

# Organic Forages for Pasture - Estimated Costs of Production

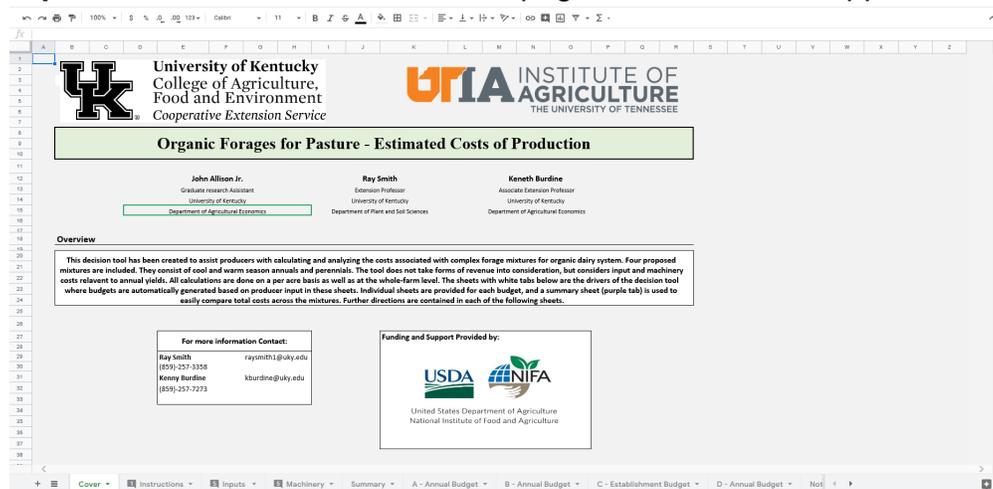
## *Supplemental Information for the Excel Tool*

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Cool season forages, such as tall fescue, orchardgrass, red and white clover, and alfalfa, frequently dominate pasture systems in the southeast. Plant growth of cool season forages decreases during periods of elevated temperatures and decreased precipitation; consequently, impacting animal production. Due to decreased grazing intake, many livestock and dairy producers supplement with hay and concentrates. However, organic dairy cows, must obtain a minimum 30% of their dry matter intake from pasture during the growing season, and are challenged with maintaining adequate milk production during summer months.

Novel forage mixtures are being evaluated for organic dairy cows in the southeast. This excel decision tool<sup>1</sup> compares warm and cool season annual forages to a cool season perennial forage system. This is especially important due to a general unfamiliarity with many of these annual forage species and the necessity of annual establishment. It has been created to assist producers with calculating and analyzing the costs associated with complex forage mixtures for organic dairy systems. Insight on utilizing the decision support tool can first be found by reading the cover and instruction pages on the spreadsheet. However, each tab is discussed in further detail below.

**Screen Capture 1.** The Cover tab is the first page in the decision support tool.



<sup>1</sup>Annual Forage Production Decision Tool and Cost Analysis Excel Document can be found at <https://forages.ca.uky.edu/decisionaids>

# Instructions

To navigate to other pages of the tool, use the white tabs at the bottom of the excel sheet. Since Mixture C contained perennial cool-season forages and no warm season forages it was considered to be the baseline control for this study (Screen Capture 2, Table 1). Details on this page should provide enough understanding to allow a user to continue navigating to the next tab of the document (the "Inputs" tab).

**Screen Capture 2.** The Instructions page explains how to use the document, contains a table of contents, and gives a detailed description of the forages used in this study.

The screenshot shows an Excel spreadsheet with the following content:

### Instructions & Information

- 1) Table 1 presents the proposed forage mixtures and species that are analyzed in the decision tool.
- 2) Hyperlinks are included above Table 1 for each section of this tool. To jump to a given sheet, click on the name of that sheet.
- 3) The white tabs below ("Inputs", "Machinery", etc.) are the sheets that drive the calculations in the decision tool. Within each of these sheets, users add their inputs, quantities, seeding rates, costs, yields, and relevant machinery. Based on this information, the "Inputs" and "Machinery" sheets, for the costs of each individual mixture, and a "Summary" sheet (purple tab) are automatically generated.
- 4) On the purple "Summary" tab, the producer can input information related to allocated acres for the given mixtures resulting in total costs being calculated at a whole-farm level.
- 5) When navigating the workbook, cells that are filled with a light blue color are those that allow user input. All other cells will be locked - including sheets that do not require user input. Cells with a red triangle at the top right corner contain more information for the user.
- 7) The grey "notes" tab below contains supplemental information relating to assumed nutrient content of manures and other information that may be beneficial to the user.

Hyperlinks to Workbook Sheets	
Input Data for Budgets	<a href="#">Annual Budget - Forage Mix A</a>
Machinery Cost Data for Budgets	<a href="#">Annual Budget - Forage Mix B</a>
Notes	<a href="#">Establishment Budget - Forage Mix C</a>
Summary of Budgets Across All Mixtures	<a href="#">Annual Budget - Forage Mix D</a>

**Table 1. Proposed Forage Mixtures and Description**

Mixture	Mix Name	Abbreviation	Species	Scientific Name	Classification	Life Cycle
A	Warm Red Clover	WRC	Annual Ryegrass	<i>Lolium multiflorum</i>	Cool Season Grass	Annual
			Red Clover	<i>Trifolium pratense</i>	Cool Season Legume	Perennial
			Crabgrass	<i>Digitaria ciliaris</i>	Warm Season Grass	Annual
			Annual Lespedeza	<i>Kummerowia striata</i>	Warm Season Legume	Annual
B	Warm Crimson Clover	WCC	Annual Ryegrass	<i>Lolium multiflorum</i>	Cool Season Grass	Annual
			Crimson Clover	<i>Trifolium incarnatum</i>	Cool Season Legume	Annual
			Sorghum-Sundangrass	<i>Sorghum bicolor</i> x <i>S. bicolor</i> var. <i>sudanense</i>	Warm Season Grass	Annual
C	Cool Season	CS	Cow Pea	<i>Vigna unguiculata</i>	Warm Season Grass	Annual
			Alfalfa	<i>Medicago Sativa</i>	Cool Season Legume	Perennial
			Red Clover	<i>Trifolium pratense</i>	Cool Season Legume	Perennial
			Orchardgrass	<i>Daactylis glomerata</i>	Cool Season Grass	Perennial
D	Warm Turnip and Rape	WTR	Tall Fescue	<i>Festuca arundinacea</i>	Cool Season Grass	Perennial
			Forage Turnip	<i>Brassica rapa</i>	Cool Season Brassica	Annual
			Forage Rape	<i>Brassica napus</i>	Cool Season Brassica	Annual
			Spring Oats	<i>Avena sativa</i> L.	Cool Season Grass	Annual
			Annual Ryegrass	<i>Lolium multiflorum</i>	Cool Season Grass	Annual
Sorghum-sudangrass	<i>Sorghum bicolor</i> x <i>S. bicolor</i> var. <i>sudanense</i>	Warm Season Grass	Annual			
Cowpea	<i>Vigna unguiculata</i>	Warm Season Grass	Annual			

# Inputs

Despite the many blue cells, some may not need to be changed. The seed quantities present in Table 5 and the yields in Table 1, are the actual quantities used in the on-farm trials associated with this study. Remember, that all cells do not have to be used, but they must contain a value. For example, if you do not want to include “other labor” (which would be any labor hours other than operator labor hours), this blue cell should contain a 0 value. Forage Stand Useful Life pertains to costs that are prorated for stand life. For Mixture C, this includes all seed and lime. Since the other mixtures are all or mostly annual forages, the only prorated items are “Lime & Application” and red clover seed in Mixture A. “Forage Utilization Efficiency” refers to the quantity and distribution of forage consumed by grazing animals. Contained in the note on this tab are percent efficiency assumptions based on the amount of time in days that animals are allowed to graze a specific area.

**Screen Capture 3.** General Input Quantities and Prices do not include costs associated with machinery.

**General Input Quantities and Prices**

1) This page is important for cost calculations and takes into consideration all input factors aside from MACHINERY which will be explored in the next sheet.

2) All cells filled with a light blue color require user input. If an input section is not relevant, it is important to place a ZERO in that cell to ensure accurate cost calculations.

Mixture	Tons/Acre (Dry Matter)
Mix A (WRC)	4
Mix B (WCC)	4
Mix C (CS)	4
Mix D (WTR)	4

Input	Quantity (units/acre)
Manure (tons)	2
Lime (tons)	2
Grazing/Rotation Labor (hours)	1
Fence Maintenance Labor (hours)	1
Other Labor (hours)	0
Operating Interest (%)	6%
Interest Period (Months)	6
Forage Stand Useful Life (years)	4
Forage Utilization Efficiency (%)	70%

Input	Dollars Per Unit
Manure (\$/ton)	\$15.00
Lime (\$/ton)	\$20.00
General Labor (\$/hour)	\$11.00
Operator Labor (\$/hour)	\$18.00
Farm Diesel (\$/gallon)	\$2.25
Pasture Cash Rent Equiv. (\$/acre)	\$45.00
Rental	\$0.00
Other Variable Costs	\$0.00
Other Fixed Costs	\$0.00

Species	Dollars Per Pound
Alfalfa	\$4.50
Annual Leppedeza	\$4.50
Annual Ryegrass	\$0.95
Cowpea	\$1.69
Crabgrass	\$7.50
Crimson Clover	\$1.50
Orchardgrass	\$3.50
Rape	\$2.50
Red Clover	\$3.00
Sorghum-Sudangrass (Sudex)	\$1.06
Spring Oat	\$0.40
Tall Fescue	\$3.50
Turnip	\$2.50

Mixture and Species	Pounds Per Acre	Mixture and Species	Pounds Per Acre
<b>Mix A - Warm Red Clover (WRC)</b>			
Red Clover	8	Crimson Clover	16
Annual Ryegrass	20	Annual Ryegrass	20
Crabgrass	4	Sorghum-Sudangrass (Sudex)	30
Annual Leppedeza	15	Cowpea	25
<b>Mix B - Warm Crimson Clover (WCC)</b>			
<b>Mix C - Cool Season (CS)</b>			
Red Clover	5	Turnip	3
Alfalfa	10	Rape	4
Orchardgrass	5	Spring Oat	32
Tall Fescue	8	Annual Ryegrass	12
		Sorghum-Sudan (Sudex)	30
		Cowpea	25
<b>Mix D - Warm Turnip and Rape (WTR)</b>			



This step also allows the user to specify the number of times they may complete a specific soil preparation method and/or whether they will use a no-till drill or a broadcast seeder. Finally, the number of times manure is spread and the pastures are cut on an annual basis are used to calculate each of these additional costs.

**Step 4:** Depending on which machinery costs were selected in Step 1, final costs can be viewed in either Table 7 or Table 9. Mixture budgets and a whole-farm summary are calculated from these tables.

## Individual Budgets

Specific and associated costs to each mixture are itemized and totaled in the annual budget tabs. User input is not required on any budget tabs.

**Screen Capture 5.** The budget for Mix A shows a prorated cost for “Lime & Application” as well as red clover seed.

Warm Season Red Clover Mixture for Pasture (Mix A) - Estimated Total Annual Costs Per Acre					
Species:	Annual Ryegrass, Red Clover, Crabgrass, Annual Lespediza			Yield (DM Tons/Acre):	4
	Quantity	Unit	Price	Total	
<b>Variable Establishment Costs (prorated for stand life)</b>					
Lime & Application	2	tons	\$20.00	\$10.00	
Red Clover Seed	8	lbs	\$3.00	\$6.00	
<b>Total Variable Establishment Costs Per Acre</b>				<b>\$16.00</b>	
<b>Variable Costs Per Acre</b>					
Dairy Manure	2	tons	\$15.00	\$30.00	
Annual Ryegrass Seed	20	lbs.	\$0.95	\$19.00	
Crabgrass Seed	4	lbs.	\$7.50	\$30.00	
Annual Lespediza Seed	15	lbs.	\$4.50	\$67.50	
Other Labor	0	hrs.	\$11.00	\$0.00	
Custom Hire	1	acre	\$114.42	\$114.42	
Machinery Rental	1	acre	\$0.00	\$0.00	
Machinery Fuel and Lube	1	acre	\$0.00	\$0.00	
Machinery Repairs & Maintenance	1	acre	\$0.00	\$0.00	
Cash Rent Equivalent	1	acre	\$45.00	\$45.00	
Other Variable Costs	1	acre	\$0.00	\$0.00	
Operating Interest	6%	\$321.92	dollars	Months 6	\$9.66
<b>Total Variable Costs Per Acre</b>				<b>\$315.58</b>	
<b>Fixed Costs Per Acre</b>					
Operator Labor	0	hrs.	\$18.00	\$0.00	
Machinery Depreciation and Overhead	1	acre	\$0.00	\$0.00	
Other Fixed Costs	1	acre	\$0.00	\$0.00	
<b>Total Fixed Costs Per Acre</b>				<b>\$0.00</b>	
<b>Total Variable &amp; Fixed Costs Per Acre</b>				<b>\$331.58</b>	
<b>Average Cost Per Ton of Dry Matter</b>				<b>\$82.89</b>	

**Screen Capture 6.** Mixture C contains only perennials so seed costs are “prorated for stand life”. Therefore, Mixture C has a lower annual cost when compared to the other mixtures containing more annuals.

Cool Season Mixture for Pasture (Mix C) - Estimated Total Annual Costs Per Acre						
Species:	Alfalfa, Red Clover, Orchardgrass, Tall Fescue			Yield (DM Tons/Acre):	4	
	Quantity	Unit	Price	Total		
<b>Variable Establishment Costs (prorated for stand life)</b>						
Lime & Application	2	tons	\$20.00	\$10.00		
Alfalfa Seed	10	lbs.	\$4.50	\$11.25		
Red Clover Seed	5	lbs.	\$3.00	\$3.75		
Orchardgrass Seed	5	lbs.	\$3.50	\$4.38		
Tall Fescue Seed	8	lbs.	\$3.50	\$7.00		
Custom Hire (Relative to Tillage & Seeding)	1	acre	\$56.50	\$14.13		
<b>Total Variable Establishment Costs Per Acre</b>				<b>\$50.50</b>		
<b>Variable Costs Per Acre</b>						
Dairy Manure	2	tons	\$15.00	\$30.00		
Other Labor	0	hrs.	\$11.00	\$0.00		
Custom Hire	1	acre	\$38.42	\$38.42		
Machinery Rental	1	acre	\$0.00	\$0.00		
Machinery Fuel and Lube	1	acre	\$0.00	\$0.00		
Machinery Repairs & Maintenance	1	acre	\$0.00	\$0.00		
Cash Rent Equivalent	1	acre	\$45.00	\$45.00		
Other Variable Costs	1	acre	\$0.00	\$0.00		
Operating Interest	6%	\$163.92	dollars	Months	6	\$4.92
<b>Total Variable Costs Per Acre</b>				<b>\$118.34</b>		
<b>Fixed Costs Per Acre</b>						
Operator Labor	0	hrs.	\$18.00	\$0.00		
Machinery Depreciation and Overhead	1	acre	\$0.00	\$0.00		
Other Fixed Costs	1	acre	\$0.00	\$0.00		
<b>Total Fixed Costs Per Acre</b>				<b>\$0.00</b>		
<b>Total Variable &amp; Fixed Costs Per Acre</b>				<b>\$168.84</b>		
<b>Average Cost Per Ton of Dry Matter</b>				<b>\$42.21</b>		

## Summary of Costs

The Summary tab is used to compare costs per acre among the four different mixtures. To allow producers to make well-informed decisions regarding animal nutrition, the summary tab costs are calculated on a dry matter basis. “Average Cost per Ton of Utilized Forage” is an estimated cost of forage dry matter being consumed by animals. This cost takes into account the percent utilization efficiency that was accounted for on the “Inputs” sheet. If multiple mixtures are being used on the same farm, the summary tab can also be used as a whole farm budget. By inputting the

number of acres for each mixture, per acre costs are automatically adjusted. Then a “tons/farm” total is generated to calculate the annual costs per acre for the whole farm.

**Screen Capture 7.** The Summary tab shows costs across mixtures and the whole farm.

This summary page allows a quick overview of per acre costs between the four mixtures. It also allows for users to input the total number of acres consisting of the different mixtures to determine whole-farm cost and yield calculations. Only the four blue cells on the right of this page require user input.

Summary of Costs Per Acre					Summary of Costs Whole-Farm				
	Mix A (WRC)	Mix B (WCC)	Mix C (CS)	Mix D (WTR)		Mix A (WRC)	Mix B (WCC)	Mix C (CS)	Mix D (WTR)
Typical Annual Yield (tons/acre)	4	4	4	4	Typical Annual Yield (tons/acre)	4	4	4	4
					Total Acres Planter	10	10	10	10
					Total Annual Yield (tons/farm)	40	40	40	40

Annual Costs (\$/acre)					Annual Costs (\$/acre)					Total Whole-Farm
	Mix A (WRC)	Mix B (WCC)	Mix C (CS)	Mix D (WTR)		Mix A (WRC)	Mix B (WCC)	Mix C (CS)	Mix D (WTR)	
Total Seed Costs	\$122.50	\$117.05	\$26.38	\$115.75	Total Seed Costs	\$1,225.00	\$1,170.50	\$263.75	\$1,157.50	\$3,816.75
Prorated Establishment Costs	\$16.00	\$10.00	\$50.50	\$10.00	Variable Costs	\$3,315.76	\$3,259.62	\$1,688.36	\$3,108.03	\$11,371.76
Variable Costs	\$331.58	\$325.96	\$168.84	\$310.80	Fixed Costs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fixed Costs	\$0.00	\$0.00	\$0.00	\$0.00	Total Costs	\$3,315.76	\$3,259.62	\$1,688.36	\$3,108.03	\$11,371.76
Total Costs	\$331.58	\$325.96	\$168.84	\$310.80						
Average Cost per Ton Dry Matter	\$82.89	\$81.49	\$42.21	\$77.70						
Average Cost Per Ton Of Utilized Forage	\$118.42	\$116.42	\$60.30	\$111.00						

**Overview**

The “Organic Forages for Pasture – Estimated Costs of Production” decision tool is the product of a multi-state research effort funded by the USDA National Institute of Food and Agriculture. This research assessed warm season annual forage mixtures’ ability to meet the nutritional needs of dairy cows during the summer months when yields of cool season forages decrease in the southeast. This tool was created to help inform farmers of the costs associated with establishing and maintaining various forage mixtures.

Comparisons are made between warm season annual mixtures and perennial cool season mixtures. Download the Annual Forage Production Decision Tool and Cost Analysis at:

<https://forages.ca.uky.edu/decisionaids>