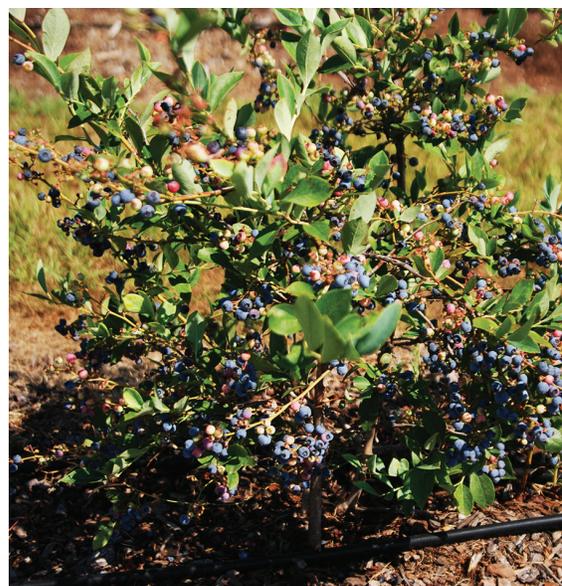


Interactive Sustainable Blueberry Budget

User Guide



Interactive Sustainable Blueberry Budgets: User Guide

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TABLE OF CONTENTS

INTRODUCTION	2
SOFTWARE REQUIREMENTS	3
QUICK START GUIDE.....	3
GETTING STARTED.....	4
1. INITIAL INPUT	4
2. NAVIGATING AND EDITING DEFAULT VALUES	11
3. ECONOMICS.....	13
3.1. Breakeven Analysis	16
3.2. Sensitivity Analysis.....	19
3.3. Risk Analysis	21
4. HELP AND OTHER TOPICS.....	23
5. GLOSSARY	24
6. ADDITIONAL RESOURCES.....	26
ACKNOWLEDGEMENTS.....	26
CONTACT US.....	26
REFERENCES.....	27
DISCLAIMER	27

INTERACTIVE SUSTAINABLE BLUEBERRY BUDGETS USER GUIDE

INTRODUCTION

The demand for blueberries still typically exceeds supply in much of the state of Arkansas, particularly early and late in the production season. In general, production of berries is considered to be risky because of a high initial investment, a delay of three or more years in returns after planting, the climate (weather extremes), and high fixed costs (Funt et al., 2011). The capital and cash input costs associated with growing blueberries in Arkansas are substantial. Detailed planning is necessary when budgeting for capital expenditures and for the annual operating costs. With new advances in high tunnel technologies, Arkansas growers have more opportunities to extend the blueberry season to meet the year-round demand while avoiding the need to ship long distances, thus leaving a lighter environmental footprint by minimizing fuel consumption.

The budget presented here should be used as a guide only, as individual on-farm production systems may have higher or lower costs and revenues than those listed. The budget is divided into variable costs (plants, fertilizers, insecticides, hours of labor, etc.), fixed costs (machinery and equipment, irrigation, high tunnel systems (if any), taxes, insurances, land costs, management, etc.), and total costs (variable costs plus fixed costs). If the farm is not entirely dedicated to blueberry production, the fixed costs should be allocated proportionally among all crops to obtain a more accurate budget. Net returns are calculated by subtracting total costs from gross returns (yield times price) each year. Since the budget is developed for a long period of time (seven years), it is necessary to adjust future returns to today's dollars. Money today is typically worth more than money in the future because of inflation.

Production costs and yields on each operation differ due to soil type, climatic conditions and agronomic practices, among others reasons. The price producers receive is determined by the market strategy chosen by the producer, quality of the product, supply of fruit in the area and other unique characteristics specific to each production situation. Therefore, producers are encouraged to enter their own values to develop their own cost of production for their specific blueberry production.

The purpose of this tool is twofold: 1) to assist producers in the evaluation of costs, revenues and risks associated with their blueberry operation, and 2) to assess the changes to cost, revenue and risk as expected costs, revenue prices and/or yields change. The production budget components of the tool estimate gross revenues, variable costs, fixed costs and total net returns using the tool's default data or information entered by the user.

But what makes this tool unique is that it includes additional economic components not found in most production budgets that: 1) estimate the operation's breakeven price and yield, 2) conduct sensitivity analyzes (answering "What if" questions related to changes in costs and revenues), and provide a risk assessment (regarding the probability of obtaining positive net returns during the life of the blueberry crop).

This tool is useful because it allows blueberry producers to estimate operating costs, fixed costs, total costs and expected total returns by modifying production practices or production systems, cost or return values. Estimating total costs per year, breakeven analyses for yields and prices, sensitivity analyzes for total costs, and risk analyzes would assist blueberry producers to make better investment and management decisions when using high tunnels in their operations.

SOFTWARE REQUIREMENTS

This tool employs standard Microsoft Windows graphical elements so that anyone familiar with the Microsoft Windows environment should find this blueberry budget easy to navigate. Familiarity with the basics of mouse operation and navigating standard Windows objects such as menus, windows, dialog boxes, scroll bars, and toolbars is very important in using this tool.

Your personal computer should have the following programs installed and operating properly:

- Windows operating system
- Microsoft Excel version 2007 or higher

QUICK START GUIDE

For easy use, please take a few moments to read the following steps:

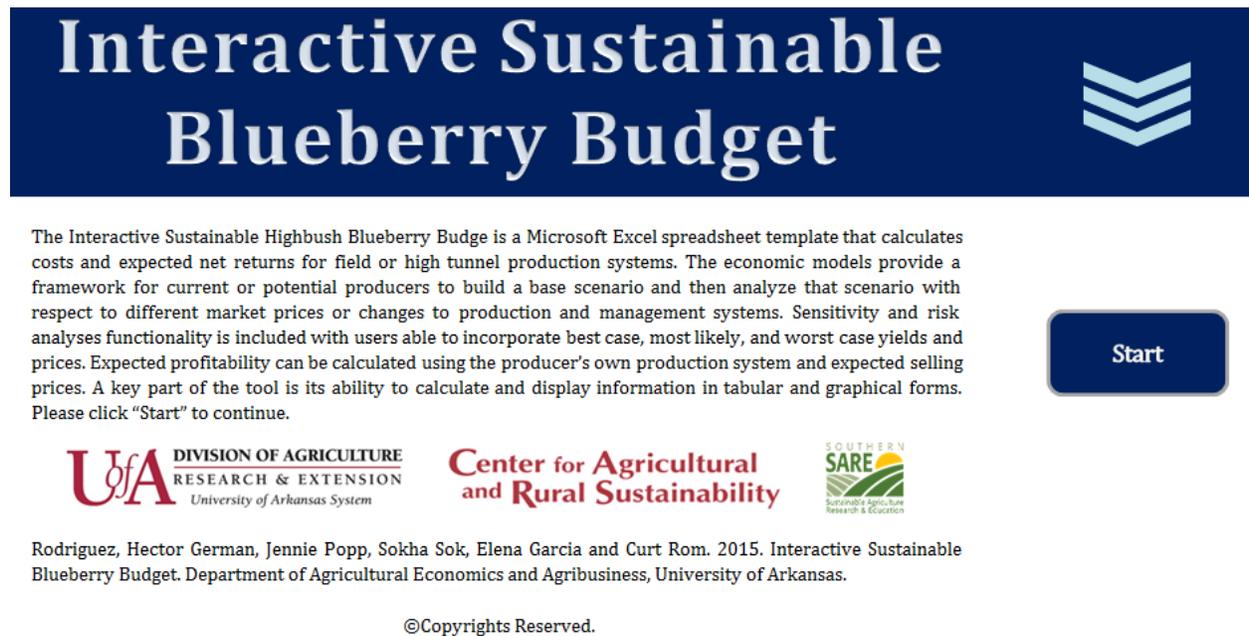
1. Press "User Input"
2. Select between field and high tunnel production (Conventional and Organic)
3. Enter or select values in the boxes
4. Click "Run" to see an overview of cost/returns
5. Navigate the application by clicking on icons at the top/bottom of the screen
6. Enter new values to customize the budget
7. Click the "Economics" button to see graphical representations of the data

GETTING STARTED

This complete user guide covers everything you need to know to start using this tool. This decision support tool is both easy to use and highly customizable. Before you can use this tool for estimating basic revenue calculations, you must tell the program a few things about your current or potential operation. Please open the tool now and follow the instructions below.

1. INITIAL INPUT

Figure 1 shows the “Cover” screen. It explains what the tool does. Click “Start” to continue.



The Interactive Sustainable Highbush Blueberry Budget is a Microsoft Excel spreadsheet template that calculates costs and expected net returns for field or high tunnel production systems. The economic models provide a framework for current or potential producers to build a base scenario and then analyze that scenario with respect to different market prices or changes to production and management systems. Sensitivity and risk analyses functionality is included with users able to incorporate best case, most likely, and worst case yields and prices. Expected profitability can be calculated using the producer's own production system and expected selling prices. A key part of the tool is its ability to calculate and display information in tabular and graphical forms. Please click “Start” to continue.

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Figure 1. Cover Menus – Blueberry Budget

From the “Main Menu” screen you can navigate across the tool (Figure 1.1).

Interactive Sustainable Blueberry Budget



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Figure 1.1 Main Menu Screen

Click on any of the green icons to get more information about this tool. Detailed instructions are available by clicking on the “User Guide” icon or by following the steps in the “Quick Start” to start using this application. Figure 2 shows the userform where you can select any of the four production systems that you can estimate with this tool.

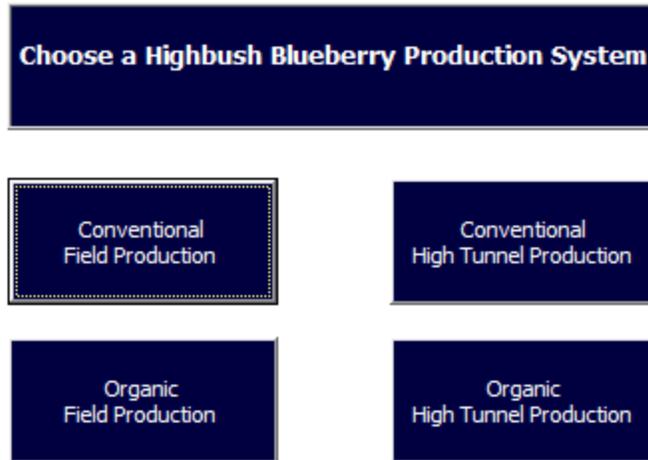


Figure 2. Choosing a Production System

Four different user-forms will appear depending on your selection. If you click on “Conventional field production”, a userform will display nine questions (Figure 3).

1. Cultivar Production System Field - Conventional	2. Cultivar Name Generic Blueberry Cultivar	3. Plant Density Row Spacing (ft) 10.0 Plant Spacing (ft) 3.0
4. Expected Yield - Production Usage Yield (lbs/plant) Click Here		5. Expected Market Prices - Wages Price (\$/lb) Click Here
6. Rates (%) Interest 4.5 Inflation 0.0		Wages (\$/hr) Management 15.00 Labor 10.00
7. Area 1.0 Acres	8. Machinery & Equipment Machinery	9. Your Irrigation System Information Total Cost (\$/area) 2500 Total Installation Labor (hours) 60 Interest Rate (%) 7 Amortization (years) 5
Click here for more information Run Cancel Help Demo		

Figure 3. Conventional Field Production Userform

If you click on “Conventional high tunnel production”, a userform will display nine questions. (Figure 4).

1. Cultivar Production System High Tunnel - Conventional	2. Cultivar Name Generic Blueberry Cultivar	3. Plant Density Row Spacing (ft) 10.0 Plant Spacing (ft) 3.0
4. Expected Yield - Production Usage Yield (lbs/plant) Click Here		5. Expected Market Prices - Wages Price (\$/lb) Click Here
6. Rates (%) Interest 4.5 Inflation 0.0	8. Machinery & Equipment Machinery	Wages (\$/hr) Management 15.00 Labor 10.00
7. Irrigation Total Cost (\$/area) 2500 Total Installation Labor (hours) 60 Interest Rate (%) 7.0 Amortization (years) 5	Run Help Cancel Demo	9. High Tunnel Total Area in High Tunnels (sqft) 43560 \$ per sqft 1.20 Total EQIP Subsidy (\$/area) 0 Total Installation Labor (hours) 500 Interest Rate (%) 7.0 Amortization (years) 10
Click here for more information		

Figure 4. Conventional High Tunnel Production Userform

Click on each of the boxes to enter your own values. All the information in the boxes is required to calculate the budget. The user-form will open with default values; you can overwrite these values with your own information at any time. Warning messages will appear if there is missing information or if you enter invalid input. Figure 5 shows an example of a warning message related to missing information.

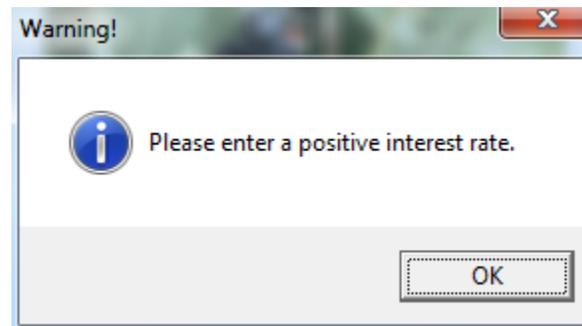


Figure 5. Example of Warning Messages

The model can be run quickly by clicking the demo button. This will populate the tool with all needed information. However, in order to customize this tool to your own operation, follow these steps. Please note information for all categories marked with an “*” is needed for the tool to run.

- 1. Fruiting Cultivar Production System** – This is the production system that you have chosen.
- 2. Cultivar Name** – Enter cultivar name.
- 3. *Plant Density (plant/ac.)** – Enter the planting distance in both “In Row (ft.)” and “Between Rows (ft.)” boxes. Once both values have been entered, the tool will automatically calculate the number of plants per acre.
- 4. *Yield (lb. /plant) and Production Usage (%)** – Enter expected yields per plant per year as well as “Fresh Market” and “Processed Market” percentages for the first seven years. These two percentages must be equal to 100% or less. If the total of both percentages is greater than 100%, a message will appear asking to correct your input. If the total of both percentages is less than 100%, it is assumed that the difference is culled fruit.

5. ***Market Price (\$/lb.) and Wages (\$/hr.)** – Enter the expected prices for “Fresh Market” and “Processed Market” fruit for each year.
6. ***Rates (%)** – enter interest and inflation rates.
7. ***Field Production Area** (Only field production) – enter area in acres (e.g., 0.3, 0.5, 1.0, 1.5, 2.0, etc.)
8. **Machinery & Equipment** – Enter machinery or equipment name, purchase cost, ownership life, salvage value (e.g., usually 20%), ownership tax costs, ownership shelter costs, and ownership insurance costs. If there is incomplete information, a message will let you know what information is missing and will take you to the corresponding box. If you do not enter the name of the machinery or equipment but you enter information in the other columns, that row information will not be included in the final calculations. Once you enter your machinery and equipment properly, you need to enter the hours of annual use for each machinery and equipment. You need to enter hour usage information for at least one of the seven years. Click on the “Demo” icon if you want to use the default values. Rental equipment can be entered each year after running the model.
9. **Irrigation System** – Enter your irrigation system information (e.g., total costs, installation labor hours, interest rate and amortization period, in years).
10. **High Tunnel** – Enter the size of your high tunnel (in square feet), the costs per square foot, value of the total EQIP subsidy (If any), the number of labor hours to install the high tunnel, the interest rate (%) for your loan and the number of years to pay the loan. This information is required if you decided to use a high tunnel in your operation. This information does not apply for field production.

By clicking on the “Run” icon, the tool will check if there is missing information. If the initial input was not entered correctly or there is missing information, a warning message asking you to correct the data will appear. If there is no missing information, the tool will open to the “Economics” screen to show a graphical representation of the budget as in Figure 6.

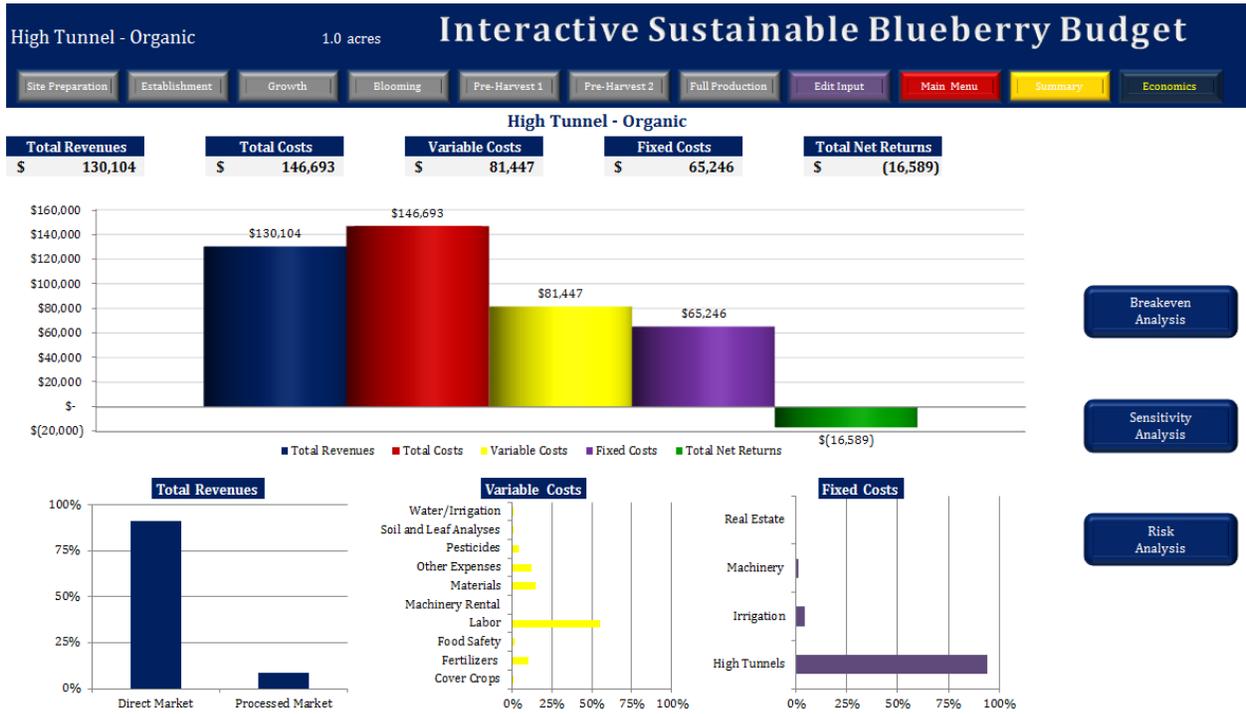


Figure 6. Economics Screen

From the “Economics” screen you can access the “Summary” screen (Figure 6.1). This screen is a snapshot of all production activity costs (variable and fixed costs), gross revenues and net returns. From this screen you can navigate across 15 different years (e.g., soil preparation, establishment, growth, and year one to 12 of production) to modify or to enter new information. In addition, you can return to the main menu, access the economic tools, access the user guide, obtain help, or edit your initial input.

High Tunnel - Conventional		1.00 acres		Interactive Sustainable Blueberry Budget																	
Site Preparation		Establishment		Growth		Blooming		Pre-Harvest 1		Pre-Harvest 2		Full Production		Edit Input		Main Menu		Summary		Economics	
Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9					
Site Preparation		Establishment		Growth		Blooming		Pre-Harvest 1		Pre-Harvest 2		Full Production		Full Production		Full Production					
Direct Market	\$	-	\$	-	\$	-	\$	1,021.13	\$	1,980.72	\$	7,581.69	\$	14,510.41	\$	13,885.56	\$	13,287.62			
Direct Market	\$	-	\$	-	\$	-	\$	879.89	\$	1,706.76	\$	6,533.05	\$	12,503.44	\$	11,965.01	\$	11,449.77			
Processed Market	\$	-	\$	-	\$	-	\$	141.23	\$	273.96	\$	1,048.64	\$	2,006.97	\$	1,920.55	\$	1,837.84			
VARIABLE COSTS	\$	6,971.30	\$	8,974.35	\$	1,160.72	\$	1,993.10	\$	2,039.18	\$	3,334.18	\$	4,996.00	\$	4,802.17	\$	4,574.99			
Soil and Leaf Analyses	\$	-	\$	-	\$	18.31	\$	17.53	\$	-	\$	-	\$	15.36	\$	29.39	\$	14.06			
Food Safety	\$	-	\$	-	\$	-	\$	153.35	\$	146.75	\$	140.43	\$	134.38	\$	128.59	\$	123.06			
Cover Crops	\$	141.34	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-			
Machinery Rental	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-			
Materials	\$	-	\$	6,947.37	\$	-	\$	223.46	\$	129.99	\$	134.27	\$	187.95	\$	179.86	\$	172.11			
Fertilizers	\$	18.00	\$	45.93	\$	43.96	\$	72.51	\$	69.39	\$	66.40	\$	63.54	\$	60.81	\$	58.19			
Pesticides	\$	62.30	\$	59.61	\$	203.32	\$	325.66	\$	311.64	\$	298.22	\$	285.38	\$	273.09	\$	261.33			
Water/Irrigation	\$	-	\$	29.47	\$	33.84	\$	38.86	\$	44.62	\$	51.24	\$	58.84	\$	56.30	\$	53.88			
Labor	\$	6,196.90	\$	1,279.33	\$	583.23	\$	863.61	\$	1,049.38	\$	2,323.02	\$	3,887.78	\$	3,726.98	\$	3,560.16			
Other Expenses	\$	552.76	\$	612.64	\$	278.06	\$	298.12	\$	287.42	\$	320.61	\$	362.77	\$	347.15	\$	332.20			
FIXED COSTS	\$	8,133.01	\$	7,782.78	\$	7,447.64	\$	7,126.93	\$	6,820.02	\$	6,037.06	\$	5,777.09	\$	5,528.32	\$	5,290.26			
Irrigation	\$	609.73	\$	583.47	\$	558.35	\$	534.30	\$	511.29	\$	-	\$	-	\$	-	\$	-			
High Tunnels	\$	7,442.36	\$	7,121.87	\$	6,815.19	\$	6,521.71	\$	6,240.87	\$	5,972.13	\$	5,714.95	\$	5,468.86	\$	5,233.35			
Machinery	\$	80.92	\$	77.44	\$	74.10	\$	70.91	\$	67.86	\$	64.94	\$	62.14	\$	59.46	\$	56.90			
Real Estate	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-			
TOTAL COSTS	\$	15,104.30	\$	16,757.13	\$	8,608.36	\$	9,120.03	\$	8,859.21	\$	9,371.24	\$	10,773.09	\$	10,330.49	\$	9,865.24			
NET RETURNS	\$	(15,104.30)	\$	(16,757.13)	\$	(8,608.36)	\$	(8,098.90)	\$	(6,878.49)	\$	(1,789.56)	\$	3,737.32	\$	3,555.07	\$	3,422.37			
CUMULATIVE NET RETURNS	\$	(15,104.30)	\$	(31,861.43)	\$	(40,469.79)	\$	(48,568.69)	\$	(55,447.17)	\$	(57,236.73)	\$	(53,499.41)	\$	(49,944.34)	\$	(46,521.97)			

Figure 6.1 Summary Screen

2. NAVIGATING AND EDITING DEFAULT VALUES

You can navigate across this tool from virtually any screen. There are navigation icons on each screen that enables movement across screens to edit, update or view information (Figure 7). Click any icon on the “Navigation Tool”, to quickly move among the various screens. In these screens, you can modify, update or enter new information. The blue icon with the text in yellow will indicate in which screen you are at the moment.



Figure 7. Example Navigation Icons on the Navigation Tool

Navigating to any category screen will reveal detailed descriptions of the costs of production for each activity and the price and quantity values used to make the calculations. You may enter your own values by placing new values in the “Your Quantity” or “Your Price” columns. Once any new values are entered, calculations are automatically

updated. If you modify the default values, the total costs will be highlighted in green. This helps to identify the activities that were modified (Figure 8).

This tool calculates costs and revenues based on a representative set of activities that occur in any given year on a blueberry crop. Additional activities specific to a producer's operation can be added to the budget; just enter a name or description, unit, quantity, and price per unit. The total cost per each additional activity will be calculated automatically. Values will be highlighted in blue.

High Tunnel - Organic		1.00 acres		Interactive Sustainable Blueberry Budget																	
Site Preparation		Establishment		Growth		Blooming		Pre-Harvest 1		Pre-Harvest 2		Full Production		Edit Input		Main Menu		Summary		Economics	
Activity	Unit	Quantity	Your Quantity	Price	Your Price	Total Cost	Net Present Value														
REVENUES								\$	2,657.16	\$	2,228.19										
Fresh Market	Pound	871.20		2.67	2.80	\$	2,439.36	\$	2,046												
Processed Market	Pound	217.80		1.00		\$	217.80	\$	183												
Harvested not Sold	Pound					\$	-	\$	-												
VARIABLE COSTS								\$	-	\$	-										
Soil and Leaf Analyses								\$	90.00	\$	75.47										
Leaf Analysis	Sample	0.00	2.00	20.00		\$	40.00	\$	34												
Soil Analysis	Sample	1.00	2.00	0.00	25.00	\$	50.00	\$	42												
								\$	-	\$	-										

Figure 8. Modifying Default Values

3. ECONOMICS

Specific economic assumptions are included in this user guide, but these assumptions may not fit every production situation as production costs and revenues are highly variable for any particular blueberry crop. Each producer should develop his/her own budget to reflect their production goals, costs and market prices.

Total Costs (TC)

Total costs describe the total economic costs of producing blueberries during the full 15 years (3 years to establish the crop and 12 years in production). Total costs are the sum of variable costs plus fixed costs (Baumol and Blinder, 2006). Variable costs vary according to the quantity of yield produced and include inputs such as labor, field operations, harvest, and raw materials. In these budgets, variable costs are broken down into 10 categories; fertilizers, pesticides, ground cover, materials, food safety, machinery rental, interest on operating capital, labor, soil and leaf analysis tests, and other expenses. Harvest variable costs include the cost of labor and custom work directly associated with harvest (e.g., packing, sorting, grading, marketing, etc.). Total variable costs are the cash costs per year required to grow and harvest blueberries.

Fixed costs are independent of yield and include inputs (capital) that cannot be varied in the short term. Fixed costs include depreciation on capital investments in machinery, irrigation equipment, and high tunnel systems as well as management overhead. These costs do not change as the level of production changes and would be incurred even if blueberries were not produced. Total costs (\$/area) of production are calculated for each production year. Total costs for each production year are calculated using the following equation:

$$TC_t = \left(TFC_t + \sum_k^n (UVC_{kt} \times Q_{kt}) \right)$$

Where, TC_t is the total cost per year t , TFC_t is the total fixed cost per year t , and UVC_{kt} are the unit variable costs for activity k for n activities per year t ; Q is each activity quantity per year t . The budget used as the core of this interactive economic decision support tool can be modified for the first seven years (first three establishment years and four production years).

Gross Revenues (GR)

Gross revenues are estimated by multiplying expected market price (\$/lb.) for each fruit quality (e.g., Quality 1 or Quality 2) and expected yield (lb./area) for each fruit quality for each year of production. Annual gross revenues of production are calculated for each production year t using the following equation:

$$GR_t = \left((Y_{EFM_t} \times P_{EFM_t}) + (Y_{EPM_t} \times P_{EPM_t}) \right)$$

Where, GR is the expected gross revenues per year t , YEFM is the expected yield to be sold in the fresh market (e.g., Quality 1) in year t , PEFM is the expected price to be received for fresh market fruit in year t , YEPM is the expected yield to be sold in the processing market in year t , PEPM is the expected price to be received for processing fruit (e.g., Quality 2) in year t . Expected yields for each fruit quality are estimated as follows:

$$Y_{EFM_t} = (TY_t \times EFM_t) \times TA$$

$$Y_{EPM_t} = (TY_t \times EPM_t) \times TA$$

Where, TY is the expected total yield per year t , EFM is the expected percentage of quality 1 produced in year t , EPM is percentage of processed market fruit produced in year t , TA is the total number of plants per area. All these yield values are input that the user needs to enter and can be modified or changed at any time. It is important to point out that there will always be some percentage of culls or drops. The user can enter expected quality 1 and quality 2 percentages for each year of production. These two percentages must be equal to 100% or less each year. If the total of both percentages is greater than 100%, a message will appear asking to correct the input. If the total of both percentages is less than 100%, it is assumed that the difference is culled fruit.

Net Returns (NR)

Net returns (\$/area) are estimated each year by subtracting total cost (\$/area) from gross revenues (\$/area). Net returns for each production year t (NR $_t$) are calculated using the following equation:

$$NR_t = GR_t - TC_t$$

Future Values (FV)

The blueberry budget could be used by a producer to estimate costs and revenues across the life of a blueberry crop before determining whether or not to undertake the operation. However, all future costs and revenues are unknown. One way to estimate the values of costs and revenues that occur in the future is to increase current values annually by an expected inflation rate using the following equation:

$$FV_t = PV_t \times (1 + I)$$

Where, FV is future cash flows occurring at time t , PV is the present value (explained below) and I is the inflation rate in decimal form.

Present Values (PV)

Present value is a future amount of money that has been discounted (using an average discount rate) to reflect its current value, as if it existed today. Present value calculations are used to make comparisons between cash flows and production years, as they do not occur at simultaneous times (Baumol and Blinder, 2006). The soil preparation year is assumed as the starting year ($t=0$). After this year, all the calculations are adjusted by the average discount rate to estimate present values. Present values for variable and fixed costs, gross revenues and net returns were estimated using the following equation:

$$PV = \sum_{t=1}^n \left(\frac{FV_t}{(1 + d)^t} \right)$$

Where, PV, is the present value of future cash flows (FV) occurring at time t , that must be discounted over the course of n years using d , the discount rate.

Net present value (NPV) was used to estimate the profitability of a blueberry crop that lasts 15 years (3 years to establish, 12 years in production) as annual net returns (gross revenue – total costs) are discounted to the present. Hence, the PV of future net returns received over the life of the crop represents the sum total of profitability expressed in today's dollars for making the decision to invest in the crop

$$NPV = \sum_{t=1}^{15} \left(\frac{NR_t}{(1 + d)^t} \right)$$

Where, NPV is the net present value, NR is the net returns, t is time period and d is the discount rate for one compounding period (in this case, annually).

The inflation rate (I) is used to adjust the value of future cash flows. Then the discount rate (d) is used to determine the PV of future cash flows. Both of these rates are entered by the user and can be updated at any time. Note that year 0 is included to represent cash flows occurred in the soil preparation year that need not be discounted. The PV of net returns or NPV is used in the risk assessment component of this budget. The larger the NPV, the better is the investment (Baumol and Blinder, 2006). Given our assumptions, a negative NPV implies that total costs cannot be covered using revenue streams generated by the crop.

By clicking on the “Economics” icon (from any screen), a graphical representation of the total cost of production, gross revenues, and net returns per area associated with the information entered in the “User Input” form and all the other screens will be displayed (See Figure 6). This tool will calculate breakeven points for price and yield (see Breakeven Analysis for more information). Sensitivity and Risk analyses can also be conducted (see Sensitivity and Risk Analyses for more information).

Depreciation (Amortization)

There are two categories (e.g., Irrigation and High Tunnel) depreciated in this tool. The user must enter the total costs, the total number of hours used to install the system, an interest rate and the duration of the loan in years as an initial input. The total value of the each system is broken down to the number of years the system is expected to operate based on the initial information entered. The total cost of the labor hours spent in the installation of a system is not used in the depreciation of the system. That costs is assumed to be a variable costs in the establishment year.

3.1. Breakeven Analysis

Although obtaining positive net present values is the main goal, it is very important to know if/when the production of blueberries will cover the total costs of production or, in other words, breakeven. This tool calculates how much revenue is needed (given expected “Quality 1” and “Quality 2” yields and prices) to cover the total costs of production.

The breakeven point is defined in this blueberry application as the point at which total costs and total revenues are equal. There is no net loss or gain (i.e., the operation has "broken even"). Expected market production (EMP_i) is equal to market yield (EMY_i) per plant times the number of plants (NP) per area times expected market price ($EMPr_i$), t is

time in years, and i is “Quality 1” or “Quality 2” (see market production equation). Total revenues are the sum of expected “Quality 1” or “Quality 2” market production during the life of the crop.

$$\text{Market Production (EMP)}_i = \sum (EMY_i * NP * EMP_{r_i})$$

So, the breakeven yield (see breakeven yield equation) is calculated by dividing the cumulative total costs of operating the crop (CTC) by the expected average market price (EMP_i) times the ratio between expected market production (EMP_i) and total revenues (TR).

$$\text{Breakeven Yield}_i = \frac{CTC}{EMP_i} * \left(\frac{EMP_i}{TR} \right)$$

The tool will calculate the breakeven “Quality 1” or “Quality 2” yields. For example, using the tool’s default values for conventional field production, cumulative total costs (CTC) are equal to \$63,344/area; total revenues are equal to \$121,260/area; “Quality 1” fruit is \$2.67/lb. assuming 70% of the fruit is sold in the fresh market and “Quality 2” fruit is \$1.00/lb. assuming 30% of the fruit is sold in the processed market. The crop will breakeven (e.g., net returns equal to zero), if total production is equal to 75,861 pounds.

Likewise, the breakeven price (see breakeven price equation) is calculated by dividing the cumulative total costs of operating the crop (CTC) by the expected average market yield (EMY_i) times the ratio between expected market production (EMP_i) and total cumulative revenues (TR). The resulting numbers will be the average annual price per pound (for each quality) that must be attained for blueberries sold for exactly zero profit to be obtained at the end of the year.

$$\text{Breakeven Price}_i = \frac{CTC}{EMY_i} * \left(\frac{EMP_i}{TR} \right)$$

For example, using the tool’s default values, cumulative total costs (CTC) are equal to \$63,344/area; total cumulative revenues are equal to \$121,260/area; total yield is 75,861 lb./area. The crop will breakeven at the end of the year (e.g., net returns equal to zero), if the “Quality 1” (fresh market) price is \$0.92/lb. and “Quality 2” (processed market fruit) price is \$0.35/lb. By clicking on the “Breakeven Analysis” icon on the Economics page (see

Figure 6), a userform will ask to choose between yield and price breakeven points (e.g., net returns equal to zero - see Figure 9).

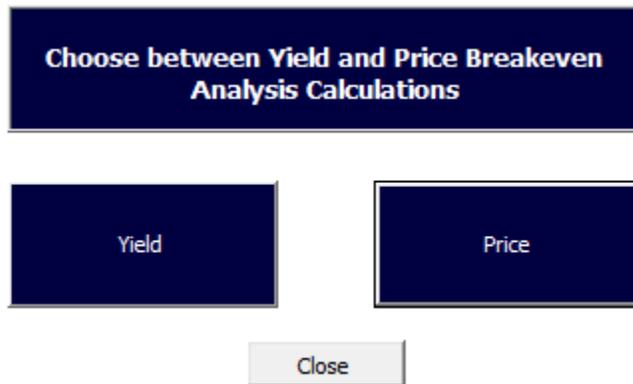


Figure 9. Breakeven Analysis

A breakeven yield analysis summary is shown in Figure 9.1. All these values are interactive and will be updated automatically if any input (including expected prices and expected yields) is changed.

Expected Values					
Average Fresh Market Price (\$/lb)	Average Processed Market Price (\$/lb)	Fresh Market Yield (lb/ac/7yr)	Processed Market Yield (lbs/ac/7yr)	Total Revenues (\$/ac/7yr)	Cumulative Total Costs (\$/ac/7yr)
2.67	1.00	59,073	16,788	121,260	63,344

Breakeven Yield Analysis					
Total Costs of Production (\$/ac)	Fresh Market Production (\$/ac)	Breakeven Fresh Yield (lb/ac)	Total Costs of Production (\$/ac)	Processed Market Production (\$/ac)	Breakeven Processed Yield (lb/ac)
63,344	104,094	20,429	63,344	16,788	8,797
Expected Fresh Market Price (\$/lb)	Total Revenues (\$/ac)		Expected Processed Market Price (\$/lb)	Total Revenues (\$/ac)	
2.67	121,260		1.00	121,260	
Breakeven Fresh Yield (lb/ac)	Expected Fresh Market Price (\$/lb)	+	Breakeven Processed Yield (lb/ac)	Expected Processed Market Price (\$/lb)	=
20,429	2.67		8,797	1.00	
					Cumulative Total Costs (\$/ac/7yr)
					63,344

Figure 9.1. Example of Yield Breakeven Analysis

3.2. Sensitivity Analysis

This tool also allows producers to examine “What If” scenarios to make better planning and investing decisions. A “What If” analysis is also called a sensitivity analysis. This technique is used to determine how different values of an input will impact the final product. In other words, a sensitivity analysis is a way to predict the outcome of a decision if a situation turns out to be different from the current situation. Here, a user might like to know how the cumulative total costs, gross revenues, and net returns will be affected if a change occurs (for example, unexpected lower yields, lower prices, etc.).

The “Sensitivity Analysis” icon (e.g., “What If Analysis”) is located on the right side of the “Economics” screen (Figure 6). Clicking on that icon will load the Sensitivity Analysis Userform (Figure 10). Values for one or more inputs (related to yields, production usage or prices) can be changed to conduct a “What If” analysis. Once the desired values have been changed, a new breakeven analysis as well as new values for cumulative gross revenues and net returns will be calculated. This “What If” analysis presents instantly the impact of a change in one or more of the inputs on the economic feasibility of the whole blueberry crop.



	Yield lbs/plant	Production Usage (%)		Market Price (\$/lb)	
		Fresh Market	Processed Market	Fresh Market	Processed Market
Year 1	0.37	80	20	2.67	1.00
Year 2	0.75	80	20	2.67	1.00
Year 3	3.00	80	20	2.67	1.00
Year 4	6.00	80	20	2.67	1.00
Year 5	6.00	80	20	2.67	1.00
Year 6	6.00	80	20	2.67	1.00
Year 7-15	6.00	80	20	2.67	1.00

Figure 10. Sensitivity Analysis Userform

Figure 10.1 displays the available analysis options from which the user can choose.

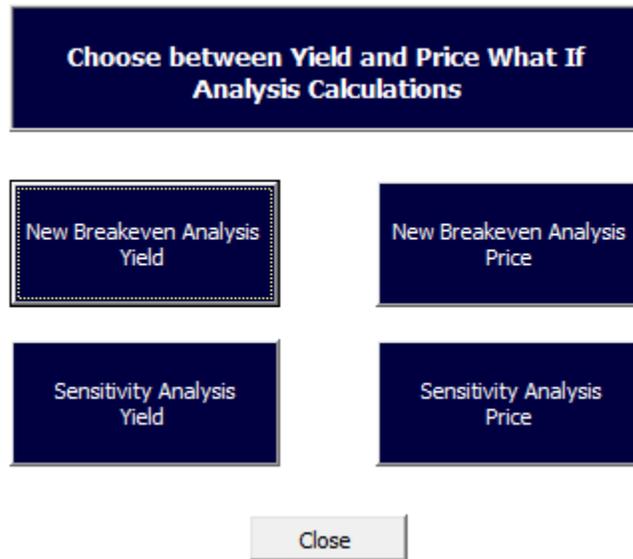


Figure 10. 1 Sensitivity Analysis Options

Additionally, the tool will estimate the net returns for different fluctuations (+/- 25% by 5% intervals) from the average for yield and prices (Figure 10.2).

Percentage	Yield (lbs/ac)	Net Returns (\$/ac)
-25%	5,274	-42,178
-20%	5,626	-37,065
-15%	5,978	-31,952
-10%	6,329	-26,839
- 5%	6,681	-57,900
0% *	7,033	-16,614
5%	7,384	-11,501
10%	7,736	-6,388
15%	8,087	-1,275
20%	8,439	3,838
25%	8,791	8,951

* Baseline - Average Yield over 12 years of production

Figure 10. 2 Sensitivity Analysis – Net Returns (\$/ac) Yield Fluctuations

3.3. Risk Analysis

This tool includes a risk analysis component. In this tool, risk analysis is defined as a technique that calculates the probability of obtaining a cumulative net return greater than a specific dollar target (e.g., \$75,000). This target is set by the user. To access the risk analysis component, click the "Risk Analysis" icon located in the "Economics" screen (bottom right corner, see Figure 6). The form will open with default values but they can be changed at any time (Figure 11).

Enter new "minimum", "most likely" and "maximum" values for yield (lb./plant) and prices (\$/lb.). Enter the percentage of usage for each quality each year. Enter the percentage by which the total cost should increase or decrease each year, a net return target dollar amount (\$/area) that you expect to receive at the end of the 15 years of production. After all the input information is recorded, click "Run".

Please indicate your expected minimum, most likely and maximum yield each year...

Yield (lbs/plant)

	Minimum	Most Likely	Maximum
Year 1	0.10	0.20	0.37
Year 2	0.20	0.37	0.75
Year 3	0.50	0.75	1.50
Year 4	2.00	3.00	4.00
Year 5	5.00	6.00	7.00
Year 6	5.00	6.00	8.00
Year 7 - 15	5.00	6.00	9.00

Cancel << Back Next >> **Finish**

Figure 11. Risk Analysis Userform

The model will calculate the probability of the net returns value being equal or greater than a specific dollar target; in this example \$75,000. To do this, the model will simulate 1,000 iterations to gain a better understanding of the range of possible cumulative net returns. It also calculates the range where the average net return will lie (Figure 12).

Results of this field production risk analysis example show that this operation has a 46.75% (out of 100%) chance that it will earn more than \$75,000 over the life of the operation. Furthermore it is most likely (a 95% chance) that the actual amount earned will fall somewhere between \$74,065 and \$75,025 over the life of the operation. Additionally, new scenarios can be compared to a baseline. Baselines are different for each production system.

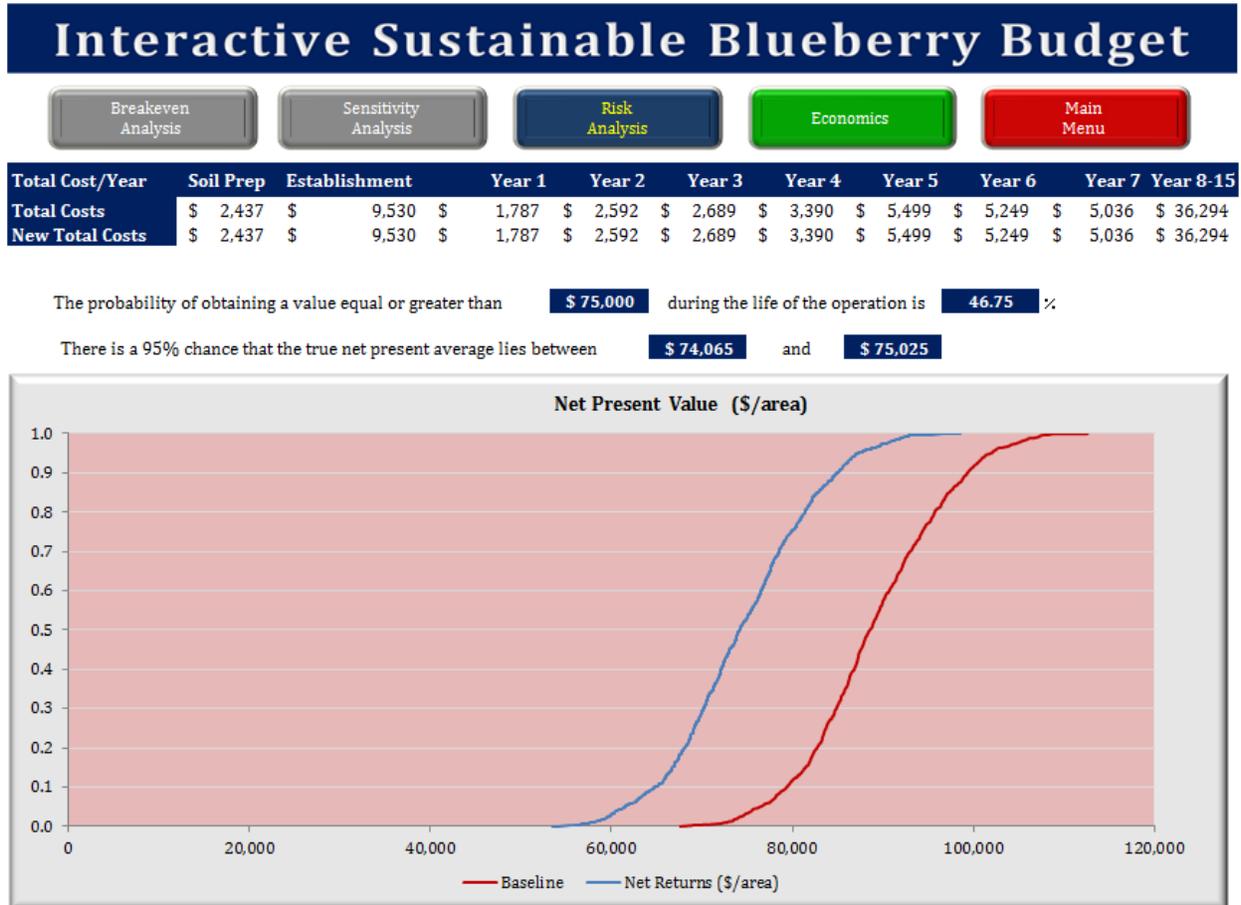


Figure 12. Conventional Field Production - Risk Analysis Output Example

4. HELP AND OTHER TOPICS

This tool provides several ways to display help. There is a “*Help*” icon located in all screens. Click this icon to access a form with nine different topics (i.e., Quick Start, Initial Input, Demo, Editing Input, Summary, Economics, Breakeven, Sensitivity and Risk Analyses). Select a topic from the list or view the topics sequentially by clicking the “Previous” and “Next” buttons (Figure 13).

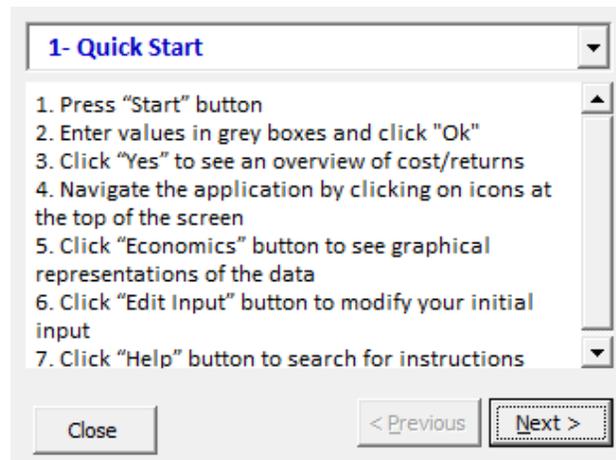


Figure 13. Help Topics

If invalid input (i.e., letters or negative numbers) is entered or there is missing input, warning messages will appear to help the user to change the entry to an appropriate value (Figure 14).

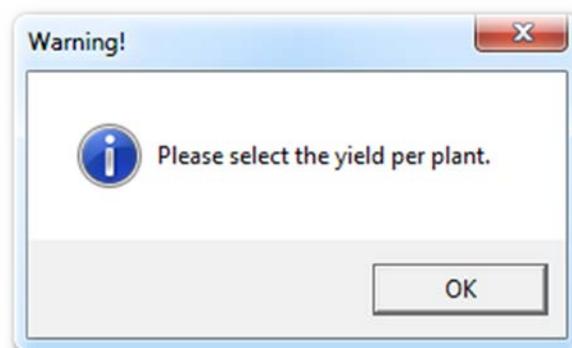


Figure 14. Warning Messages

5. GLOSSARY

Breakeven is the point at which *total cost* and *revenue* (i.e., gross revenues) are equal: there is no net loss or gain (i.e., the producer has "broken even").

Breakeven price is the amount of money for which a product (i.e., blueberry) must be sold to cover the costs of producing it. In this tool, the breakeven price is calculated assuming that the total costs of production must be covered.

Breakeven yield is the yield required to cover the total cost of producing berries. In other words, it is the point at which the money brought in from the sale of berries is equal to the total cost of producing berries.

Cash flow is an amount of money that is either paid out (total cash has decreased; negative) or received (total cash has increased; positive) at the end of a period of time.

Cumulative net returns is the aggregate amount that an investment or production process has gained or lost over a period of time. In this case, it is the addition of all gross revenues minus the addition of all total costs during seven years of production.

Depreciation (amortization schedule) is the amount of each payment allocated to principal and interest. Every payment made on a loan is split between principal and *interest*. An amortization schedule provides the exact amount remaining on a loan after each payment is made.

Fixed costs are independent of the quantity of a good produced and include inputs (capital) that cannot be varied in the short term, such as buildings and machinery.

Fresh market fruit is high quality berries ("Quality 1") that are free of injury, decay, calyxes (caps) and sunscald, are fully black in color, appear and feel turgid, and are of regular shape. To meet U.S. Grade 1, $\leq 1\%$ of the lot must be free from mold and 5% free of other defects.

Interest is the additional amount of money gained/paid between the beginning and the end of a time period.

Interest rate is the change, expressed as a percentage, in the amount of money during the length of time that must occur before *interest* is added to the total.

Net present value (NPV) is the sum of the present values (PVs) of incoming and outgoing cash flows over a period of time. Because of the time value of money, a dollar earned in the future will not be worth as much as one earned today. The discount rate in the NPV formula is a way to account for this (Please see section 3.)

Net return is the money a producer makes after accounting for all the blueberry production expenses. It is calculated as: Gross Revenues minus Total Costs.

Present value is the value of an expected income stream determined as of the date of valuation. The present value is always less than or equal to the future value because money has interest-earning potential or “A dollar today is worth more than a dollar tomorrow” (Please see section 3).

Processed market fruit consists of berries of one variety which fail to meet the requirements of the U.S. No. 1 grade but which do not contain more than 10 percent, by volume, of berries in any lot which are seriously damaged by any cause, including therein not more than 2 percent for berries which are affected by mold or decay. In this guide, these berries are referred as “Quality 2” fruit.

Revenue (Gross revenues) is income that a farm receives from the sale of berries to customers. In other words, it is the total amount of money received by a producer from the sale of any given quantity of berries. It is calculated as: Quantity times Price.

Risk analysis calculates the probability of obtaining a *net present net return* value greater than a specific dollar target.

Sensitivity analysis determines how different values of an input will impact the final product or good. It helps to predict the outcome of a decision if a situation turns out to be different from the current situation. Same as a “What if” analysis.

Total costs describe the total economic cost of production and is made up of *variable costs* plus *fixed costs*.

Variable costs are costs that change in proportion to the good that a farm produces and include inputs such as labor and raw materials.

What If (See *Sensitivity analysis*)

6. ADDITIONAL RESOURCES

Author(s)/ Company	Title/Link
Edwards, W., A. Johanns, and A. Chamra	2013 Iowa farm custom rate survey
FarmTek - High Tunnels	High Tunnel Prices
Four Seasons Tools - High Tunnels	High Tunnel Prices
Galinato, S.P., and T.W. Walters	2011 Cost estimates of producing berries in high tunnel Washington
Garden Organic - Henry Doubleday Research Association	How to grow berries
Irrigation - DripWorks	Irrigation Price Information
Irrigation - Mechanical Transporter Company	Plastic Mulch Prices
Pike, A.W.	2013 Machinery custom rates
Rimol - Greenhouses Systems	High Tunnel Prices
Stiles, S., and T. Griffin	Estimating farm machinery costs

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DISCLAIMER

Activities and prices were based on research conducted at the Fruit Production Research Unit at the Division of Agriculture, Agricultural Research and Extension Center, Fayetteville, AR. The practices described are based on production procedures considered typical for this crop in Northwest Arkansas, and may not apply to every blueberry crop. The costs, practices, and materials will not be applicable to all situations or every production year. Users are encouraged to replace default information with that specific to their operations.

This material is provided as an educational tool and is not a substitute for individualized technical advice. This budget should be used as a guide only. Please direct all production questions to your university Horticulture Department or your local Cooperative Extension Service office.

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