Capital Input Analysis 1

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Version: DevTreks 1.6.8

A. Introduction

This reference explains how to start to collect, measure, and analyze, capital input cost data (**2***). DevTreks believes that every capital input, from the machinery used to grow crops to the x-ray machine used to diagnose bone breaks, has a story to tell and lessons to teach. Those lessons can only be learned when data about the input is collected, measured, aggregated, analyzed, explained, and stored in online knowledge banks. A full, uniform, and accurate accounting of the costs, benefits, and outcomes for capital investments made in tractors, robots, trucks, medical equipment, sewing machines, and cloud computing servers, should be one or two links away for everyone. If a business owner, worker, government official, or citizen needs to make a decision involving capital inputs, they should have ready access to the best data and advice available. This reference introduces another DevTreks way to build these types of knowledge banks.

B. Data

The *Ag Production Analysis 1, Construction Analysis 1, and Health Care Analysis 1* tutorials demonstrate how capital input data can be structured to support the analyses shown in this reference. The actual data used in this analysis was structured for the purpose of testing these analyzers.

The Analyzers demonstrated in this reference can be found at:

> https://www.devtreks.org/agtreks/preview/crops/linkedviewgroup/Resource Stock Analyzer Group/19/none/

This reference used the localhost deployment (Version 1.6.3) to document calculations.

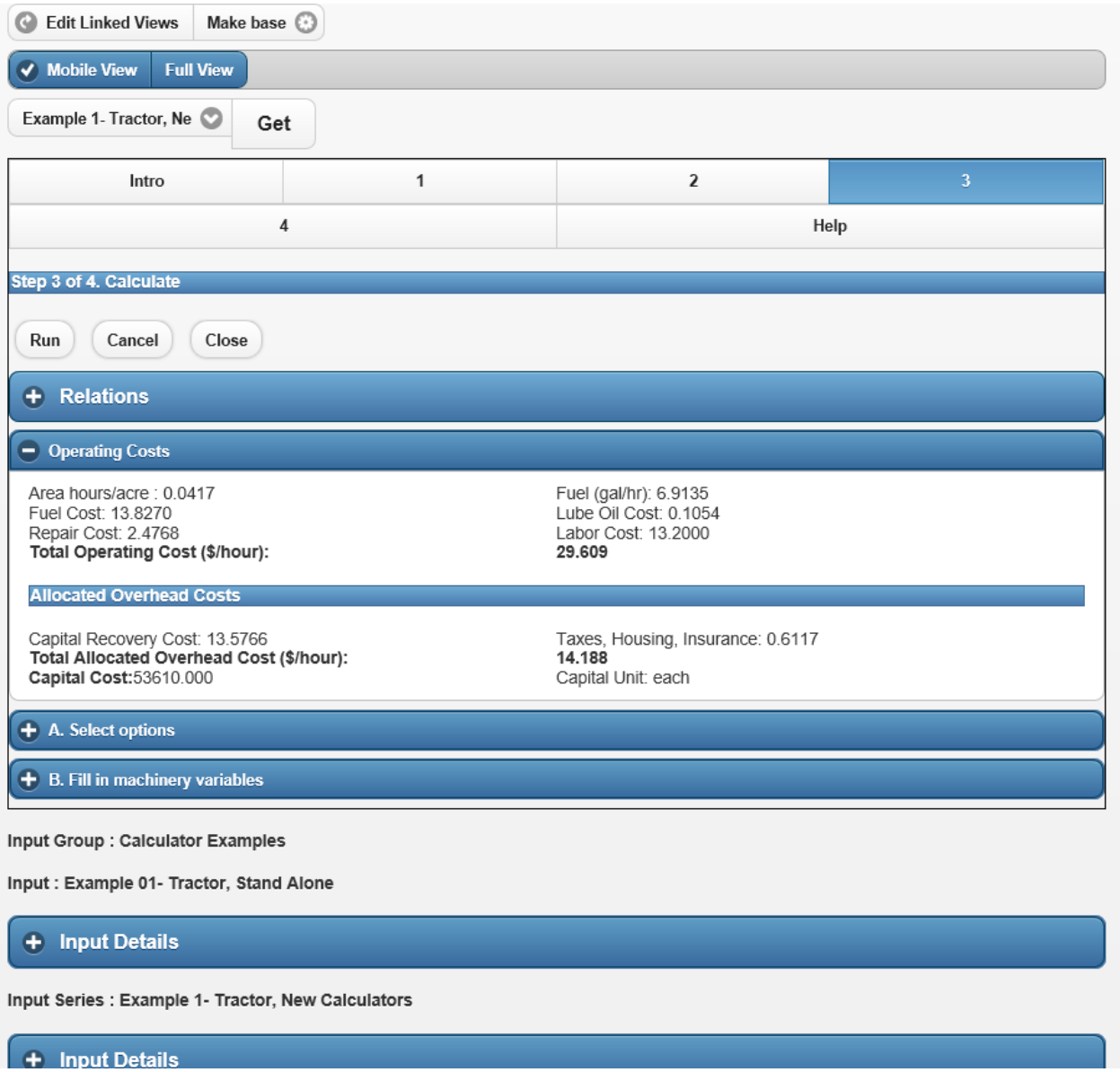
C. Work Breakdown Structure (WBS) and Calculator Rules

DevTreks recommends classifying all data using Work Breakdown Structures. In addition, networks or clubs should establish standard rules for members to follow explaining how to manage capital input datasets. Those rules include guidance about setting calculator properties such as interest rates, horsepower, capacity options, energy prices, and labor use. The goal of the rules is to support the uniform aggregation and analysis of capital input data. Networks and clubs should provide written documentation and videos to their members explaining the rules.

D. Capital Input Calculations

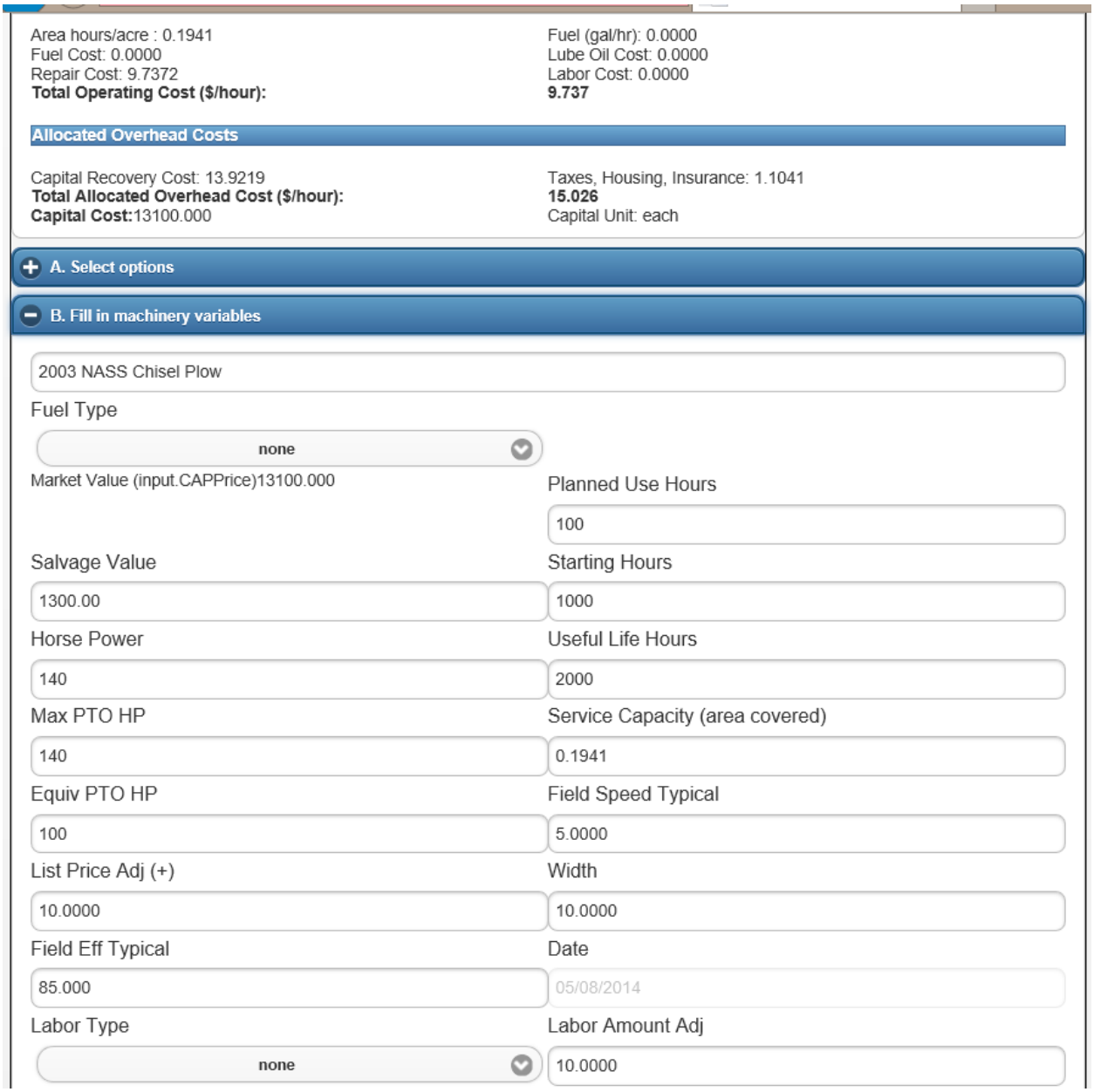
The *Capital Input Calculators 1* reference documents the Input calculations that will be aggregated and analyzed in this reference (**3***). Separate analyzers are available for the base elements found in Operations, Components, Operating Budgets, and Capital Budgets. The *Calculator and Analyzer 1* reference documents how all DevTreks' Analyzers work. The Calculator Type property of analyzers is used to specify the capital input calculations to analyze. The current version supports the following calculators:

Agricultural Machinery Calculator: This calculator supports the analysis of agricultural and machinery capital inputs. The following image displays a typical result. Operating costs calculated by this calculator include fuel, lube, repair, and labor. Allocated overhead costs calculated by this calculator include capital recovery and taxes, housing, and insurance. As explained in the next section, this calculator ignores manual OCAmount and AOHAmount data entries. Even so, the quality of the base element data appears neater by setting these values equal to the calculated amounts.

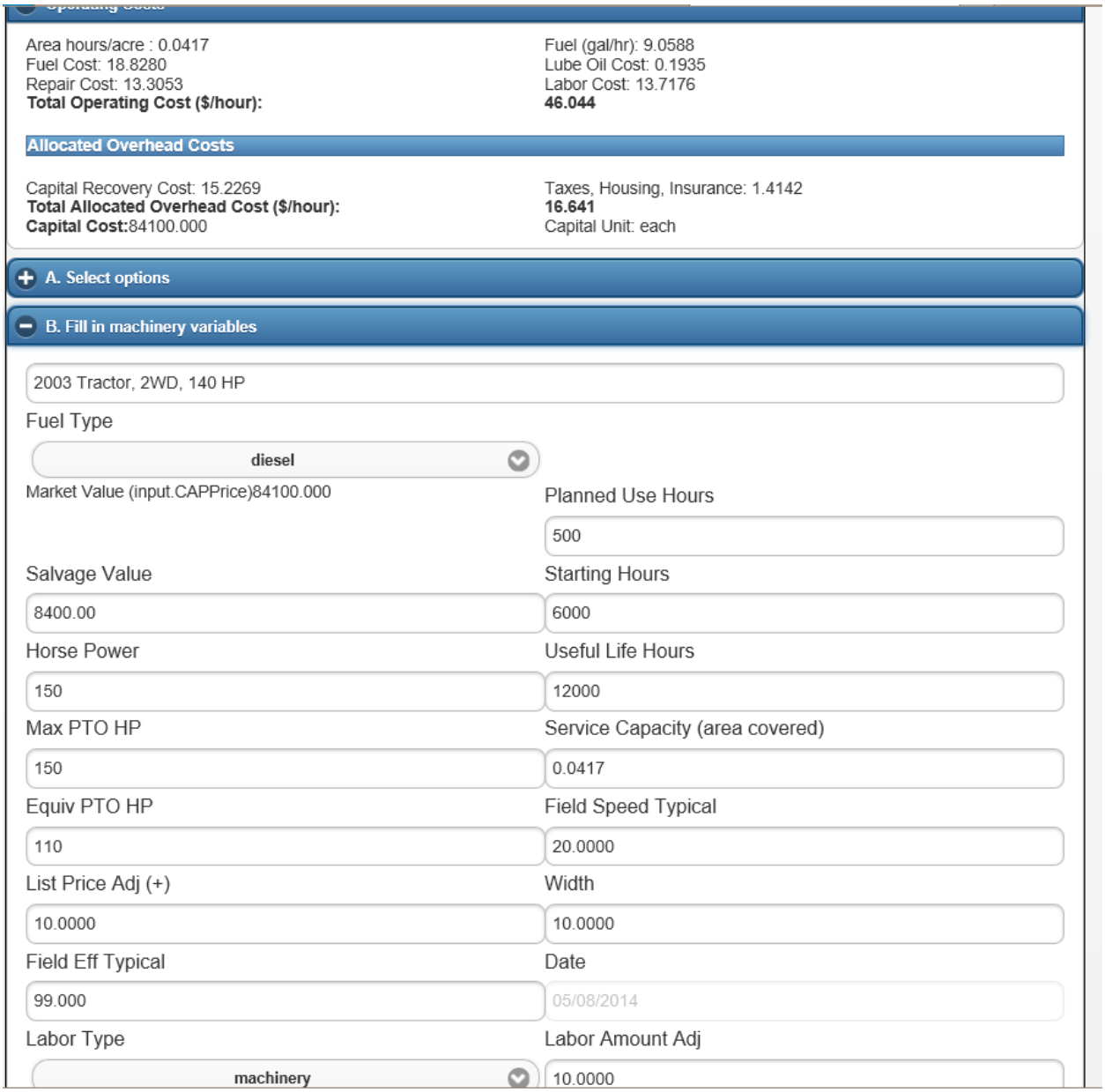


NPV Joint Machinery Calculations: The *Capital Input 1 Calculator* reference explains that when power and nonpower machinery inputs are combined in an Operation or Component, and Net Present Value (NPV) Calculators are run, new machinery calculations are generated. The following images display the results of running separate input machinery calculations for a tractor and a chisel plow. Note the individual differences in area, fuel, labor, width, field efficiency, and horsepower properties.

Chisel Plow


Area hours/acre : 0.1941
Fuel Cost: 0.0000
Repair Cost: 9.7372
Total Operating Cost ($/hour):
Fuel (gal/hr): 0.0000
Lube Oil Cost: 0.0000
Labor Cost: 0.0000
9.737
Allocated Overhead Costs
Capital Recovery Cost: 13.9219
Total Allocated Overhead Cost ($/hour):
Capital Cost:13100.000
Taxes, Housing, Insurance: 1.1041
15.026
Capital Unit: each
A. Select options
B. Fill in machinery variables
2003 NASS Chisel Plow
Fuel Type
none
Market Value (input.CAPPrice)13100.000
Planned Use Hours
100
Salvage Value
1300.00
Starting Hours
1000
Horse Power
140
Useful Life Hours
2000
Max PTO HP
140
Service Capacity (area covered)
0.1941
Equiv PTO HP
100
Field Speed Typical
5.0000
List Price Adj (+)
10.0000
Width
10.0000
Field Eff Typical
85.000
Date
05/08/2014
Labor Type
none
Labor Amount Adj
10.0000

Tractor



The following image displays the results of running a NPV Calculator for an Operation that combines the two inputs. Both inputs now have the same OCAmounts and AOHAmounts that reflect joint calculations. The only price that changed is the tractor's OCPrice. The implement's width, field efficiency, and equivalent horsepower, and the tractor's maximum horsepower were used in the joint calculations.

Chisel Plow Operation

Operation							
Date Applied	Label 1	Label 2	Amount	Eff. Life	Salv. Value	Incent. Amount	Incent. Rate
2003 Chisel Plow NASS (5/7/2014 12:00:00 AM)							
12/31/2003	A!010	none	1	1	0.0000	0.0000	0
Operation Unit:acre			ResourceWeight	0	Rates (R and N)		0.0100 0.0300
Description	This operation uses NASS inputs and is used in a DevTreks machinery tutorial.						

Total Costs - Operation	Total Cost	Annual Cost	Interest Portion
Total Operating Costs	14.29	14.29	3.81
Total Allocated Overhead Costs	8.39	8.39	2.24
Total Capital Costs	0.00	0.00	0.00
Total Costs - Operation	22.68	22.68	6.05
Total Costs - Operation w. Incentives	22.68	22.68	

Inputs							
Input Name	Date Applied	Times	Incent. Amount	Incent. Rate			
2003 Chisel Plow, Maximum 1 foot depth, Chisel or Sweep Type, Drawn or Moun							
	5/7/2014 12:00:00 AM	1	0.0000	0			

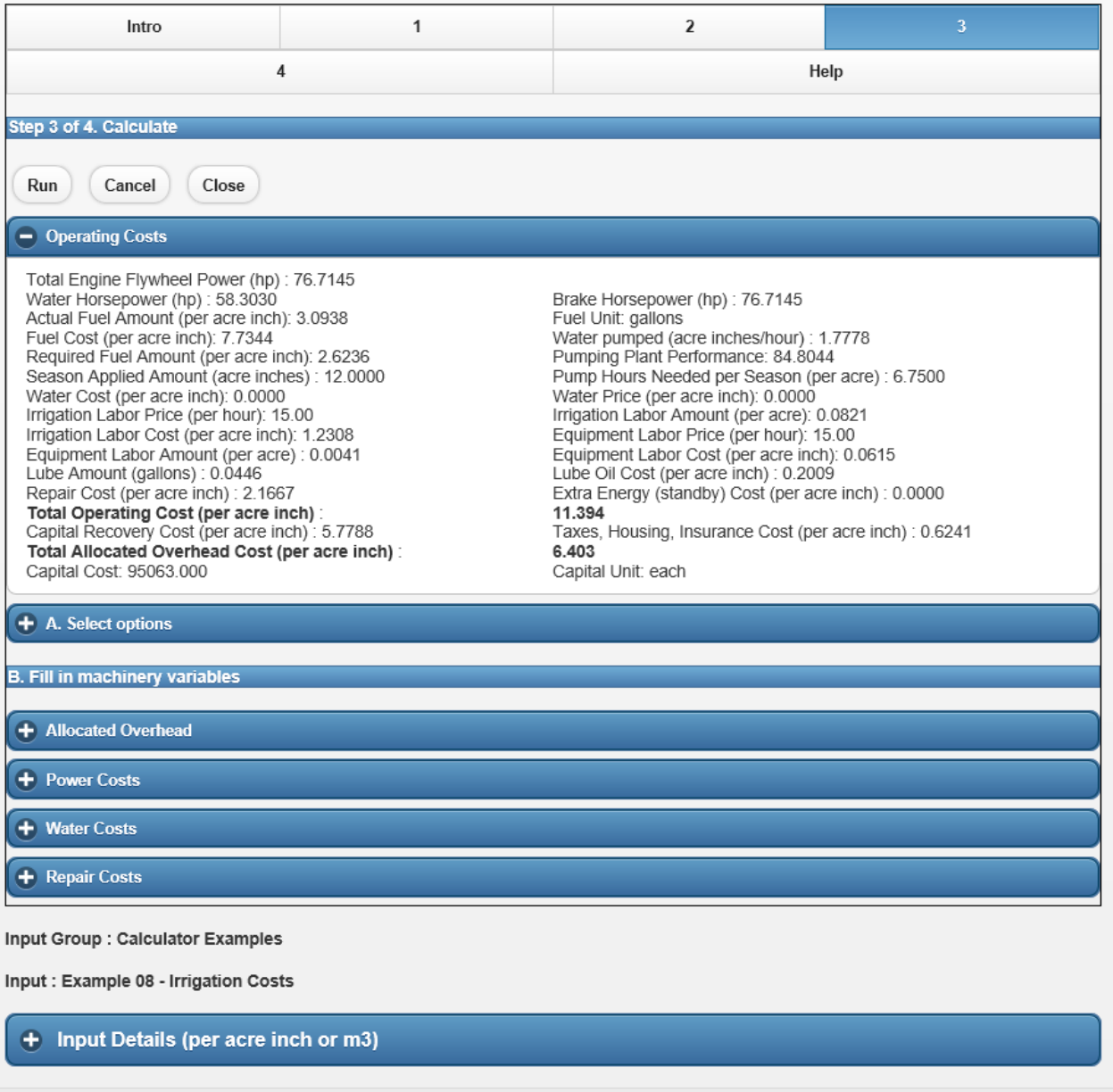
Total Costs - Input	Amount	Unit	Price	Total	Interest	Total Cost
Total Operating Costs	0.1941	hours/acre	9.7400	1.89	0.69	2.58
Total Allocated Overhead Costs	0.194	hours/acre	15.0300	2.92	1.06	3.98
Total Capital Costs	0	each	13100.0000	0.00	0.00	0.00
Total Costs with Incentives						6.56
Description	See parent input group for price reference.					

Input Name	Date Applied	Times	Incent. Amount	Incent. Rate			
2003 Tractor, 2-Wheel Drive, 140-159 PTO HP							
	5/7/2014 12:00:00 AM	1	0.0000	0			

Total Costs - Input	Amount	Unit	Price	Total	Interest	Total Cost
Total Operating Costs	0.194	hours/acre	44.25	8.59	3.13	11.72
Total Allocated Overhead Costs	0.194	hours/acre	16.6400	3.23	1.18	4.41

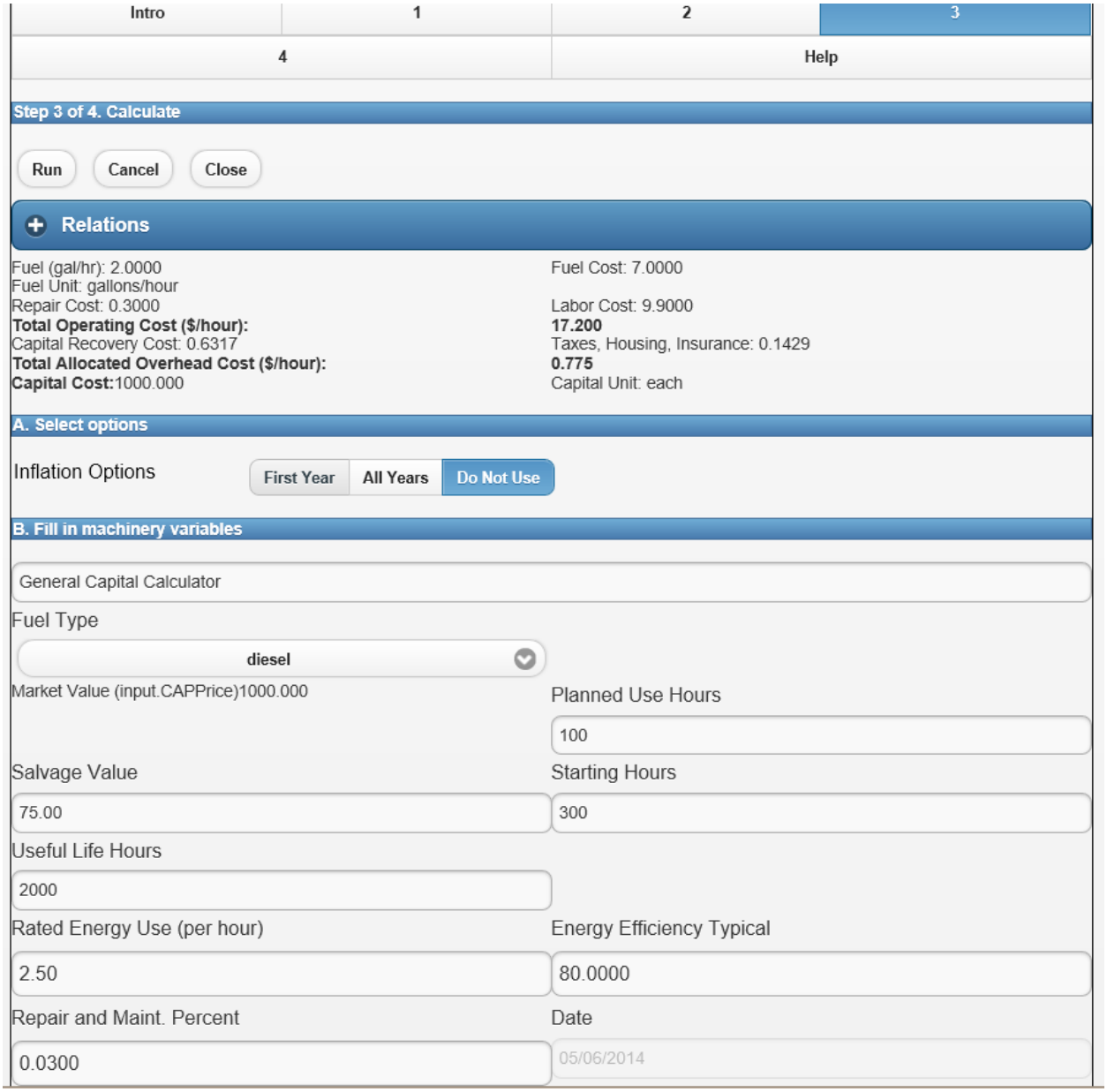
Irrigation Power Calculator: This calculator supports the analysis of irrigation power capital inputs. The following image displays a typical result. Operating costs calculated by this calculator include fuel, lube, repair, labor, and water. Allocated overhead costs calculated by this calculator include capital recovery and taxes, housing, and insurance. This calculator is rerun when NPV calculators are run and will ignore manual OCAmount and AOHAmount data entries.

Even so, the quality of the base element data appears neater by setting these values equal to the calculated amounts.



General Capital Calculator: This calculator supports the analysis of generic capital inputs. The following image displays a typical result. Operating costs calculated by this calculator include fuel, repair, and labor. Allocated overhead costs calculated by this calculator include capital recovery and taxes, housing, and insurance. This calculator is rerun when NPV calculators are

run and will ignore manual OCAmount and AOHAmount data entries. Even so, the quality of the base element data appears neater by setting these values equal to the calculated amounts.



Timeliness Penalty Calculators: Step 2 of the Machinery Calculator can be used to set up to 5 feasible combination of machinery properties that can be to determine penalties for not completing machinery operations or components in a timely manner. Step 2 of NPV Operation

or Component NPV Timeliness Penalty calculators must be used to set properties for calculating the timeliness penalty.

E. Multipliers

Machinery totals are multiplied by Input.Times, Operation.Amount, Component.Amount, and TimePeriod.Amount properties. This restores some of the customization taken away by not being able to manually change OCAmount or AOHAmount properties in some calculators.

F. Net Present Value (NPV) Calculators

With the exception of Input base elements, NPV calculators must be run prior to running capital input analyzers. The NPV calculated document contains the data that will be analyzed.

G. Capital Input Benefits

This reference does not explicitly include an analysis of capital input benefits (**2***). Instead, their benefits have to be indirectly inferred from the Outputs and Outcomes included in Operating and Capital Budgets.

H. Capital Input Analyses

The Analysis Type property of analyzers is used to specify the type of analysis to run. The current version supports the following analyses:

1. Totals Analysis

A *Totals Analysis* sums capital input calculations for every base element in an analysis. No *Aggregate Using* or *Compare Using* properties are offered in the analyzers because basic totals should be documented before more complicated types of analyses are run. All analyzers run this analysis for each aggregated base element before carrying out additional calculations. This analysis is available for the Machinery, Irrigation, and General Capital calculators. The Operating and Allocated Overhead total costs displayed in this calculator is a summation of the non-discounted individual costs calculated by the calculator.

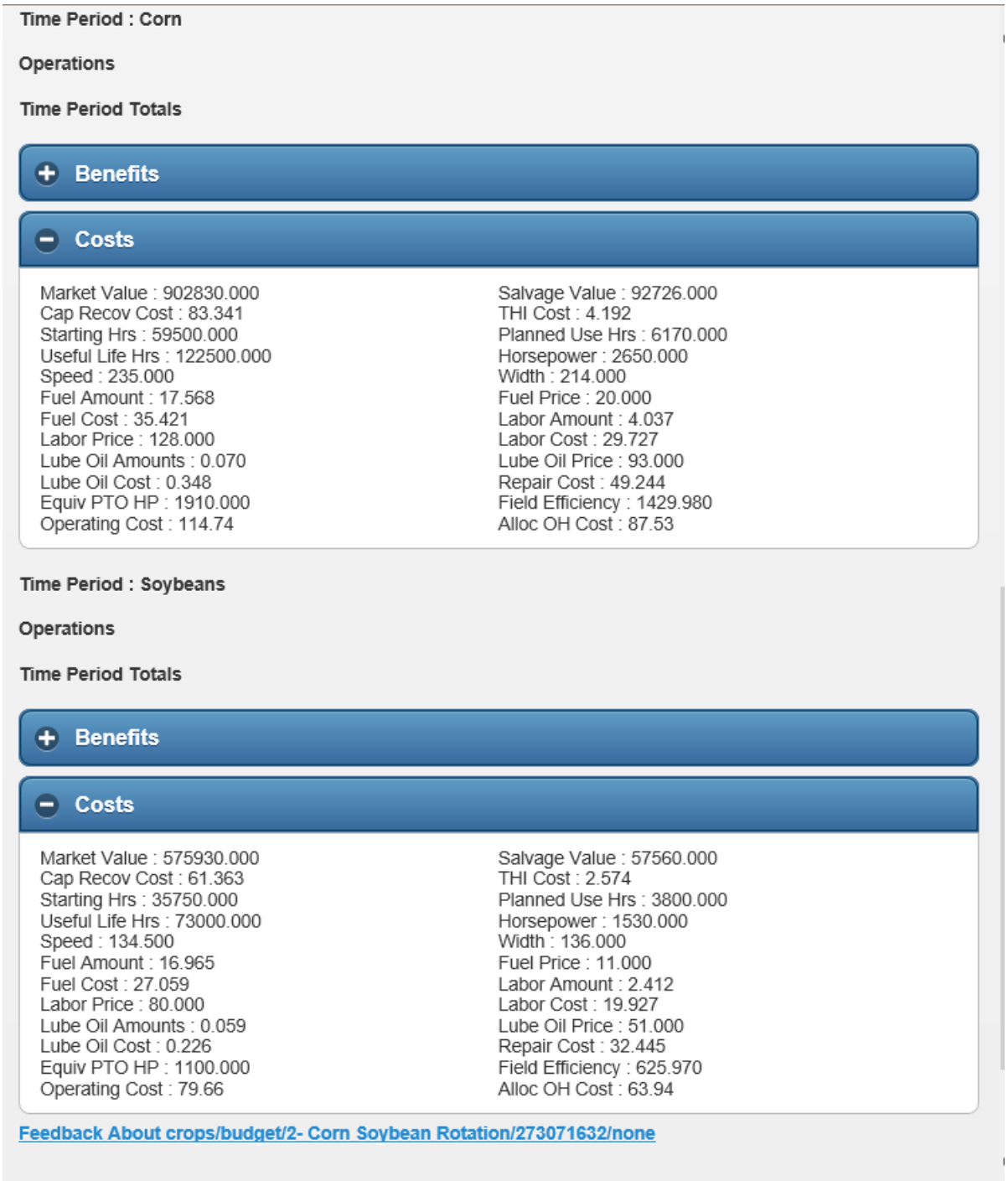
The following Machinery *Totals* Operation Analysis displays typical results for agricultural machinery used in crop operations.

Base Resource (Input) Calculations To Analyze Type:

Agricultural Machinery

Operation Group									
Tillage and Cultivation, General									
549770.000	54900.000	12818.490	896.722	38750.000	3400.000	73500.000	1580.000	131.000	11
2802.799	10.000	5605.598	642.760	60.000	4008.543	13.326	50.000	69.288	10
1000.000	905.000	20251.03	13715.21						
Operation									
Field Cultivate									
Market Value	**Salvage Value**	**Cap Recov Cost**	**THI Cost**	**Starting Hrs**	**Planned Use Hrs**	**Useful Life Hrs**	**Horsepower**	**Speed**	**W**
Fuel Amount	**Fuel Price**	**Fuel Cost**	**Labor Amount**	**Labor Price**	**Labor Cost**	**Lube Oil Amounts**	**Lube Oil Price**	**Lube Oil Cost**	**R C**
Equiv PTO HP	**Field Efficiency**	**Operating Cost**	**Alloc OH Cost**						
90430.000	9000.000	4.451	0.347	7000.000	700.000	14000.000	290.000	25.000	20
1.754	2.000	3.509	0.433	12.000	2.826	0.008	10.000	0.040	3.
200.000	179.000	10.18	4.80						
Input: Cultivator, Row Crop, 6 Row									
6330.00	600.00	1.3141	0.0552	1000	200	2000	140	5.0000	10
0.0000	0.0000	0.0000	0.2060	0.00	0.0000	0.0000	5.0000	0.0000	1.
100	80.0000	1.07	1.37						
Input: Tractor, 2-Wheel Drive, 140-159 PTO HP									
84100.00	8400.00	3.1367	0.2913	6000	500	12000	150	20.0000	10
1.7544	2.0000	3.5087	0.2266	12.00	2.8258	0.0077	5.0000	0.0399	2.
100	99.0000	9.12	3.43						
Operation									
Rotary Hoe									
Market Value	**Salvage Value**	**Cap Recov Cost**	**THI Cost**	**Starting Hrs**	**Planned Use Hrs**	**Useful Life Hrs**	**Horsepower**	**Speed**	**W**

The following *Totals* Operating Budget Analysis displays typical results for the farm equipment used in a corn soybean rotation.



Time Period : Corn

Operations

Time Period Totals

Benefits

Costs

Market Value : 902830.000	Salvage Value : 92726.000
Cap Recov Cost : 83.341	THI Cost : 4.192
Starting Hrs : 59500.000	Planned Use Hrs : 6170.000
Useful Life Hrs : 122500.000	Horsepower : 2650.000
Speed : 235.000	Width : 214.000
Fuel Amount : 17.568	Fuel Price : 20.000
Fuel Cost : 35.421	Labor Amount : 4.037
Labor Price : 128.000	Labor Cost : 29.727
Lube Oil Amounts : 0.070	Lube Oil Price : 93.000
Lube Oil Cost : 0.348	Repair Cost : 49.244
Equiv PTO HP : 1910.000	Field Efficiency : 1429.980
Operating Cost : 114.74	Alloc OH Cost : 87.53

Time Period : Soybeans

Operations

Time Period Totals

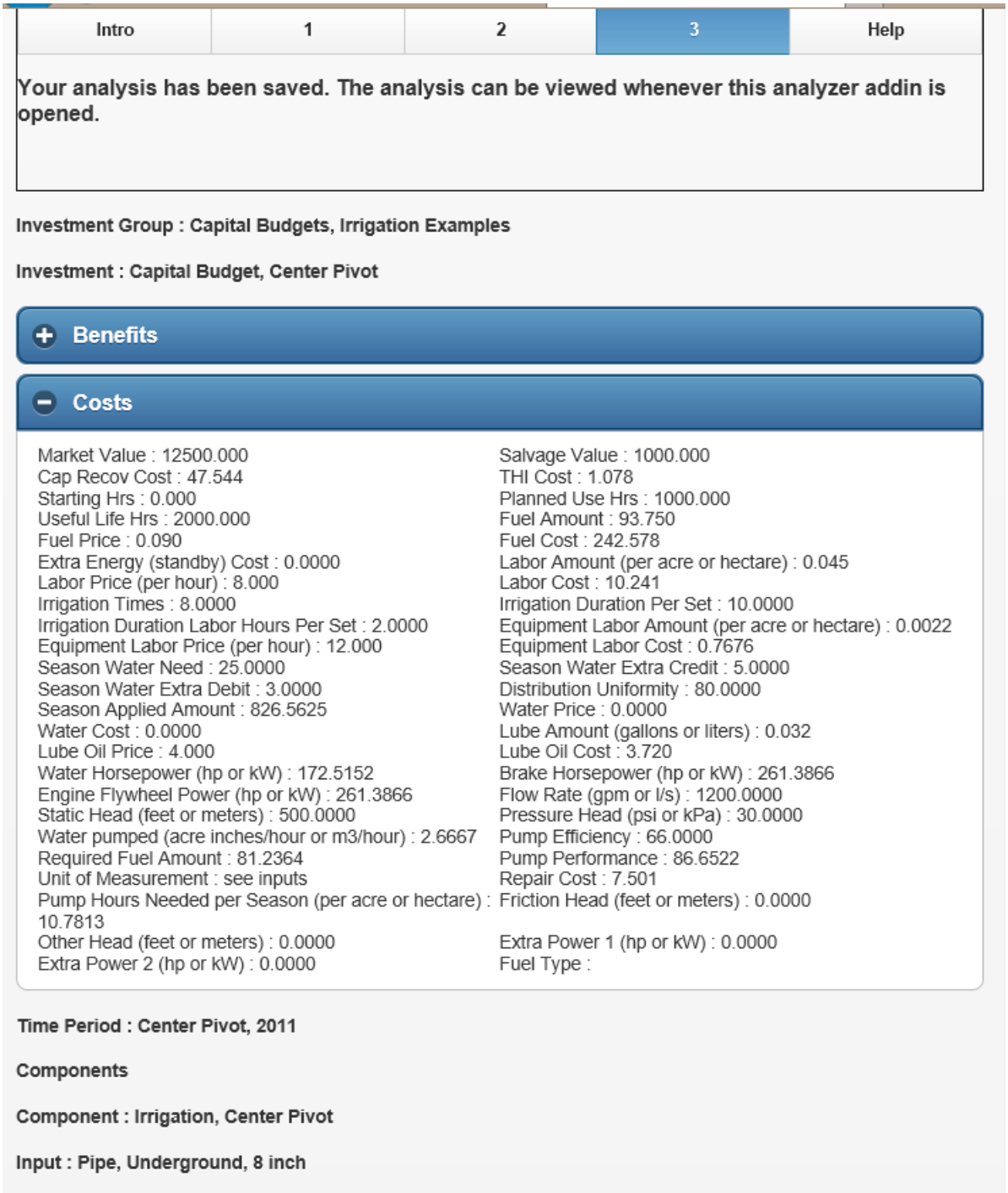
Benefits

Costs

Market Value : 575930.000	Salvage Value : 57560.000
Cap Recov Cost : 61.363	THI Cost : 2.574
Starting Hrs : 35750.000	Planned Use Hrs : 3800.000
Useful Life Hrs : 73000.000	Horsepower : 1530.000
Speed : 134.500	Width : 136.000
Fuel Amount : 16.965	Fuel Price : 11.000
Fuel Cost : 27.059	Labor Amount : 2.412
Labor Price : 80.000	Labor Cost : 19.927
Lube Oil Amounts : 0.059	Lube Oil Price : 51.000
Lube Oil Cost : 0.226	Repair Cost : 32.445
Equiv PTO HP : 1100.000	Field Efficiency : 625.970
Operating Cost : 79.66	Alloc OH Cost : 63.94

Feedback About crops/budget/2- Corn Soybean Rotation/273071632/none

The following *Totals* Capital Budget Analysis displays typical results for the irrigation power equipment used in a center pivot irrigation investment. Footnotes 3 and 4 are particularly relevant for these types of analyses.



Intro | 1 | 2 | 3 | Help

Your analysis has been saved. The analysis can be viewed whenever this analyzer addin is opened.

Investment Group : Capital Budgets, Irrigation Examples

Investment : Capital Budget, Center Pivot

Benefits

Costs

Market Value : 12500.000
Cap Recov Cost : 47.544
Starting Hrs : 0.000
Useful Life Hrs : 2000.000
Fuel Price : 0.090
Extra Energy (standby) Cost : 0.0000
Labor Price (per hour) : 8.000
Irrigation Times : 8.0000
Irrigation Duration Labor Hours Per Set : 2.0000
Equipment Labor Price (per hour) : 12.000
Season Water Need : 25.0000
Season Water Extra Debit : 3.0000
Season Applied Amount : 826.5625
Water Cost : 0.0000
Lube Oil Price : 4.000
Water Horsepower (hp or kW) : 172.5152
Engine Flywheel Power (hp or kW) : 261.3866
Static Head (feet or meters) : 500.0000
Water pumped (acre inches/hour or m3/hour) : 2.6667
Required Fuel Amount : 81.2364
Unit of Measurement : see inputs
Pump Hours Needed per Season (per acre or hectare) : 10.7813
Other Head (feet or meters) : 0.0000
Extra Power 2 (hp or kW) : 0.0000

Salvage Value : 1000.000
THI Cost : 1.078
Planned Use Hrs : 1000.000
Fuel Amount : 93.750
Fuel Cost : 242.578
Labor Amount (per acre or hectare) : 0.045
Labor Cost : 10.241
Irrigation Duration Per Set : 10.0000
Equipment Labor Amount (per acre or hectare) : 0.0022
Equipment Labor Cost : 0.7676
Season Water Extra Credit : 5.0000
Distribution Uniformity : 80.0000
Water Price : 0.0000
Lube Amount (gallons or liters) : 0.032
Lube Oil Cost : 3.720
Brake Horsepower (hp or kW) : 261.3866
Flow Rate (gpm or l/s) : 1200.0000
Pressure Head (psi or kPa) : 30.0000
Pump Efficiency : 66.0000
Pump Performance : 86.6522
Repair Cost : 7.501
Friction Head (feet or meters) : 0.0000
Extra Power 1 (hp or kW) : 0.0000
Fuel Type :

Time Period : Center Pivot, 2011

Components

Component : Irrigation, Center Pivot

Input : Pipe, Underground, 8 inch

The following *Totals* Capital Budget Analysis displays typical results for general capital inputs used in a simple capital investment analysis.

Base Resource (Input) Calculations To Analyze Type:

General Capital

Investment Group									
Capital Budgets, Capital Input Examples									
Investment									
General Capital, Example 1									
Time Period									
Example 1, General Capital									
Outcomes									
Costs									
Market Value	**Salvage Value**	**Capital Recovery Cost**	**THI Cost**	**Starting Hrs**	**Planned Use Hrs**	**Useful Life Hrs**			
Fuel Amount	**Fuel Price**	**Fuel Cost**	**Labor Amount**	**Labor Price**	**Labor Cost**	**Energy Use Hr**	**Energy Efficiency**	**R and M Percent**	**Repair Cost**
Component									
General Capital, Example 1									
Costs									
1000.000	75.000	3.159	0.715	300.000	100.000	2000.000			
10.000	3.500	35.000	5.500	9.000	49.500	2.500	80.000	0.030	1.500
Input : Example 7- General Capital Input Calculator									
Costs									
1000.00	75.00	3.1585	0.7145	300	100	2000			
10.0000	3.5000	35.0000	5.5000	9.00	49.5000	2.50	80.0000	0.0300	1.5000
Time Period Totals									
Costs									
1000.000	75.000	3.159	0.715	300.000	100.000	2000.000			
10.000	3.500	35.000	5.500	9.000	49.500	2.500	80.000	0.030	1.500

Feedback About cropsconservation/investmenttimeperiod/Period 1, Capital Budget/2108448203/none

2. Timeliness Penalty Analysis (4*)

These analyses can be completed for Operations, Components, Operating Budgets, and Capital Budgets. Operations or Components that can't be completed in a timely fashion, as determined by the properties set in the underlying calculators, will be assessed a penalty based on the number of extra days needed to complete the operation. The following image displays a typical analysis.

Operation Group : Nutrient Management, General

Operation Details

Market Value : 84100.000	Salvage Value : 8400.000
Cap Recov Cost : 959.295	THI Cost : 89.095
Starting Hrs : 6000.000	Planned Use Hrs : 500.000
Useful Life Hrs : 12000.000	Horsepower : 150.000
Speed : 20.000	Width : 10.000
Fuel Amount : 570.704	Fuel Price : 2.000
Fuel Cost : 1186.164	Labor Amount : 69.300
Labor Price : 12.000	Labor Cost : 864.209
Lube Oil Amounts : 2.344	Lube Oil Price : 5.000
Lube Oil Cost : 12.191	Repair Cost : 838.234
Equiv PTO HP : 110.000	Field Efficiency : 99.000
Operating Cost : 2900.80	Alloc OH Cost : 1048.39
Labor Available (hours per day) : 20.000	Area Covered (ac/ha per day) : 166.667
Planned vs Actual Start Date : ;	Probable Field Days Needed : 12.000
Probable Finish Date :	Timeliness Penalty Days From Start : 8.000
Timeliness Penalty (percent) : 2.000	Additional Penalty (percent) : 4.000
Timeliness Penalty Cost (currency) : 223198.996	Timeliness Penalty Cost Per Hour : 2480.038

Operation : Apply Anyhdrous(Amount: 1500; Date: 12/31/2003

Operation Details

Market Value : 84100.000	Salvage Value : 8400.000
Cap Recov Cost : 959.295	THI Cost : 89.095
Starting Hrs : 6000.000	Planned Use Hrs : 500.000
Useful Life Hrs : 12000.000	Horsepower : 150.000
Speed : 20.000	Width : 10.000
Fuel Amount : 570.704	Fuel Price : 2.000
Fuel Cost : 1186.164	Labor Amount : 69.300
Labor Price : 12.000	Labor Cost : 864.209
Lube Oil Amounts : 2.344	Lube Oil Price : 5.000
Lube Oil Cost : 12.191	Repair Cost : 838.234
Equiv PTO HP : 110.000	Field Efficiency : 99.000
Operating Cost : 2900.80	Alloc OH Cost : 1048.39
Labor Available (hours per day) : 10.000	Area Covered (ac/ha per day) : 166.667
Planned vs Actual Start Date : 04/15/2003 ; 04/15/2003	Probable Field Days Needed : 12.000
Probable Finish Date : 04/26/2003	Timeliness Penalty Days From Start : 4.000
Timeliness Penalty (percent) : 1.000	Additional Penalty (percent) : 2.000
Timeliness Penalty Cost (currency) : 223198.996	Timeliness Penalty Cost Per Hour : 2480.038

Input : Anhydrous Applicator Rental

Input : Fertilizer, Anhydrous Ammonia

Input : Tractor, 2-Wheel Drive, 140-159 PTO HP

Input Details

Market Value : 84100.00	Salvage Value : 8400.00

Besides regular machinery properties, these analyses include the following properties:

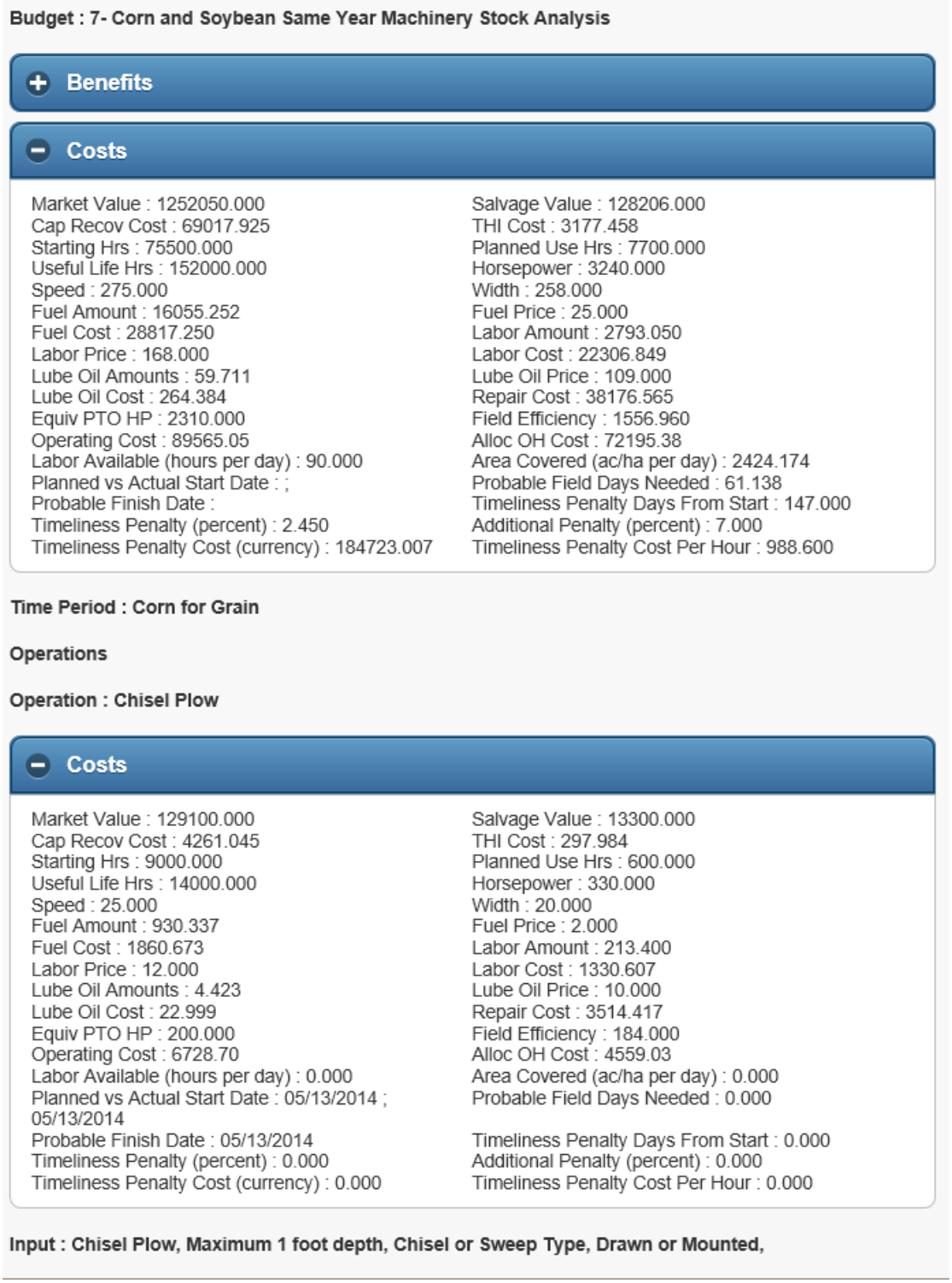
- **Labor Available (hours per day):** This property is set in the NPV Calculators.

- **Area Covered (ac/ha per day)** = Field Capacity (ac/hour) / Labor Available (hours/day)
- **Planned versus Actual Start Date:** The Planned Date derives from the Start Date in the NPV Calculators. In Least Cost Analysis, the actual start date derives from an analysis of sequential feasible machinery operations/components.
- **Probable Field Days Needed =** Operation/Component Amount (or Time Period Amount) / Area Covered
- **Probable Finish Date**: Actual Start Date + (Field Days Needed / Probably Workdays from NPV Calculators)
- **Timeliness Penalties Days from Start:** This property is set in the NPV Calculators.
- **Timeliness Penalty (percent):** This property is set in the NPV Calculators.
- **Additional Penalty (percent):** This property is set in the NPV Calculators.
- **Total Revenue =** Operations and Components: Operation/Component.Amount * Output.Price * Output.Amount * Output.CompositionAmount * Output.Times
  Time Periods: The output with the highest revenue will be used in the following formula: TimePeriod.Amount * Outcome.Amount * Output.Price * Output.Amount * Output.CompositionAmount * Output.Times
- **Timeliness Penalty ($)** = ((Probable Field Days Needed - Timeliness Penalties Days from Start) * (Timeliness Penalty * Total Revenue)) + ((Probable Field Days Needed – Additional Timeliness Penalties Days from Start) * (Additional Timeliness Penalty * Total Revenue))
- **Timeliness Penalty Cost per Hour**: Timeliness Penalty / ((1 / Field Capacity) / * Operation/Component Amount (or Time Period Amount))

A numeric example can be found in the *Capital Input 1 Calculator* reference. Operation and Component Analyses use the Output properties set in their underlying NPV Operation or Component NPV Timeliness Penalty Calculator, to determine penalties. Operating and Capital Budgets use the Outputs in the budgets to determine the penalties. They use the Output with the highest revenue that contains, or equals, the Operation/Component's Ouput.Name. They use the Outcome.Amount property in the revenue calculation but the Operation/Component's Amount property to compute penalty days. The TimePeriod.Amount property is a multiplier used in both calculations.

Actual Timeliness Penalty Analysis: These analyses can be completed for Operations, Components, Operating Budgets, and Capital Budgets. Operations or components that can't be completed in a timely fashion, as determined by the properties set in the underlying calculators, will be assessed a penalty based on the number of extra days needed to complete the operation. These analyses use the default, rather than size range, properties of machinery inputs to determine penalties.

The following Actual Timeliness Penalty Operating Budget analysis displays basic machinery totals associated with a corn soybean rotation.



Budget : 7- Corn and Soybean Same Year Machinery Stock Analysis

Benefits

Costs

Market Value : 1252050.000	Salvage Value : 128206.000
Cap Recov Cost : 69017.925	THI Cost : 3177.458
Starting Hrs : 75500.000	Planned Use Hrs : 7700.000
Useful Life Hrs : 152000.000	Horsepower : 3240.000
Speed : 275.000	Width : 258.000
Fuel Amount : 16055.252	Fuel Price : 25.000
Fuel Cost : 28817.250	Labor Amount : 2793.050
Labor Price : 168.000	Labor Cost : 22306.849
Lube Oil Amounts : 59.711	Lube Oil Price : 109.000
Lube Oil Cost : 264.384	Repair Cost : 38176.565
Equiv PTO HP : 2310.000	Field Efficiency : 1556.960
Operating Cost : 89565.05	Alloc OH Cost : 72195.38
Labor Available (hours per day) : 90.000	Area Covered (ac/ha per day) : 2424.174
Planned vs Actual Start Date : ;	Probable Field Days Needed : 61.138
Probable Finish Date :	Timeliness Penalty Days From Start : 147.000
Timeliness Penalty (percent) : 2.450	Additional Penalty (percent) : 7.000
Timeliness Penalty Cost (currency) : 184723.007	Timeliness Penalty Cost Per Hour : 988.600

Time Period : Corn for Grain

Operations

Operation : Chisel Plow

Costs

Market Value : 129100.000	Salvage Value : 13300.000
Cap Recov Cost : 4261.045	THI Cost : 297.984
Starting Hrs : 9000.000	Planned Use Hrs : 600.000
Useful Life Hrs : 14000.000	Horsepower : 330.000
Speed : 25.000	Width : 20.000
Fuel Amount : 930.337	Fuel Price : 2.000
Fuel Cost : 1860.673	Labor Amount : 213.400
Labor Price : 12.000	Labor Cost : 1330.607
Lube Oil Amounts : 4.423	Lube Oil Price : 10.000
Lube Oil Cost : 22.999	Repair Cost : 3514.417
Equiv PTO HP : 200.000	Field Efficiency : 184.000
Operating Cost : 6728.70	Alloc OH Cost : 4559.03
Labor Available (hours per day) : 0.000	Area Covered (ac/ha per day) : 0.000
Planned vs Actual Start Date : 05/13/2014 ; 05/13/2014	Probable Field Days Needed : 0.000
Probable Finish Date : 05/13/2014	Timeliness Penalty Days From Start : 0.000
Timeliness Penalty (percent) : 0.000	Additional Penalty (percent) : 0.000
Timeliness Penalty Cost (currency) : 0.000	Timeliness Penalty Cost Per Hour : 0.000

Input : Chisel Plow, Maximum 1 foot depth, Chisel or Sweep Type, Drawn or Mounted,

Feasible Timeliness Penalty Analysis (4*): A *Feasible Timeliness Penalty Analysis* can be completed for Operations and Components. Operations or components that can't be completed in a timely fashion, as determined by the properties set in the underlying calculators, will be

assessed a penalty based on the number of extra days needed to complete the operation. These analyses use the default and size range properties of machinery inputs to determine penalties. All feasible combinations are analyzed. A non-power input's feasible Maximum Horsepower size range properties are used to limit the feasible combinations. Power inputs that are within +-10 Maximum Horsepower are considered feasible.

The following Feasible Timeliness Penalty Operation analysis displays basic machinery totals associated with a planting operation group. The difference in penalties shown here derives from implement width and tractor size. The equipment used in the first Operation can plant at a rate of 0.24 hours per acre (implement width of 10 feet, 70 equivalent pto hp). The equipment in the second Operation can plant at a rate of 0.20 hours per acre (implement width of 12 feet, 85 equivalent pto hp). Although the tractor in the second Operation is more expensive than the first tractor, the total capital recovery costs per acre are allocated over a greater area (50.9 versus 42.4).

Operation : Plant, Corn Grain, medium tractor, Example 1(Amount: 500; Date: 12/31/2003

Operation Details

Market Value : 53000.000	Salvage Value : 8966.000
Cap Recov Cost : 3240.311	THI Cost : 109.971
Starting Hrs : 750.000	Planned Use Hrs : 500.000
Useful Life Hrs : 7500.000	Horsepower : 240.000
Speed : 25.000	Width : 20.000
Fuel Amount : 689.622	Fuel Price : 2.000
Fuel Cost : 1379.244	Labor Amount : 259.286
Labor Price : 12.000	Labor Cost : 1555.714
Lube Oil Amounts : 3.150	Lube Oil Price : 8.000
Lube Oil Cost : 9.451	Repair Cost : 1191.455
Equiv PTO HP : 140.000	Field Efficiency : 169.000
Operating Cost : 4135.86	Alloc OH Cost : 3350.28
Labor Available (hours per day) : 10.000	Area Covered (ac/ha per day) : 42.424
Planned vs Actual Start Date : 04/21/2003 ; 04/21/2003	Probable Field Days Needed : 18.132
Probable Finish Date : 05/09/2003	Timeliness Penalty Days From Start : 7.000
Timeliness Penalty (percent) : 0.500	Additional Penalty (percent) : 1.000
Timeliness Penalty Cost ($) : 52610.577	Timeliness Penalty Cost Per Hour : 446.393

Input : Example 1- Tractor, New Calculators

Input Details

Input : Grain Drill, Most Common Spacing, Plain, 15-17 Openers

Input Details

Operation : Plant, Corn Grain, medium tractor, Example 1(Amount: 500; Date: 12/31/2003

Operation Details

Market Value : 60000.000	Salvage Value : 8966.000
Cap Recov Cost : 3205.999	THI Cost : 104.609
Starting Hrs : 750.000	Planned Use Hrs : 500.000
Useful Life Hrs : 7500.000	Horsepower : 260.000
Speed : 25.000	Width : 22.000
Fuel Amount : 694.992	Fuel Price : 2.000
Fuel Cost : 1389.984	Labor Amount : 216.071
Labor Price : 12.000	Labor Cost : 1296.429
Lube Oil Amounts : 3.038	Lube Oil Price : 8.000
Lube Oil Cost : 9.113	Repair Cost : 1175.120
Equiv PTO HP : 170.000	Field Efficiency : 169.000
Operating Cost : 3870.65	Alloc OH Cost : 3310.61
Labor Available (hours per day) : 10.000	Area Covered (ac/ha per day) : 50.909
Planned vs Actual Start Date : 04/21/2003 ; 04/21/2003	Probable Field Days Needed : 15.110
Probable Finish Date : 05/06/2003	Timeliness Penalty Days From Start : 7.000
Timeliness Penalty (percent) : 0.500	Additional Penalty (percent) : 1.000
Timeliness Penalty Cost ($) : 28019.231	Timeliness Penalty Cost Per Hour : 285.287

Least Cost Timeliness Penalty Analysis (5*): A *Least Cost Timeliness Penalty Analysis* can be completed for Operating Budgets and Capital Budgets. Operations or components that can't be completed in a timely fashion, as determined by the properties set in the underlying calculators, will be assessed a penalty based on the number of extra days needed to complete the operation.

These analyses use the size range properties of machinery inputs to determine penalties. This analysis returns the least cost combination of machinery. Unlike the Actual and Feasible Penalty Analyzers, this analyzer uses the Operation/Component.Amount, rather than Outcome.Amount, in the Revenue calculation.

Budgets use the TimePeriod.Date property to specify the sequential priority of time period budgets. Enterprises, or Practices, with earlier dates are considered more important than ones with later dates and will be completed first.

The following Least Cost Timeliness Penalty Operating Budget analysis displays basic machinery totals and penalties associated with the same corn soybean rotation as displayed for the Actual Timeliness Penalty Analysis. The soybean crop being grown in this rotation has lower priority than the corn crop, but this analysis is able to use the feasible combinations of machinery for each Operation and select the lowest cost combination.

Budget									
7- Corn and Soybean Same Year Machinery Stock Analysis									
Costs									
1361480.000	128206.000	56757.537	2250.463	432000.000	41200.000	823000.000	19720.000	1507.000	1524.000
11592.299	0.000	22649.350	2366.015	0.000	18185.376	45.445	0.000	217.000	24416.508
15540.000	10247.910	65468.23	59008.00						
90.000	753.333		108.835		165.000	2.450	7.000	66064.503	328.889
Time Period									
Corn for Grain									
Costs									
Market Value	**Salvage Value**	**Cap Recov Cost**	**THI Cost**	**Starting Hrs**	**Planned Use Hrs**	**Useful Life Hrs**	**Horsepower**	**Speed**	**Width**
Fuel Amount	**Fuel Price**	**Fuel Cost**	**Labor Amount**	**Labor Price**	**Labor Cost**	**Lube Oil Amounts**	**Lube Oil Price**	**Lube Oil Cost**	**Repair Cost**
Equiv PTO HP	**Field Efficiency**	**Operating Cost**	**Alloc OH Cost**						
Labor Available (hours per day)	**Area Covered (ac/ha per day)**	**Planned vs Actual Start Date**	**Probable Field Days Needed**	**Probable Finish Date**	**Timeliness Penalty Days From Start**	**Timeliness Penalty (percent)**	**Additional Penalty (percent)**	**Timeliness Penalty Cost (currency)**	**Timeliness Penalty Cost Per Hour**
Time Period Totals									
Costs									
700090.000	66346.000	28080.857	1153.981	0.000	0.000	0.000	0.000	0.000	0.000
5968.504	0.000	12025.047	1169.014	0.000	9022.377	22.432	0.000	110.685	11843.573
0.000	0.000	33001.68	29234.84						
50.000	512.424		56.222		81.000	1.700	4.000	2940.237	12.830
Time Period									
Soybeans for Grain									
Costs									
Market Value	**Salvage Value**	**Cap Recov Cost**	**THI Cost**	**Starting Hrs**	**Planned Use Hrs**	**Useful Life Hrs**	**Horsepower**	**Speed**	**Width**
Fuel	**Fuel Price**	**Fuel Cost**	**Labor**	**Labor**	**Labor**	**Lube Oil**	**Lube Oil**	**Lube Oil**	**Repair**

3. Other Analyses

Future releases will include additional types of analyses.

I. Performance Analysis

The data generated by the Capital Input Analyzers can be used in Performance Measures to support decisions related to capital inputs. These Measures, which include Net Returns, Net Savings, Return on Investment, Output per Unit Input, and Input per Unit Output, are documented in the *Performance Analysis 1* reference.

J. Comparative Analysis

DevTreks does not currently support the comparative analysis of capital input data.

K. Sample Data Sets (6*)

This section contains links to sample data sets that display the results of running these analyzers. Keep in mind that these data sets were structured for the purpose of testing the analyzers. The data is fictitious and no weight should be assigned to the absolute numbers –pay attention to the aggregation techniques only. Refer to Footnote 1. These date sets also contain the exact same NPV calculators and analyzers. All of the capital input cost data found in the NPV totals derive from the calculated capital input results.

> https://www.devtreks.org/agtreks/select/crops/operationgroup/Seeding and Planting, corn/44/none/
> https://www.devtreks.org/agtreks/preview/crops/budgetgroup/Operating Budgets, Common Agricultural Examples/2140761538/none/

L. Multimedia (Resources)

Pictures and videos of the capital input should be part of all stories that accompany capital input calculations. Videos that explain how to manage the capital input should also accompany stories.

M. Stories (Linked Views)

Machinery specifications, such as pdf files, can be part of the all stories that accompany capital input calculations. The story should explain the significance of the capital input analysis.

N. Knowledge Bank Standards

All capital input analyses should be entered into online knowledge banks (i.e. production servers as contrasted to development servers) that can be used to analyze the costs, benefits, and performance of capital inputs. That structured evidence must be passed down to future generations. These knowledge banks aggregate and analyze all of the data in a network. Future references will demonstrate how these knowledge banks will evolve (i.e. semantic data, forecasts) to support future decision making needs. The flexibility offered by DevTreks in documenting capital input costs means that networks need to develop "rules" explaining the "standards" that should be followed by clubs in their network. The "standards" make it possible to build knowledge banks.

Summary

Clubs using DevTreks can start to carry out the basic analysis of certain capital inputs. Clubs can solicit help understanding and managing capital inputs. Networks can build knowledge banks that explain why some capital inputs fit better than others. They can pass that knowledge down to future generations. The result may be farmers that conserve scare water resources better, hospitals that treat patients more affordably, software programmers who access international

audiences quicker, factories that balance workers and machines fairly, and people who improve their lives and livelihoods.

Footnotes

1. While employed as a county supervisor for the USDA, Farmers Home Administration, the author routinely appraised the value of farms, farm machinery and chattel property. He also managed up to 5100 acres of capital intensive farmland (irrigated Imperial Valley, CA, USA inventory cropland) that required managing capital inputs (irrigation pumps). While employed as an agricultural economist for the USDA, Natural Resources Conservation Service, the author routinely built tools that analyzed the costs of capital inputs, especially farm equipment.
2. Capital Input Analysis has a long tradition that includes more advanced analytic techniques than those used in this reference. Future releases will include some of these techniques.
3. In the past, the author has mostly worked with multi-disciplinary teams to build these types of calculators. In the recent past, DevTreks focus has been IT first, rather than multi-disciplinary first. These types of calculators will continue to evolve and improve over the years –especially as customers provide feedback or contract with us for new or improved tools.
4. The types of calculations in this example help to explain why farmers often seek to expand their acreage.
5. This supplements Footnote 3. A potential customer identified the need for these types of analyses when DevTreks was still in beta testing. Optimization algorithms use a wide variety of techniques –this algorithm uses an extremely simple sorting technique. These types of algorithms can do a particularly good job of analyzing resource allocation data. They'll expand over the years.
6. These calculators and analyzers were tested using limited, sample data sets. Full industry support should be tested using larger data sets. Email us if you'd like to pursue that avenue.

References

References for Capital Input analysis can be found in the introductory *Capital Input Calculators 1* reference.

References Note

We try to use references that are open access or that do not charge fees.

Improvements, Errors, and New Features

Please notify DevTreks (devtrekkers@gmail.com) if you find errors in these references. Also please let us know about suggested improvements or recommended new features.

Video tutorials explaining this reference can be found at:

https://www.devtreks.org/commontreks/preview/commons/resourcepack/Machinery Costs 1/437/none/

https://www.devtreks.org/commontreks/preview/commons/resourcepack/Irrigation Costs 1/443/none/

https://www.devtreks.org/commontreks/preview/commons/resourcepack/General Capital Costs 1/465/none/