



DevTreks –social budgeting that improves lives and livelihoods

## Capital Input Analysis 1

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**Version: DevTreks 2.1.6**

### 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.

Section	Page
Data URLs	2
Work Breakdown Structure and Calculator Rules	3
Capital Input Calculations	3
Multipliers	9
NPV Calculators	10
Capital Input Benefits	10
Capital Input Analyses	10
Totals Analysis	10
Timeliness Penalty Analysis	17
Actual Timeliness Penalty Analysis	20
Feasible Timeliness Penalty Analysis	22



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Least Cost Timeliness Penalty Analysis	24
Performance Analysis and Other Types of Machinery Analysis	26
Multimedia and Stories	26
Knowledge Banks and Summary and Conclusions	26

## B. Data URLs

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 club, Iowa, Corn and Soybeans ..., owns most of this data. They subscribe to the Capital Input calculators and analyzers owned by the Core Sample Economics Datasets club.

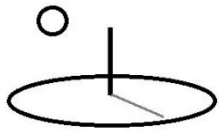
The Analyzers demonstrated in this reference can be found at:

[https://www.devtreks.org/agtreks/preview/crops/linkedviewgroup/Machinery Analyzer  
Group/19/none/](https://www.devtreks.org/agtreks/preview/crops/linkedviewgroup/Machinery%20Analyzer%20Group/19/none/)

[http://localhost:5000/agtreks/preview/crops/linkedviewgroup/Machinery Analyzer  
Group/19/none](http://localhost:5000/agtreks/preview/crops/linkedviewgroup/Machinery%20Analyzer%20Group/19/none)

[https://www.devtreks.org/agtreks/select/crops/operationgroup/Seeding and Planting,  
corn/44/none/](https://www.devtreks.org/agtreks/select/crops/operationgroup/Seeding%20and%20Planting,%20corn/44/none/)

[https://www.devtreks.org/agtreks/preview/crops/budgetgroup/Operating Budgets, Common  
Agricultural Examples/2140761538/none/](https://www.devtreks.org/agtreks/preview/crops/budgetgroup/Operating%20Budgets,%20Common%20Agricultural%20Examples/2140761538/none/)



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This reference used the localhost (Version 2.1.0) and cloud deployments (Version 2.1.0) to document calculations. No major attempt is made to keep the localhost and cloud datasets the same.

### 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. 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



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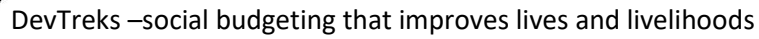
Net Present Value (NPV) Calculators are run, new machinery calculations are generated. The following images display the results of running separate input machinery calculations for a tractor and a chisel plow. Note the individual differences in area, fuel, labor, width, field efficiency, and horsepower properties.

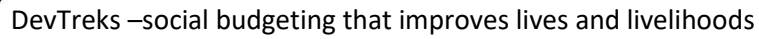
URLs:

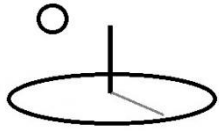
[https://www.devtreks.org/agtreks/preview/crops/inputseries/2002 Tractor, 4-Wheel Drive, 200-280 PTO HP/2147377908/none](https://www.devtreks.org/agtreks/preview/crops/inputseries/2002%20Tractor,%204-Wheel%20Drive,%20200-280%20PTO%20HP/2147377908/none)

[https://www.devtreks.org/agtreks/preview/crops/inputseries/2002 Chisel Plow, Maximum 1 foot depth, Chisel or Sweep Type, Drawn or Moun/2147377820/none](https://www.devtreks.org/agtreks/preview/crops/inputseries/2002%20Chisel%20Plow,%20Maximum%201%20foot%20depth,%20Chisel%20or%20Sweep%20Type,%20Drawn%20or%20Moun/2147377820/none)

Chisel Plow

Tractor

6



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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 joint calculations also changed all OCPrices and AOHPPrices. The prices that change depend on the base calculation parameters. The implement's width, field efficiency, and equivalent horsepower, and the tractor's maximum horsepower were used in the joint calculations.

URLs (owned by the Iowa, Corn and Soybean club)

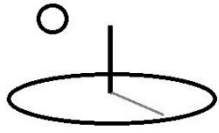
<https://www.devtreks.org/agtreks/preview/crops/operation/Tillage, First, 2003, Chisel Plow, NASS machinery/2091544565/none>

<http://localhost:5000/agtreks/preview/crops/operation/Tillage, First, 2003, Chisel Plow, NASS machinery/2091544565/none>

Chisel Plow Operation







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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 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 used 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.

When multipliers were first tested during Version 2.1.0 tests, it appeared that certain multipliers, such as those used with irrigation calculations, no longer worked. Closer inspection of the analysis results showed that the multipliers only changed the summary costs, such as fuel and repair, but not other calculated variables, such as market value. They work as designed, but the analyst has to understand that design. The design includes understanding that when any changes are made to any base element property, such as Input.Times or Operation.Amount, the base document must be “made” again, prior to running any calculation.



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## **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**

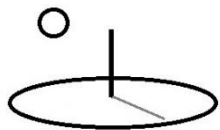
The Analysis Type property of analyzers is used to specify the type of analysis to run. The current version supports the following analyses:

### **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.

[https://www.devtreks.org/agtreks/preview/crops/operationgroup/Nutrient Management, Nashua corn and beans research plots, N application/326/none](https://www.devtreks.org/agtreks/preview/crops/operationgroup/Nutrient%20Management,%20Nashua%20corn%20and%20beans%20research%20plots,%20N%20application/326/none)



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Note how the 10 crop operations in this example all have equal machinery costs. Also note how the Operation Group’s costs verify that they are a summation of the 10 children machinery operations. This is likely to be an example of an expeditious, but not necessarily fully accurate, machinery analysis. The same machinery was used in each crop operation even though 10 years of crop operations are being analyzed. Networks need to provide thorough guidance about the data standards employed by their clubs. In general, high quality data does not employ expeditious techniques. It might be forgiven in this example because 10 years of machinery data was simply not available and the analysis was mainly concerned about nutrient management, not machinery management.

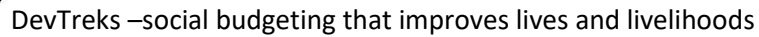
Version 2.1.0 verified that this dataset actually has extra crop operations (i.e. 30 on the cloud). These datasets get tested for multiple purposes –possibly to test the NPV analyzers that are also used to analyze this operation group. The machinery analysis still shows these results, but only because they were not rerun with the current dataset.



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Operation Group									
Nutrient Management, Nashua corn and beans research plots, N application									
430020.000	43000.000	26.796	0.615	66000.000	5300.000	132000.000	2200.000	170.000	200.000
86.271	20.000	172.542	4.080	120.000	24.480	0.177	30.000	0.353	15.400
2000.000	16.900	n.a.	212.85	27.41					
Operation									
Nutrient Management, 1990 pre-plant N application									
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	Rep Cost
Equiv PTO HP	Field Efficiency	Amount	Operating Cost	Alloc OH Cost					
43002.000	4300.000	2.680	0.061	6600.000	530.000	13200.000	220.000	17.000	20.000
8.627	2.000	17.254	0.408	12.000	2.448	0.018	3.000	0.035	1.540
200.000	1.690	n.a.	21.28	2.74					
Input: Spreader, Calumet, with injectors, used									
3250.00	300.00	1.2676	0.0352	600	30	1200	110	7.0000	10.000
0.0000	0.0000	0.0000	0.2040	0.00	0.0000	0.0000	1.0000	0.0000	0.520
100	0.7000	0.2041	0.52	1.30					
Input: Tractor, John Deere, 1996, Model 7600, 110 HP (high service capacity)									
39752.00	4000.00	1.4120	0.0263	6000	500	12000	110	10.0000	10.000
8.6271	2.0000	17.2542	0.2040	12.00	2.4480	0.0177	2.0000	0.0353	1.020
100	0.9900	0.2041	20.76	1.44					
Input: Fertilizer, Anhydrous Ammonia 1990									
Operation									
Nutrient Management, 1991 pre-plant N application									

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



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### Budget : 2- Corn Soybean Rotation

+ Benefits

- Costs

Market Value : 1478760.000	Salvage Value : 149386.000
Cap Recov Cost : 141.309	THI Cost : 7.035
Starting Hrs : 93250.000	Planned Use Hrs : 10100.000
Useful Life Hrs : 192500.000	Horsepower : 4260.000
Speed : 364.500	Width : 328.000
Fuel Amount : 26.402	Fuel Price : 32.000
Fuel Cost : 53.353	Labor Amount : 5.763
Labor Price : 196.000	Labor Cost : 41.727
Lube Oil Amounts : 0.105	Lube Oil Price : 148.000
Lube Oil Cost : 0.534	Repair Cost : 77.378
Equiv PTO HP : 3040.000	Field Efficiency : 2453.990
Operating Cost : 172.99	Alloc OH Cost : 148.34

**Time Period : Corn**

**Operations**

**Operation : 2003 Dry, grain, custom**

**Input : 2003 Dry Grain, Custom**

**Operation : Apply Anyhdrous**

- Costs

Market Value : 84100.000	Salvage Value : 8400.000
Cap Recov Cost : 0.640	THI Cost : 0.059
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 : 0.477	Fuel Price : 2.000
Fuel Cost : 0.991	Labor Amount : 0.046
Labor Price : 12.000	Labor Cost : 0.576
Lube Oil Amounts : 0.002	Lube Oil Price : 5.000
Lube Oil Cost : 0.008	Repair Cost : 0.559
Equiv PTO HP : 140.000	Field Efficiency : 99.000
Operating Cost : 2.13	Alloc OH Cost : 0.70

**Input : 2003 Anhydrous, Sample Calculation**



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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.

[https://www.devtreks.org/agtreks/preview/cropsconservation/investmentgroup/Capital Budgets, Irrigation Examples/275505672/none](https://www.devtreks.org/agtreks/preview/cropsconservation/investmentgroup/Capital%20Budgets,%20Irrigation%20Examples/275505672/none)



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Machinery Totals Analyzer

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Media

✓ Mobile

Desktop

Intro	1	2	3	Help
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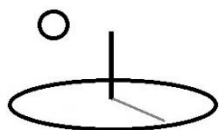
Your analysis has been saved. The analysis can be viewed whenever this analyzer addin is opened.

Investment Group : Capital Budgets, Irrigation Examples

+ Benefits

- Costs

Market Value : 37500.000	Salvage Value : 3000.000
Cap Recov Cost : 142.632	THI Cost : 3.234
Starting Hrs : 0.000	Planned Use Hrs : 3000.000
Useful Life Hrs : 6000.000	Fuel Amount : 281.250
Fuel Price : 0.270	Fuel Cost : 727.734
Extra Energy (standby) Cost : 0.0000	Labor Amount (per acre or hectare) : 0.134
Labor Price (per hour) : 24.000	Labor Cost : 30.722
Irrigation Times : 24.0000	Irrigation Duration Per Set : 30.0000
Irrigation Duration Labor Hours Per Set : 6.0000	Equipment Labor Amount (per acre or hectare) : 0.0066
Equipment Labor Price (per hour) : 36.000	Equipment Labor Cost : 2.3029
Season Water Need : 75.0000	Season Water Extra Credit : 15.0000
Season Water Extra Debit : 9.0000	Distribution Uniformity : 240.0000
Season Applied Amount : 2479.6875	Water Price : 0.0000
Water Cost : 0.0000	Lube Amount (gallons or liters) : 0.097
Lube Oil Price : 12.000	Lube Oil Cost : 11.161
Water Horsepower (hp or kW) : 517.5456	Brake Horsepower (hp or kW) : 784.1598
Engine Flywheel Power (hp or kW) : 784.1598	Flow Rate (gpm or l/s) : 3600.0000
Static Head (feet or meters) : 1500.0000	Pressure Head (psi or kPa) : 90.0000
Water pumped (acre inches/hour or m3/hour) : 8.0001	Pump Efficiency : 198.0000
Required Fuel Amount : 243.7092	Pump Performance : 259.9566
Unit of Measurement : see inputs	Repair Cost : 22.503
Pump Hours Needed per Season (per acre or hectare) : 32.3439	Friction Head (feet or meters) : 0.0000
Other Head (feet or meters) : 0.0000	Extra Power 1 (hp or kW) : 0.0000
Extra Power 2 (hp or kW) : 0.0000	Fuel Type :



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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

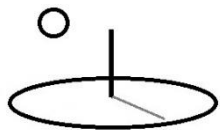
Time Period Totals

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](#)





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## **2. Timeliness Penalty Analysis (4\* and 6\*)**

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. This crop operation is a sibling to the Example 1 Operation used to explain these penalties in the calculator reference.

<https://www.devtreks.org/agtreks/preview/crops/operation/Plant, Corn Grain, medium tractor, Example 2/2091544226/none>



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Seeding and Planting, corn X

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**Operation : Plant, Corn Grain, medium tractor,**  
**Example 2(Amount: 500; Date: 12/31/2003)**

—

**Operation Details**

Market Value : 67610.000	Salvage Value : 8966.000
Cap Recov Cost : 2750.026	THI Cost : 103.564
Starting Hrs : 750.000	Planned Use Hrs : 500.000
Useful Life Hrs : 7500.000	Horsepower : 280.000
Speed : 10.000	Width : 24.000
Fuel Amount : 697.368	Fuel Price : 2.000
Fuel Cost : 1394.736	Labor Amount : 184.800
Labor Price : 12.000	Labor Cost : 1108.800
Lube Oil Amounts : 2.948	Lube Oil Price : 8.000
Lube Oil Cost : 8.854	Repair Cost : 1241.251
Equiv PTO HP : 200.000	Field Efficiency : 150.000
Operating Cost : 3753.64	Alloc OH Cost : 2853.59
Labor Available (hours per day) : 10.000	Area Covered (ac/ha per day) : 59.524
Planned vs Actual Start Date : 04/21/2003 ; 04/21/2003	Probable Field Days Needed : 12.923
Probable Finish Date : 05/03/2003	Timeliness Penalty Days From Start : 10.000
Timeliness Penalty (percent) : 0.500	Additional Penalty (percent) : 1.000
Timeliness Penalty Cost (\$): 7928.734	Timeliness Penalty Cost Per Hour : 94.384

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

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

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



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- **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 Output.Name. They use the Outcome.Amount property in the revenue calculation but the Operation/Component's Amount



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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.

<https://www.devtreks.org/agtreks/preview/crops/budget/7- Corn and Soybean Same Year Machinery Stock Analysis/273071763/none>

<http://localhost:5000/agtreks/preview/crops/budget/7- Corn and Soybean Same Year Machinery Stock Analysis/273071761/none>

21



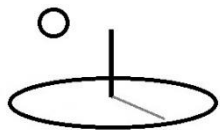
**Feasible Timeliness Penalty Analysis (4\*):** A *Feasible Timeliness Penalty Analysis* can be completed for Operations and Components. Operations or components that can't be completed in a timely fashion, as determined by the properties set in the underlying calculators, will be assessed a penalty 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. [These specific calculations were not proofed in Version 2.0.0. The source hasn't changed in that version and the general principle remains true]. 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).



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<a href="https://www.devtreks.org">https://www.devtreks.org</a> <input type="text" value="Search"/>							
Operation Group							
<b>Seeding and Planting, corn</b>							
3300490.000	353698.000	2728.683	103.943	145250.000	22800.000	410500.000	11210.000
671.183	74.730	1341.681	193.382	456.400	1158.318	2.953	344.000
9325.000	5828.640	n.a.	3748.06	2832.63			
380.000	2380.364		77.623		714.000	19.000	38.000
Operation							
<b>Plant</b>							
Market Value	Salvage Value	Cap Recov Cost	THI Cost	Starting Hrs	Planned Use Hrs	Useful Life Hrs	Horsepower
Fuel Amount	Fuel Price	Fuel Cost	Labor Amount	Labor Price	Labor Cost	Lube Oil Amounts	Lube Oil Price
Equiv PTO HP	Field Efficiency	Amount	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)
114100.000	11400.000	12.344	0.518	6750.000	700.000	13500.000	290.000
1.638	2.000	3.275	0.404	12.000	2.638	0.007	10.000
200.000	164.000	n.a.	13.58	12.86			
10.000	52.000	04/21/2003 ---04/21/2003	0.030	04/21/2003	21.000	0.500	1.000
<b>Input: Tractor, 2-Wheel Drive, 140-159 PTO HP</b>							
84100.00	8400.00	2.9283	0.2720	6000	500	12000	150
1.6377	2.0000	3.2755	0.2115	12.00	2.6380	0.0072	5.0000
100	99.0000	0.1923	8.51	3.20			
<b>Input: Planter, Row Crop, with Fertilizer Attachment, 8-row</b>							
30000.00	3000.00	9.4153	0.2460	750	200	1500	140
0.0000	0.0000	0.0000	0.1923	0.00	0.0000	0.0000	5.0000
100	65.0000	0.1923	5.07	9.66			



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**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 (6\*) 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.

<https://www.devtreks.org/agtreks/preview/crops/budget/7- Corn and Soybean Same Year Machinery Stock Analysis/273071763/none>





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[Machinery Least Cost Time ▼](#) [Get](#)

[Media](#) [✓ Mobile](#) [Desktop](#)

Intro	1	2	3	Help
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Your analysis has been saved. The analysis can be viewed whenever this analyzer addin is opened.

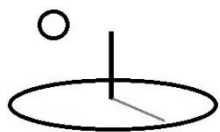
**Budget Group : Operating Budgets, Common Agricultural Examples**

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

**+ Benefits**

**- Costs**

Market Value : 1349340.000	Salvage Value : 126206.000
Cap Recov Cost : 47931.972	THI Cost : 2568.550
Starting Hrs : 0.000	Planned Use Hrs : 0.000
Useful Life Hrs : 0.000	Horsepower : 0.000
Speed : 0.000	Width : 0.000
Fuel Amount : 10771.895	Fuel Price : 0.000
Fuel Cost : 21715.473	Labor Amount : 2153.381
Labor Price : 0.000	Labor Cost : 15571.453
Lube Oil Amounts : 41.916	Lube Oil Price : 0.000
Lube Oil Cost : 212.029	Repair Cost : 27525.725
Equiv PTO HP : 0.000	Field Efficiency : 0.000
Operating Cost : 65024.68	Alloc OH Cost : 50500.52
Labor Available (hours per day) : 60.000	Area Covered (ac/ha per day) : 343.636
Planned vs Actual Start Date : ;	Probable Field Days Needed : 71.069
Probable Finish Date :	Timeliness Penalty Days From Start : 112.000
Timeliness Penalty (percent) : 1.200	Additional Penalty (percent) : 4.000
Timeliness Penalty Cost (currency) : 7076.513	Timeliness Penalty Cost Per Hour : 98.290



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## **I. Performance Analysis and Other Types of Machinery 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 I* reference. The Performance and Social Performance Analysis tutorials include a calculator pattern that employs Indicator metadata, backend TEXT datasets, and custom algorithms that employ mathematical and statistical libraries. That pattern is more generic and powerful than strict reliance on domain-specific calculators (i.e. such as the Ag Machinery and Irrigation calculators).

## **J. Multimedia (Resources) and Stories (Linked Views)**

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.



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.

## **K. Knowledge Bank Standards**



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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 and Conclusions**

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 scarce water resources better, hospitals that treat patients more affordably, cities that mitigate climate change more effectively, 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.



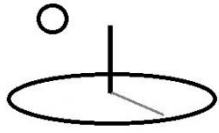
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2. Capital Input Analysis has a long tradition that includes more advanced analytic techniques than those used in this reference. The Social Performance Analysis tutorial introduces more advanced techniques.
3. In the past, the author has mostly worked 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.
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. Version 2.1.4 testing required several efforts to set the base calculations before the penalties actually kicked in. As the accompanying video points out, the cloud’s Mobile View of the Least Cost Timeliness Penalty linked to the wrong analyzer resulting in a “can’t find stylesheet error”. Version 2.1.6 fixed the most onerous bugs revealed in the 2.1.4 tests, but a full debug of every calculation is deferred until sustainability is addressed in the underlying calculators. These types of analyses require attention to detail and 3<sup>rd</sup> party testing. They serve as introductory examples of typical issues that will be faced by any science-oriented club and network, including the need for full transition to 100% digits for sustainable agricultural decision support.

## References

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

## References Note



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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](https://www.devtreks.org/commontreks/preview/commons/resourcepack/Machinery%20Costs)  
1/437/none