	GRAMOXONE (BURNDOWN)	PINT	2	\$3.38	\$6.76			
13	2 4-D	PINT	1	\$2.50	\$2.50			
14	ROUNDUP (2 PASSES)*	QUART	2	\$4.88	\$9.76			
15	WARRIOR II	OUNCE	1.92	\$2.20	\$4.22			
16								
17								
18	CROP INSURANCE (RP 70%)	ACRE	1	\$5.95	\$5.95			
19								
20								
21	INTEREST ON OPERATING CAPITAL		\$130.34	0.5	8.5%	\$5.54		
22								
23	TOTAL VARIABLE COSTS LISTED ABOVE				\$141.83			
24	FIXED/OVERHEAD COSTS (CUSTOM RATES ARE USED AS A PROXY FOR FIELD OPERATION COSTS)							
25	FIXED/OVERHEAD COSTS							
26	CORN GRAIN NO TILL/WEEDRESIS	SOYBEANS	SOYBEANS LL	SOYBEANS XTEND	SOYBEANS ...			

ANALYSIS	
BREAKEVEN	\$5.76
VARIABLE COSTS PER UNIT	\$2.36
OVERHEAD COST PER UNIT	\$3.40
TOTAL COST PER UNIT	\$5.76
PROFIT PER UNIT	\$5.95

Project Results

Figure 2. Screenshot of the new web-based soybean crop budget tool

Analysis by bushel | Summary table

Variable	Value
Breakeven	7.32
Variable costs per unit	3.23
Overhead cost per unit	4.09
Total cost per unit	7.32
Profit per unit	1.85

https://awleslie.shinyapps.io/budget_4/

Farm Specific Inputs

Field Name

Yield goal (bu/acre): 50

Price goal (\$/bu): 9.17

Total acres farmed: 500

Generate report

Variable inputs

Enter soybean variety information

Soybean variety

Herbicide tolerance

RoundUp Ready

Seed cost (\$/unit)

46.2

Check here if you have herbicide resistant weeds

Seeding rate (x1000 seeds/acre):

150

Soil testing (\$/acre)

0.3

Phosphorus (lbs/acre):

45

Cost (\$/lb)

0.58

Pest Management

Preplant burndown herbicides:

Burndown herbicide

2,4-D amine

Rate (pt)

1

Cost (\$/gal)

16.71

Burndown herbicide

Gramoxone

Rate (pt)

2

Cost (\$/gal)

22.2

Burndown herbicide

none

Rate (-)

Fixed inputs

Enter fixed/overhead costs custom rates are used as proxy for field operation costs

Fertilizer Application (\$/acre)

8.57

Planting - No-Till (\$/acre)

20.33

Pesticide Application (\$/acre)

10.23

Number of Pesticide Applications

3

Harvesting (\$/acre)

34.94

Hauling (\$/acre)

9.5

Specify loan interest rate on spring custom charges

Interest rate (%)

8.5

shiny package provides a simple interface for flexible crop budgeting

The new online crop budget tool now has options for 7 different herbicide tolerance packages, and up to 12 different pesticides, including seed treatment and spray adjuvants. All fields come pre-populated with average prices and rates, but can be fully customized to match specific farming practices.

Optional PDF report allows for additional information sharing

A separate script using the *R Markdown* package in R allows users to save the information entered into the budget tool as a PDF. This output organizes inputs into tables based on category, and can also include additional information, such as HRAC, IRAC, or FRAC groups for pesticides, and specific additional production recommendations.

Updating the tool requires adjusting prices/pesticides

All information related to average prices and recommended pesticide rates are contained within an Excel spreadsheet uploaded to the Shiny server. Any updates from year to year will simply require uploading new spreadsheets with current prices, or with any changes to pesticides that have gained or lost registrations. Users will always have access to the updated version.

All codes are freely available through GitHub

Files containing codes used to construct this online app are freely available for download through the GitHub repository (<https://github.com/awleslie/soybean-budget>) under a GNU General Public Use license. The R software and all packages are open source and free to download, which means that any state wishing to reproduce this type of budget tool can do so free of charge.