

**CYMIDA - An Interactive Computerized Cotton
Yield Monitor Investment Decision Aid: User
Guide for Version 1.2.61**



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CYMIDA - An Interactive Computerized Cotton Yield Monitor Investment Decision Aid: User Guide[†]

R.L. Cochran, J.A. Larson, R.K. Roberts, B.C. English, and B.S. Wilson

Introduction

An integral part of precision farming is the advanced computer-based technologies that are used to identify and measure spatial variability of crop yields in a farm field and its causes, prescribe site-specific seed, fertilizer, chemical, and other input applications that match varying crop and soil needs, and apply those inputs as prescribed using variable rate technology (VRT). A popular entry point for farmers interested in precision farming is the installation of computerized yield monitors on harvesting equipment (Lowenberg-DeBoer, 1998). Electronic yield monitoring technology provides farmers with a way to collect detailed field spatial information about crop yields. Spatial yield data that have been referenced to specific locations in a farm field using Global Positioning System (GPS) can then be converted from raw data into a yield map using Geographic Information System (GIS)-based precision farming computer applications. This database of field spatial variability can be combined with other information (e.g., grid soil sample data, plant mapping information, etc) to make field maps for variable rate input application and other site-specific management choices.

Because cotton yield monitors are a relatively new precision farming technology, growers lack information about the ownership costs of a yield monitoring information system. This cost information is useful for evaluating what returns are required from the use of spatial yield information in management decision making to cover the costs of gathering and analyzing yield data. This publication describes the Cotton Yield Monitor Investment Decision Aid (CYMIDA). CYMIDA is an interactive computerized decision aid that is designed to help you evaluate the yield gains and input savings required to pay for investment in a cotton yield monitoring system. A description of the economic breakeven analysis relationships that are used in CYMIDA to determine the yield gains and input savings required to pay for the yield monitor information system are described in the first section of this publication. Section II explains how to use CYMIDA. The final part of this publication provides an investment analysis example using CYMIDA.



[†] Funding for CYMIDA that was provided by Cotton Incorporated is gratefully acknowledged.

**Section I - Description of the Partial Budgeting and Breakeven
Analysis Methods Used in CYMIDA**

Analytical Framework for CYMIDA

NOTE: This section documents the partial budgeting and breakeven analysis methods used in CYMIDA. You do not need to read this section to use CYMIDA. To begin using CYMIDA, proceed directly to Section II: Getting Started with CYMIDA.

CYMIDA utilizes partial budgeting and breakeven techniques to evaluate the potential costs and benefits of a cotton yield monitoring information system. Partial budgeting, which incorporates marginal analysis techniques, is particularly useful for analyzing the addition of equipment to a farm enterprise (Boehlje and Eidman, 1984). Breakeven analysis methods are used to calculate the level of a variable needed to obtain a desired level of profit. When breakeven analysis and partial budgeting are combined, they can provide insight into the potential economic effects of changes in revenues and costs associated with the decision to purchase the yield monitoring information system.

Equation (1) summarizes the potential net benefits of a cotton yield monitoring information system:

$$(1) \quad \pi = \sum_{i=1}^n [(p\Delta y_i - r_i\Delta x_i - vrc_i)\lambda_i - oic_i] - \frac{occ}{ca} - \frac{oco}{ca + oa},$$

where π is the net dollar return from the cotton yield monitoring information system (\$/acre), p is cotton lint price (\$/lb), Δy_i is gain in lint yield (lb/acre) from applying crop input x_i (units/acre) using the yield monitoring information system to make variable rate input decision i , λ_i is proportion of crop acreage affected by the management decision, r_i is price per unit of crop input x_i , vrc_i is difference in input application costs (\$/acre) for variable rate technology (VRT) versus uniform rate technology (URT), oic_i is cost (\$/acre) of other information used to make the VRT decision (e.g., grid soil sampling information, cotton plant mapping data, field scouting information), occ is ownership costs for yield monitoring system equipment components that are specific to the cotton enterprise, and oco is ownership costs for yield monitoring system equipment components that can be used for other crop enterprises, ca is cotton enterprise acreage, and oa is other crop enterprise acreage.

Because some information system components can be used for crops other than cotton, ownership cost for system component j is modeled in CYMIDA using the following cost calculation relationships (ASAE, 2003; Boehlje and Eidman, 1984):

$$(2) \quad occ = \sum_{j=1}^m pt_j \times (1 - sv_j) \times cr + pt_j \times sv_j \times i + pt_j \times tih + oe$$

and

$$(3) \quad oco = \sum_{j=1}^m pt_j \times (1 - sv_j) \times cr + pt_j \times sv_j \times i + pt_j \times tih + oe$$

where pt_j is the purchase price of yield monitoring equipment component j (\$), sv_j is the salvage value as a percentage of purchase price (%), cr is a capital recovery factor (%), i is the real rate of interest representing the opportunity cost on farmer capital (%), tih is taxes, insurance, and housing as a percentage of purchase price (%), and oe is other annual expenses (\$) incurred from ownership of information system. The capital recovery term $[pt_j \times (1 - sv_j) \times cr]$ in equations (2) and (3) represents the amount of money set aside to account for the loss in value (depreciation) of equipment due to wear, obsolescence, and age and the opportunity cost (interest charge) on capital tied up in investment in the information system. The cr term is calculated using the following relationship (Boehlje and Eidman, 1984):

$$(4) \quad cr = \frac{i}{1 - (1 + i)^{-t}},$$

where t is the estimated useful life of the investment (years). The second term in equations (2) and (3) represents an interest charge on any projected equipment salvage value. Besides depreciation and interest, annual charges for taxes, insurance, and housing (tih) are the other costs typically associated with machinery and equipment ownership (Boehlje and Eidman, 1984; ASAE, 2003). Taxes represent any personal property taxes, if any, that can be assessed on the purchased property. Insurance is for the cost of providing insurance coverage for potential damage or loss of equipment. Housing is a general overhead charge for the cost of providing shelter for equipment. Other expenses (oe) might include such other annual costs as an annual GPS signal subscription and an annual allowance for attending workshops on how to use site-specific information in management decision making.

Ownership costs for the information system are assumed to be a function of crop acreage. Physical limitations on the crop acreage that a cotton picker can cover in a day and the limited harvest season for cotton in the United States as influenced by weather dictate how many pickers (and thus the number of yield monitors) are required for a given cotton acreage (Cooke, Parvin, and Spurlock, 1991). These physical limitations on cotton harvest determine how much crop acreage over which the costs of the cotton yield monitoring system can be distributed.

Equation (1) can be used to evaluate the breakeven yield gains required to pay for the information system. The breakeven lint yield gain relationship derived by algebraic manipulation of equation (1) is:

$$(5) \quad n \sum_{i=1}^n \Delta y_i \lambda_i = \frac{\sum_{i=1}^n (r_i \Delta x_i \lambda_i + vrc_i \lambda_i + oic_i) + \frac{occ}{ca} + \frac{oco}{ca + oa} + \pi}{p},$$

where $n \sum_{i=1}^n \Delta y_i \lambda_i$ is the cotton enterprise average total yield gain (lb/acre) over n input choices.

Equation (5) is used in CYMIDA for two-way sensitivity analysis (Clemen and Reilly, 2001) by varying one or more of the variables on the right hand side and evaluating the resulting impact on the required yield gains to pay for the information system.

Section II: *Getting Started with CYMIDA*

Getting Started with CYMIDA

System Requirements

To use CYMIDA, you should have the following:

- IBM or IBM compatible personal computer
- Hard disk with 1.0 MB free disk space
- Windows 98 or higher

Installing CYMIDA

You must run SETUP from the installation CD to install CYMIDA. To install CYMIDA on your hard disk,

1. Place the CYMIDA CD into your CD-ROM drive.
2. Select **Start | Run**.
3. Type **D:\setup.exe** where D is the letter of your CD-ROM drive, then choose **OK**.
4. Follow the installation instructions on the screen.

CYMIDA will be installed into the **C:\Program Files** directory. After installing all needed files, the setup program will place the CYMIDA program icon on your computer's desktop.

Starting the Program

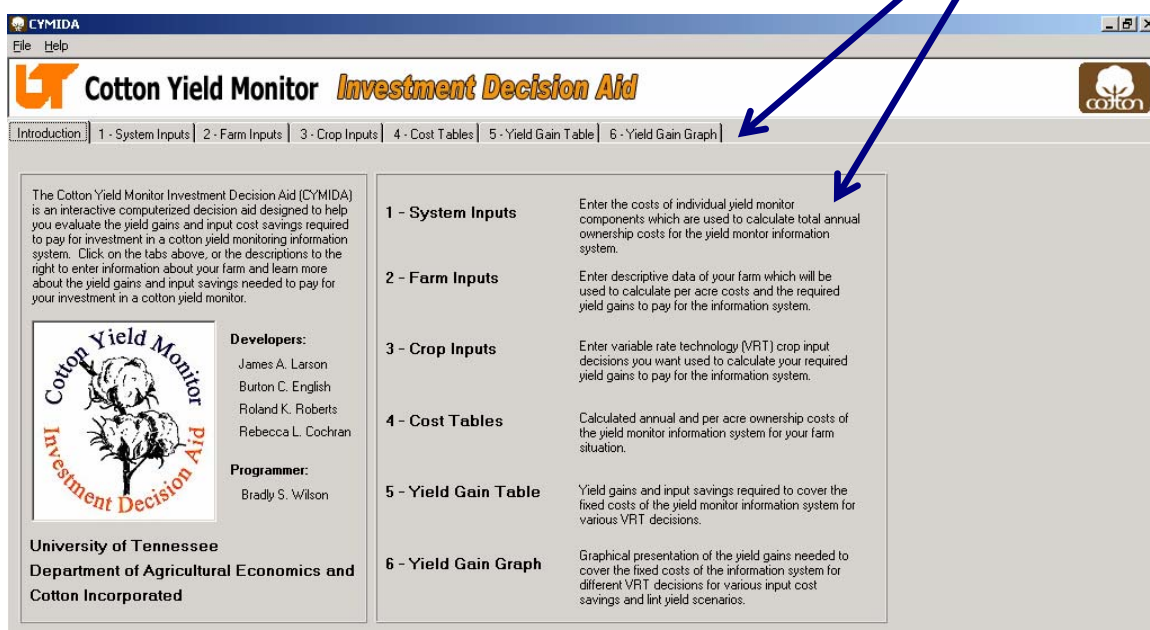
Double-click on the CYMIDA icon on your computer's desktop to start the program.

Entering Information

Figure 2-1

Introduction

You may click on the tabs or the screen description to advance to the next screen.



System Input Data (Figure 2-2)

The system input screen allows you to enter purchase costs, expected useful lives, and salvage values for a cotton yield monitoring system. The default equipment complement includes a general purpose monitor/controller console, cotton flow sensors on every other chute of a cotton picker, a digital GPS receiver, a PCMCIA memory card, a desktop computer and color printer, and GIS mapping software. These components represent the necessary equipment needed to electronically collect and analyze yield data for management decision-making. Default cotton yield monitor costs are from a price list published by Ag Leader Technology (Ag Leader Technology, 2004). CYMIDA also allows you to enter the cost of an annual GPS signal subscription, annual expenses for software training or attending work shops on how to manage and analyze the data from the information system, and custom installation costs for retrofitting a yield monitor on an existing harvester.

CYMIDA assumes that a flow sensor is mounted on every other row of a cotton harvester. You can evaluate the cost of sensors mounted on every row by clicking the yes box for sensors on every row and adjusting per row costs to reflect any per sensor unit price difference. CYMIDA assumes all costs are allocated to the cotton enterprise when calculating ownership costs and breakeven values. You can allocate costs of one or more yield monitoring information system components (except for the cotton sensors and monitor installation) across all crop area by clicking the yes box after each component. Program users may adjust any of the default information on this screen with the arrow buttons on the right side of the box or by typing a new number in the box.

Figure 2-2
System Inputs

Cotton Yield Monitor Investment Decision Aid

Introduction | **1 - System Inputs** | 2 - Farm Inputs | 3 - Crop Inputs | 4 - Cost Tables | 5 - Yield Gain Table | 6 - Yield Gain Graph

Ownership Cost Data

	Purchase Cost	Expected Useful Life	Salvage Value % Purchase Cost	Allocate Costs Across All Crop Area
Cotton Yield Monitoring System				
Monitor/Controller Console	2,295.00	8	0	<input type="checkbox"/> Yes
Cotton Sensors (Cost per Row)	1,592.50	8	0	<input type="checkbox"/> Yes
Sensors Every Row <input type="checkbox"/> Yes				
Global Positioning System	795.00	5	0	<input type="checkbox"/> Yes
Annual GPS Signal Subscription	0.00			<input type="checkbox"/> Yes
Flash Card	100.00	5	0	<input type="checkbox"/> Yes
Monitor Installation	500.00	8	0	<input type="checkbox"/> Yes
Office Computer				
Desktop Computer and Color Printer	1,593.00	3	0	<input type="checkbox"/> Yes
PC Flash Card Reader	28.00	3	0	<input type="checkbox"/> Yes
Software and Training				
Field Mapping Software	1,572.00	20	0	<input type="checkbox"/> Yes
Annual Software Update	434.00			<input type="checkbox"/> Yes
Annual Data Management and Analysis Training	700.00			<input type="checkbox"/> Yes

Click on the Help button for a description of the current screen.

Click on the Yes box to allocate the input cost across all crop area.

Click on the arrows to change the value in the box.

Farm Input Data (Figure 2-3)

The Farm Inputs screen allows you to personalize the investment analysis to your individual farm situation. The proportion of computer costs allocated to yield monitor analysis allows you to choose how much computer time is devoted to yield monitor analysis. The program is defaulted to 1.00 suggesting that the sole purpose of the computer is to analyze yield monitor data. However, if the computer has other uses such as personal finance or children's schoolwork, you can choose the proportion (between 0 and 1) of computer costs that represent the amount of time it is used for yield monitor analysis.

You can also enter information concerning your cotton harvester size, number of cotton acres and other crop acres. CYMIDA assumes that two sensors are used on 4-row and 5-row harvesters, three sensors are used on a 6-row harvester, and four sensors are used on an 8-row harvester. You can change the default area that can be harvested in one season by a cotton harvester by entering your own value. If more than one harvester is required to complete harvest, the program calculates annual ownership costs for equipping each harvester with a yield monitor.

The real rate of interest represents an opportunity cost on the funds that you use to buy the yield monitor system, e.g., your next best alternative might be to invest the funds in the stock market or a CD rather than a yield monitoring system. Taxes as a percent of purchase cost includes any personal property taxes that can be assessed on any equipment related to the yield monitor system. Insurance as a percent of purchase cost includes any insurance carried for equipment replacement due to storms, fire and vandalism. Housing reflects the percent of purchase costs associated with providing equipment housing and maintenance facilities on the farm. It represents a general overhead charge for the cost of housing farm equipment.

CYMIDA uses the average yield that you expect to get on your farm with uniform rate application (URT) practices and the lint price that you expect to receive to calculate required yield gains. The profit goal is the dollars per acre amount you expect as a return on your investment.

Figure 2-3
Farm Inputs

CYMIDA assumes that one 4-row harvester will harvest 712 acres per season. You can change this to match what you do on your farm by entering your own number, e.g., 900 acres/harvester/season.

The screenshot shows the CYMIDA software interface. The title bar reads 'CYMIDA'. Below it is a menu bar with 'File' and 'Help'. The main header area contains the 'Cotton Yield Monitor Investment Decision Aid' logo and a navigation bar with tabs: 'Introduction', '1 - System Inputs', '2 - Farm Inputs', '3 - Crop Inputs', '4 - Cost Tables', '5 - Yield Gain Table', and '6 - Yield Gain Graph'. The '2 - Farm Inputs' tab is selected. The main content area is titled 'Farm Data' and contains two sections: 'Ownership Cost Calculation' and 'Yield, Price, and Profit Goal'. The 'Ownership Cost Calculation' section has input fields for 'Proportion of Computer Costs Allocated to Yield Monitor Analysis' (1.00), 'Cotton Harvester Size (4, 5, 6, or 8 Rows)' (4), 'Cotton Area Harvested/Harvester/Season' (712, circled with a blue arrow), 'Your Cotton Area' (900), 'Your Other Crop Area' (607), 'Real Rate of Interest, %' (7), 'Taxes, % of Purchase Cost' (1), 'Insurance, % of Purchase Cost' (0.75), and 'Housing, % of Purchase Cost' (0.25). The 'Yield, Price, and Profit Goal' section has input fields for 'URT Base Lint Yield' (656), 'Expected Lint Price' (0.56), and 'Profit Goal' (0.00). Each input field has a unit dropdown menu next to it.

Crop Input Data (Figure 2-4)

The Crop Inputs screen allows you to enter information about 11 potential crop input decisions that might be made using the cotton yield monitoring information system. Click on the input decisions that you want to include in the breakeven analysis. You may also rename an input by double-clicking on the input name. Enter the expected input price in dollars per unit and your annual input usage per acre. You may change the units given in CYMIDA to reflect what you use on your farm (e.g., pounds to pints). If you use multiple chemicals for an input, (e.g., Staple, MSMA 6, and Diuron herbicides) you may find it useful to convert to pounds of active ingredient per acre (lb a.i./acre) and use a weighted expected input price. CYMIDA will calculate your total input cost correctly as long as the units you use for price and quantity are the same. The change in input rate reflects the percentage change in the input application rate that you expect by using variable rate technology (VRT) to apply that specific input (e.g., -5 indicates a 5% decrease in your input rate from your base URT input application). The change in input cost reflected in dollars per acre is automatically calculated by CYMIDA.

The change in application cost represents the cost difference in applying an input using URT versus VRT. One easy way to represent this cost difference is to find out what an agricultural input supplier would charge for custom VRT application versus URT application.

To be useful for decision making, yield monitoring data often must be combined with other information such as grid soil sampling, plant mapping, remote sensing data, etc, that were used to make the VRT input decision. Other information costs reflect the cost of other information amortized over more than one year that was used in conjunction with the yield monitor

information to make the VRT decision, e.g., grid soil sampling costs. Proportion of cotton acres affected represents the proportion (between 0 and 1) of your cotton acres affected by the VRT decision.

Drainage cost is an estimate of what it would cost per unit of crop area to install drainage tile or other drainage improvements in a field or a portion of a field. CYMIDA automatically amortizes the tiling cost over a 30-year period. However, you may change the amortization period to fit your situation.

Figure 2-4
Crop Inputs

You can rename the inputs by double-clicking on an input name.

Click on the 'Include' button to choose which input decisions you might use with the information system.

	Seed	Nitrogen	Phosphorus	Potassium	Lime	Fungicide	Insecticide	Herbicide	Growth Reg	Harv Aid	Drainage
<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include	<input checked="" type="checkbox"/> Include
Item	Unit	lb/acre	lb/acre	lb/acre	ton/acre	lb/acre	lb/acre	lb a.i./acre	pt/acre	oz/acre	
Expected Input Price	\$	1.44	0.33	0.28	0.13	19.00	2.11	3.27	6.82	8.53	0.43
Base Annual Input Usage		10.00	80.00	60.00	90.00	0.50	6.00	3.50	2.13	1.50	36.00
Total Input Cost	\$/acre	14.40	26.40	16.80	11.70	9.50	12.66	11.45	14.53	12.80	15.48
Change From Base Input Rate	%	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
Change in Input Cost	\$/acre	-0.72	-1.32	-0.84	-0.59	-0.48	-0.63	-0.57	-0.73	-0.64	-0.77
Change in Application Cost	\$/acre	2.00	2.00	1.90	1.00	0.90	1.00	1.00	4.00	1.00	1.00
Other Information Costs	\$/acre	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.00	1.00	1.00
Proportion of Cotton Area Affected		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Drainage Improvement Cost	\$/acre										414.10

Amortization Period Years: 30

Click on a text label to get help on a particular item.

You can change the amortization period to fit your situation.

Cost Tables (Figures 2-5 and 2-6)

The Cost Tables screen summarizes yield monitoring information system ownership costs for your farm. This table gives you the number of cotton acres harvested per season by one harvester, cotton acres, and number of cotton yield monitors needed for your acreage base. Annual information system costs are broken down into ownership costs specific to cotton, ownership costs that can be allocated across all crop acreage (i.e., computer and software costs as chosen by you in the Systems Input screen), and total information system fixed costs for your farm situation. The crop area information system ownership cost shows you the cost allocated to cotton acres only and then over all crop acres.

Figure 2-5
Cost Tables - Summary

The screenshot shows the 'Cotton Yield Monitor Investment Decision Aid' software interface. The 'Summary' tab is selected under 'Information System Ownership Costs (Results)'. The table displays the following data:

	Amount	Unit
Cotton Area Harvested Per Season by One Harvester	712	acres
Cotton Area	959	acres
Cotton Yield Monitors	2	units
Annual Information System Costs		
Ownership Costs Specific to Cotton	4,687.09	\$
Ownership Costs Not Specific to Cotton	0.00	\$
Total Information System Fixed Costs	4,687.09	\$
Crop Area Information System Ownership Cost		
All Costs Allocated Cotton Only	4.89	\$/acre
Selected Costs Allocated All Crops	4.89	\$/acre

A 'Help' button is located to the right of the table. A note states: 'Click the Help button for more information on Cost Tables.'

Additional detail about capital recovery charges, taxes, insurance, housing and total fixed costs for each component is also provided under the Information System Details tab.

Figure 2-6
Cost Tables - Details

The screenshot shows the 'Details' tab under 'Information System Ownership Costs (Results)'. The table provides a breakdown of costs for various components:

	Capital Recovery Charge	Taxes Insurance Housing	Total Fixed Cost
Monitor/Controller Console	768.68	91.80	860.48
Cotton Sensors	1,066.77	127.40	1,194.17
Global Positioning System	387.79	31.80	419.59
Annual GPS Signal Subscription	0.00		0.00
Memory Card	48.78	4.00	52.78
Monitor Installation	167.47	20.00	187.47
Desktop Computer and Color Printer	607.02	31.86	638.88
PC Card Reader	10.67	0.56	11.23
Field Mapping Software	148.39	31.44	179.83
Annual Software Update	434.00	8.68	442.68
Data Management and Analysis Training (Annual)	700.00		700.00
Total Cost	4,339.55	347.54	4,687.09

Yield Gain Table (Figure 2-7)

The Yield Gain Table screen summarizes the total yield gain per unit of cotton crop area that would be needed for all of the input decisions that you chose to evaluate along with the average yield gain per input decision. Changes in total production costs due to the added investment in the information system and changes in input and other costs due to VRT application of inputs are also summarized on this screen. The yield gain required to pay for the information system when ownership costs are not allocated to a VRT decision is also displayed on this screen. As an example, you may find that differences in yields on a yield map were due to a faulty fertilizer application by a custom applicator. If you decided to change custom applicators, the yield gain that you would need to pay for the system if it is only used for this decision is 9 lb/acre. This assumes you make no changes other than to switch applicators.

Figure 2-7
Yield Gain Table

Cotton Yield Monitor <i>Investment Decision Aid</i>				
Introduction 1 - System Inputs 2 - Farm Inputs 3 - Crop Inputs 4 - Cost Tables 5 - Yield Gain Table 6 - Yield Gain Graph				
Lint Yield Gains and Input Savings (Results)				
	Costs Not Allocated To Any VRT Decision	VRT Application All Chosen Inputs		Unit
Base Lint Yield	656	656	656	lb/acre
Yield Gain-Costs Allocated to Cotton				
Change	9	105	10	lb/acre
Change, %	1.33%	16.00%	1.45%	%
Yield Gain-Costs Allocated to All Crops				
Change	9	105	10	lb/acre
Change, %	1.33%	16.00%	1.45%	%
Base URT Input Costs		145.72		\$/acre
Input Savings				
Change		-7.29		\$/acre
Change, %		-5.00		%
Other Costs		27.80		\$/acre
Information System Ownership Costs				
All Costs Allocated Cotton Only		4.89		\$/acre
Selected Costs Allocated All Crops		4.89		\$/acre
Drainage Improvement Costs		33.37		\$/acre
Change in Total Production Cost				
All Costs Allocated Cotton Only		58.77		\$/acre
Selected Costs Allocated All Crops		58.77		\$/acre

Click the Help button for more information on Yield Gain Tables.

Help

Yield Gain Graph (Figure 2-8)

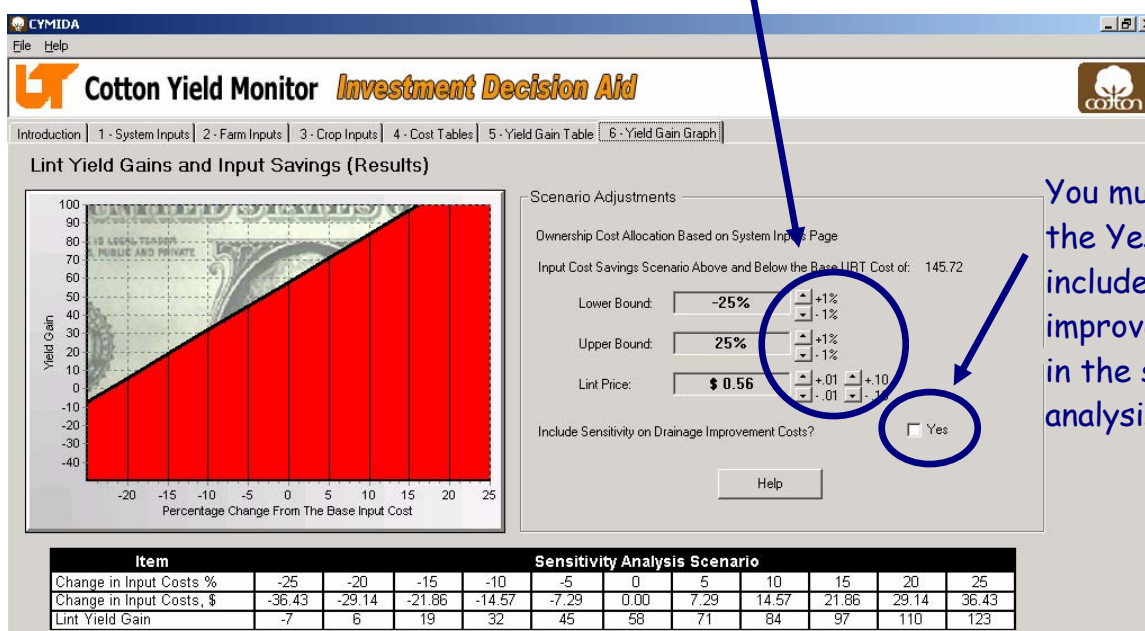
CYMIDA allows you to evaluate lint yield gains and input savings tradeoffs for alternative lint price and input cost savings scenarios using the two-way sensitivity graph. This screen reflects your choices on cost allocation of each input from the System Inputs screen. If you did not check any of the Yes boxes to allocate an input cost across all crop area on the System Inputs screen, CYMIDA assumes all input costs are allocated to the cotton enterprise. You may evaluate different scenarios by changing your input cost allocation on the System Inputs screen. Click on the Yes box to include drainage improvement costs in the sensitivity analysis scenario. You **MUST** click on the Yes box even if you chose drainage as an input on the Crop Inputs

screen. CYMIDA **will not** automatically include drainage improvement costs in the Sensitivity Analysis Scenario.

The required lint yield gain (lb/acre) to pay for the information system is given on the vertical axis of the graph for different input savings scenarios (on the horizontal axis). For example, assume that you expect to reduce input cost by 10% from your base uniform input application rate. To find your required yield gain for this 10% input savings, follow the black vertical line upward from the -10% value on the horizontal axis to where it intersects the black sloped line. From that intersection, follow the dashed horizontal line left to the vertical axis to find the required yield gain. If your expected yield gain is less than the yield gain on the sloped black line (i.e., in the red portion of the graph), then the expected cost savings and yield gains are not enough to pay for the investment in the information system. On the other hand, if you expected yield gain is above the black sloped line (i.e., in the green portion of the graph), then the expected input savings and yield gains will more than pay for investment in the information system. You can change the lint price to see how it influences the required yield gains for alternative input cost savings scenarios. Changing the lower and upper bounds on input cost savings evaluates the effects of alternative input cost savings scenarios on the required yield gains to pay for the information system. Adjustments in input savings are based on the proportion of crop acres affected multiplied by the base uniform application rate input costs. You can also evaluate the sensitivity of drainage improvement costs along with other crop input costs on the required yield gains to pay for the information system.

Figure 2-8
Yield Gain Graph

Click on the arrows to change the lower and upper bounds to evaluate various input cost savings scenarios. You can also use the arrows to adjust the lint price.



You must click on the Yes box to include drainage improvement costs in the sensitivity analysis scenario.

Getting Help in CYMIDA (Figures 2-9 and 2-10)

Help is available on several screens in CYMIDA. When a question mark appears with the cursor (Figure 2-9), click on the item for a help screen to appear.

Figure 2-9

Getting Help in CYMIDA

CYMIDA
File Help

Cotton Yield Monitor Investment Decision Aid

Introduction | 1 - System Inputs | 2 - Farm Inputs | 3 - Crop Inputs | 4 - Cost Tables | 5 - Yield Gain Table | 6 - Yield Gain Graph

Farm Data

	Value	Unit
Ownership Cost Calculation		
Proportion of Computer Costs Allocated to Yield Monitor Analysis	1.00	
Cotton Harvester Size (4, 5, 6, or 8 Rows)	4	
Cotton Area Harvested/Harvester/Season	712	acres
Your Cotton Area	959	acres
Your Other Crop Area	607	acres
Real Rate of Interest, %	7	
Taxes, % of Purchase Cost	1	
Insurance, % of Purchase Cost	0.75	
Housing, % of Purchase Cost	0.25	

When this cursor appears, click on the item for a help box.

Figure 2-10

CYMIDA Help Box

Help

The decision aid assumes that a 4-row harvester can harvest 712 acres (288 hectares) in one season. If 712 acres (288 hectares) does not fit your farm situation, you can change this number to reflect how much cotton area on average you harvest with one cotton harvester in one season, e.g., 900 acres (364 hectares).

OK

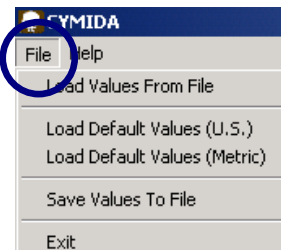
The Help box provides a brief description of the selected item for the user. Click 'OK' to close the box.

Saving Your Farm Information in CYMIDA (Figure 2-11)

CYMIDA offers the user the option of saving and reloading data. By clicking on 'File' a drop-down menu appears where you can choose to save your current data or load previous data. You can also choose to load the CYMIDA default values in both US and metric units.

Figure 2-11
Saving Data in CYMIDA

Click on 'File' to display menu choices.



Section III: An Example Using *CYMIDA*

An Example Using CYMIDA

A fertilizer and lime example was created to show how easy CYMIDA is to use. The assumptions used in the example are outlined in the following text and screenshots.

System Inputs (Figure 3-1)

- PF3000 Precision Faming System manufactured by AgLeader Technology, Ames, IA including monitor/controller console, cotton sensors and memory card (Ag Leader Technology, 2004).
- Ag Leader GPS 4100 costing \$2,995 (Ag Leader Technology, 2003). Assumed a more expensive GPS unit with increased accuracy for potential use for variable rate application of fertilizer and lime.
- WAAS GPS subscription – currently free.
- Monitor installation charge of \$500.
- Computer equipment including a Pentium IV with 512 MB RAM, 80 GB Hard-drive, CD drive with read and write capabilities, 19-inch color video monitor, color printer and PC card reader. (These prices are an average for manufactures taken from an informal survey conducted by the authors.)
- GIS field mapping software costing \$1,572 with an annual software update of \$434. (These prices are an average for software manufactures taken from an informal survey conducted by the authors.)
- Annual data management and analysis training costing \$700.
- Useful life for each piece of equipment was based on assumptions made by Gandonou et al. (2001).
- A zero salvage value was assumed for each piece of equipment (Gandonou et al., 2001).
- Assume system costs allocated to all crop acres.

Figure 3-1
CYMIDA Example - System Inputs

Category	Item	Purchase Cost	Expected Useful Life	Salvage Value %	Allocate Costs Across All Crop Area
Cotton Yield Monitoring System	Monitor/Controller Console	2,295.00	8	0	<input checked="" type="checkbox"/> Yes
	Cotton Sensors (Cost per Row)	1,592.50	8	0	<input checked="" type="checkbox"/> Yes
	Sensors Every Row	<input type="checkbox"/> Yes			
	Global Positioning System	2,995.00	5	0	<input checked="" type="checkbox"/> Yes
	Annual GPS Signal Subscription	0.00			<input checked="" type="checkbox"/> Yes
	Flash Card	100.00	5	0	<input checked="" type="checkbox"/> Yes
Office Computer	Monitor Installation	500.00	8	0	<input checked="" type="checkbox"/> Yes
Office Computer	Desktop Computer and Color Printer	1,593.00	3	0	<input checked="" type="checkbox"/> Yes
	PC Flash Card Reader	28.00	3	0	<input checked="" type="checkbox"/> Yes
Software and Training	Field Mapping Software	1,572.00	20	0	<input checked="" type="checkbox"/> Yes
	Annual Software Update	434.00			<input checked="" type="checkbox"/> Yes
	Annual Data Management and Analysis Training	700.00			<input checked="" type="checkbox"/> Yes

Farm Inputs (Figure 3-2)

- 100% of computer costs are allocated to yield monitor analysis.
- A 4-row cotton harvester is used to harvest 712 acres per season (Cooke, Parvin and Spurlock, 1991).
- The example farm has 1,300 cotton acres and 1,113 other crop acres consisting of corn, soybeans and wheat.
- Real rate of interest of 7%. The real rate of interest was calculated using nominal interest rates paid by farmers for capital from Farm Credit Services for 1985 through 2000 (U.S. Department of Agriculture, Economic Research Service, 2001a) and the annual percentage change in inflation for that period as measured by the Implicit Gross Domestic Product Price Deflator (Congress of the U.S., Council of Economic Advisors, 2001).
- Taxes, insurance and housing were assumed to be 1.00, 0.75 and 0.25 percent, respectively, of purchase cost (ASAE Standards, 2003).
- Base lint yield of 656 lb/acre – the detrended yield average for 1960 through 2000 (U.S. Department of Agriculture, Economic Research Service, various issues).
- Expected lint price of 56 ¢/lb – the detrended upland cotton price average for 1970 through 2000 (U.S. Department of Agriculture, Economic Research Service, 2001b).
- A 15% profit goal equaling 65 ¢/acre. Calculated by taking 15% of the total information system fixed costs allocated to cotton and dividing by the number of cotton acres.

Figure 3-2
CYMIDA Example - Farm Inputs

Farm Data		Value	Unit
Ownership Cost Calculation			
Proportion of Computer Costs Allocated to Yield Monitor Analysis	1.00		
Cotton Harvester Size (4, 5, 6, or 8 Rows)	4		
Cotton Area Harvested/Harvester/Season	712		acres
Your Cotton Area	1300		acres
Your Other Crop Area	1113		acres
Real Rate of Interest, %	7		
Taxes, % of Purchase Cost	1		
Insurance, % of Purchase Cost	0.75		
Housing, % of Purchase Cost	0.25		
Yield, Price, and Profit Goal			
URT Base Lint Yield	656		lb/acre
Expected Lint Price	0.56		¢/lb
Profit Goal	0.65		\$/acre

Crop Inputs (Figure 3-3)

- Including nitrogen, phosphorus, potassium and lime in the VRT decision.
- Custom VRT application costs for nitrogen, phosphorus, potassium and lime are \$2.00, \$1.90, \$1.00, and \$0.90 more than URT application costs, respectively. (Roberts, English and Sleigh, 2000).
- 100% of cotton acres affected by the VRT decision.
- Assume a 10% reduction in the application rate for each input by using VRT.
- Expected input prices and base annual input usage taken from University of Tennessee, Agricultural Extension Service Cotton Budgets (Gerloff, 2004).

Figure 3-3
CYMIDA Example - Crop Inputs

Item	Unit	Seed	Nitrogen	Phosphorus	Potassium	Lime	Fungicide	Insecticide	Herbicide	Growth Reg	Harv Aid	Drainage
Expected Input Price	\$	0.33	0.28	0.13	19.00							
Base Annual Input Usage		80.00	60.00	90.00	0.50							
Total Input Cost	\$/acre	26.40	16.80	11.70	9.50							
Change From Base Input Rate	%	-10	-10	-10	-10							
Change in Input Cost	\$/acre	-2.64	-1.68	-1.17	-0.95							
Change in Application Cost	\$/acre	2.00	1.90	1.00	0.90							
Other Information Costs	\$/acre	1.00	1.00	1.00	1.00							
Proportion of Cotton Area Affected		1.00	1.00	1.00	1.00							
Drainage Improvement Cost	\$/acre											

Amortization Period: Years 30

Click on a text label to get help on a particular item.

Yield Gain Table (Figure 3-4)

The total required yield gain necessary for all the chosen inputs (N, P, K, and lime) is 14 lb/acre (a 2.14 %/acre yield gain) and an average required yield gain of 4 lb/acre (0.53 %/acre) for each input when costs are allocated to cotton only. By allocating the costs across all crop acres, your total required yield gain decreases by 3 lb/acre to 11 lb/acre. The average required yield gain across your chosen inputs decreases to 3 lb/acre. The yield gain required to pay for the information system when ownership costs are not allocated to a VRT decision is 8 lb/acre (1.22 %/acre) if costs are allocated to cotton only and 5 lb/acre (0.79 %/acre) when allocated across all crop acres.

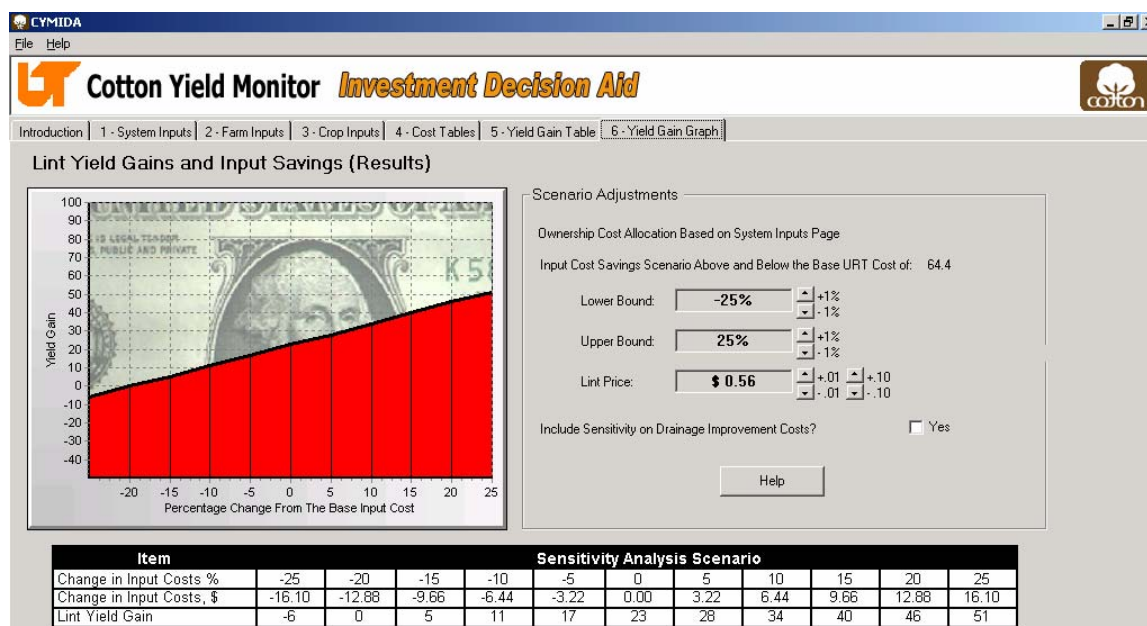
Figure 3-4
CYMIDA Example - Yield Gain Table

Cotton Yield Monitor <i>Investment Decision Aid</i>				
Introduction 1 - System Inputs 2 - Farm Inputs 3 - Crop Inputs 4 - Cost Tables 5 - Yield Gain Table 6 - Yield Gain Graph				
Lint Yield Gains and Input Savings (Results)				
	Costs Not Allocated To Any VRT Decision	VRT Application All Chosen Inputs		Unit
Base Lint Yield	656	656	656	lb/acre
Yield Gain-Costs Allocated to Cotton				
Change	8	14	4	lb/acre
Change, %	1.22%	2.14%	.53%	%
Yield Gain-Costs Allocated to All Crops				
Change	5	11	3	lb/acre
Change, %	.79%	1.71%	.43%	%
Base URT Input Costs		64.40		\$/acre
Input Savings				
Change		-6.44		\$/acre
Change, %		-10.00		%
Other Costs		9.80		\$/acre
Information System Ownership Costs				
All Costs Allocated Cotton Only		4.50		\$/acre
Selected Costs Allocated All Crops		2.91		\$/acre
Drainage Improvement Costs		0.00		\$/acre
Change in Total Production Cost				
All Costs Allocated Cotton Only		7.86		\$/acre
Selected Costs Allocated All Crops		6.27		\$/acre

Yield Gain Graph (Figure 3-5)

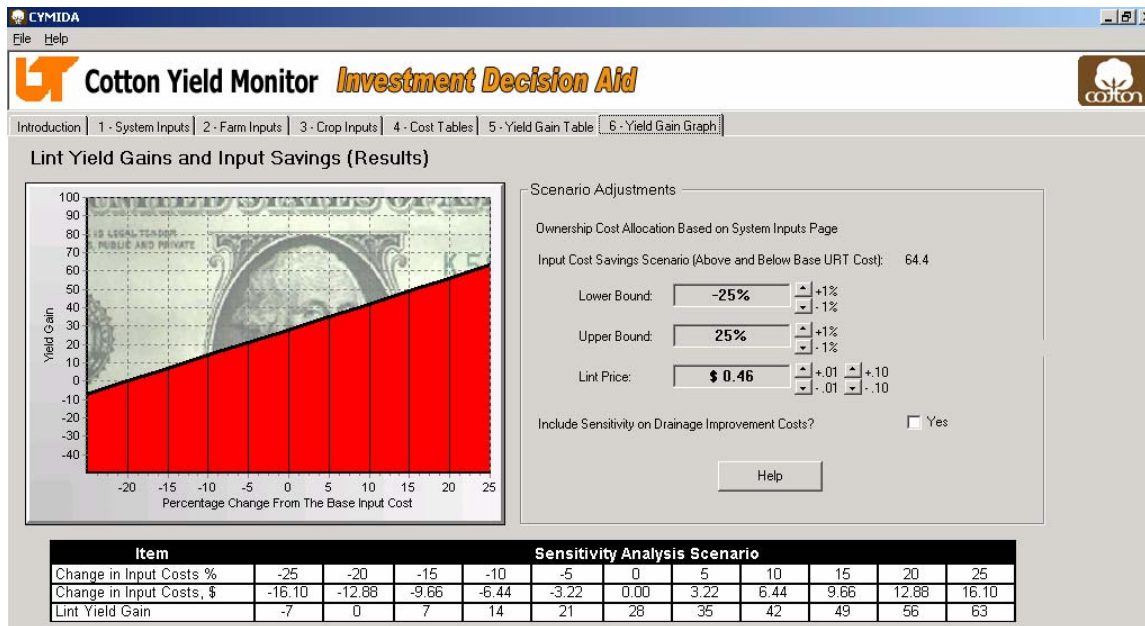
When using VRT to apply your chosen inputs, a yield gain of 11 lb/acre is necessary if you are to reduce input costs by 10% from your base URT input cost when costs are allocated to cotton.

Figure 3-5
CYMIDA Example - Yield Gain Graph



Now assume the lint price drops by 10¢. A 10% decrease in VRT costs from the base URT input cost requires a yield gain of 14 lb/acre.

Figure 3-6
CYMIDA Example -
Yield Gain Graph with Price Change



Download your FREE copy of CYMIDA on the Web at:

<http://economics.ag.utk.edu/cymida.html>

Or

<http://www.cottoninc.com>

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