DevTreks –social budgeting that improves lives and livelihoods

DevPacks Analysis

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Version: DevTreks 2.1.6 (5*)

A. Introduction

DevPacks are a regular data service that any club can deliver (**1***). They are arbitrary hierarchies of data that contain structured xml. The xml must derive from base element data: Inputs, Outputs, Operations, Components, Outcomes, Operating Budgets, or Capital Budgets. DevPacks offer a flexible data service that permits science and technology data, such as randomized control trial (RCT) data, to be collected, analyzed, stored and explained in online knowledge banks (**2***).

Their data hierarchy consists of a Service element, DevPackGroup elements, one or more DevPack element layers, DevPackPart elements, and Resource Pack elements. The DevPack layers can contain up to 4 layers. An xml document is uploaded to the DevPackPart element. The DevPackPart and DevPack xml data can be analyzed using standard Linked View calculators and analyzers. The Resource Pack contains any multimedia needed to support the part, such as a style sheet or image.

The following image displays randomized control trial budget data that has been structured using this hierarchy. The analyses conducted using this data can be found in the References.
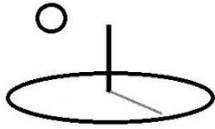
DevTreks –social budgeting that improves lives and livelihoods

AgTreks	Search	Preview	Select
Edit	Pack	Views	Club

← Preview   Edit →

← Row   Row of 35   `25`   Row →

↑ Iowa, ARS-NRCS 2, Treatments 1 through 35, Full Set

DevPack

⬇ Treatment 26: Chisel Plow, soybean-corn rotation, SM Fall Corn(1993-2003) (< **preview IRI**

⬇ Treatment 27: Chisel Plow, corn-corn rotation, SM Fall and UAN Spring(1999) (< **preview IRI**

⬇ Treatment 28: Chisel Plow, corn-soybean rotation, SM Fall and UAN Spring(2000-2003) (< **preview IRI**

⬇ Treatment 29: Chisel Plow, soybean-corn rotation, SM Fall and UAN Spring(2000-2003) (< **preview IRI**

⬇ Treatment 30: Chisel Plow, corn-corn rotation, SM Fall, Corn and Soybean(2000) (< **preview IRI**

⬇ Treatment 31: Chisel Plow, corn-soybean rotation, SM Fall, Corn and Soybean(2001-2003) (< **preview IRI**

⬇ Treatment 32: Chisel Plow, soybean-corn rotation, SM Fall, Corn and Soybean(2001-2003) (< **preview IRI**

⬇ Treatment 33: No-till, corn-soybean rotation, SM Spring Preplant(2000-2003) (< **preview IRI**

⬇ Treatment 34: No-till, soybean-corn rotation, SM Spring Preplant(2001-2003) (< **preview IRI**
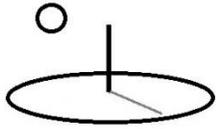
Treatment 35

DevPackPart

Plot 06, 1999, Corn

needs description (< preview IRI

Plot 06, 2000, Soybeans

needs description (< preview IRI

Plot 32, 1999, Corn

needs description (< preview IRI

Plot 32, 2000, Soybeans

needs description (< preview IRI

Plot 36, 1999, Corn

needs description (< preview IRI

Plot 36, 2000, Soybeans

needs description (< preview IRI

The typical raw, hierarchical, xml data appears as follows. The devpackpart xml element refers to the xml data that will be analyzed. Those xml files are stored statefully in file/blob storage. Version 2.0.6 tests conducted using this type of multi-hierarchical dataset initially did not work on localhost because the stateful files had been deleted so that "clean machine" tests could be conducted. An important point to remember when conducting similar tests on localhost.
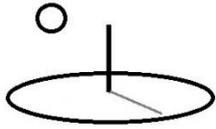
```xml
- <root>
  - <servicebase Id="2674" NetworkId="6" ServiceClassId="800"
    ServiceCurrency1="usdollar" ServiceDesc="Randomized control trial data stored in
    DevPacks." ServiceName="Malnutrition RCTs" ServiceNum="none"
    ServicePrice1="0.0000" ServiceUnit1="month">
    - <devpackgroup Id="78" DevPackClassDesc="Tests of RCT data."
      DevPackClassName="M and E RCT Tests" DevPackClassNum="none"
      ServiceId="2674" TypeId="0">
      - <devpack Id="311" DevPackClassAndPackDesc="Monitoring and Evaluation
        devpack tests." DevPackClassAndPackFileExtensionType="none"
        DevPackClassAndPackName="M and E Treatment 01"
        DevPackClassAndPackSortLabel="none" DevPackClassId="78"
        DevPackId="1115" ParentId="">
        - <devpack Id="312" DevPackClassAndPackDesc="ME tests."
          DevPackClassAndPackFileExtensionType="none"
          DevPackClassAndPackName="SubTreatment 01"
          DevPackClassAndPackSortLabel="none" DevPackClassId="78"
          DevPackId="1116" ParentId="311">
          - <devpackpart Id="5462" DevPackClassToDevPackId="312"
            DevPackPartId="4068" DevPackToDevPackPartDesc="DevPack tests."
            DevPackToDevPackPartFileExtensionType="none"
            DevPackToDevPackPartName="Budget 01"
            DevPackToDevPackPartSortLabel="none">
              <devpackresourcepack Id="3809" DevPackToDevPackPartId="5462"
              ResourcePackId="274" SortLabel="a" ResourcePackName="Operating
              Budget NPV Stylesheet Pack" ResourcePackDesc="These stylesheets
              display the results of running an operating budget calculator."/>
          </devpackpart>
        </devpack>
      </devpack>
    </devpackgroup>
  </servicebase>
</root>
```

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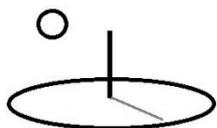
**B. Social Budgeting Economies of Scale, Scope, and Limitations**
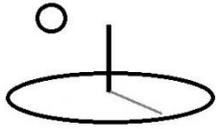
DevPacks contribute to economies of scale and scope in the delivery of social budgeting data services by leveraging existing data, calculators, analyzers, and information technology infrastructure. The ability to conduct metadata analysis, in particular, can aid decision making (see the calculator pattern introduced in the Resource Stock Example). A formal definition for the term "economies of scale and scope" can be found in the Performance Analysis tutorial.

Given their potential for decision support, customers should expect to pay for the resources needed to conduct large-scale analysis, including physical infrastructure, analyst time, and new algorithm development. As footnote 3 mentions, the current version has not undergone testing with full datasets yet. The manipulation of the xml/html data used in these services imposes potential limitations on the size of the datasets that can be analyzed (currently).

C. WorkFlows

The workflows associated with DevPacks work differently than regular base element workflows. The major differences include:

Add New Element Workflow: The following image shows that this workflow is similar to any other hierarchical workflow. The major difference is that multiple layers of DevPacks can be added (i.e. Treatment 1, SubTreatment 1, SubSubTreatment 1). As with the Linked View data service, the final element, a DevPackPart, uses the "Select and Save ResourcePack" to add children Resource Packs that support the part, such as images used to enhance the display of the part.
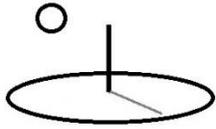
AgTreks	Search	Preview	Select
Edit	Pack	Views	Club

Select ⟵   PackIt ⟶

Row ⟵   Row of 35   25   Row ⟶

Submit   Cancel   Close

Iowa, ARS-NRCS 2, Treatments 1 through 35, Full Set

DevPack Part ⊕   0

DevPack ⊕   0

Recursive DevPack

⊕ Treatment 26

⊕ Treatment 27

⊕ Treatment 28

⊕ Treatment 29

⊕ Treatment 30

⊕ Treatment 31

⊕ Treatment 32

⊕ Treatment 33

⊕ Treatment 34

⊕ Treatment 35

DevPackPart Workflow: The following image displays the "Make Base" command button which generates the base document that is uploaded. With the exception of Inputs and Outputs, these commands appear when calculators and analyzers are run for base elements.

This document can be downloaded using the Pack workflow that is explained in the Calculators and Analyzers tutorial. The following image shows that the base document can be distinguished from sibling documents by its name –a base document's file name starts with "Name" rather than "Addin". This document is usually edited, using a text editor, prior to uploading.

Alternatively, the results of NPV calculations can be downloaded and used as an initial DevPackPart. The advantage to using NPV documents is that the NPV calculations don't need to be rerun for DevPackParts. The disadvantage is that any custom edits made to the NPV calculations, such as quantities and prices, need to be manually calculated for the NPV totals prior to being uploaded. The following image highlights the naming conventions used to save the files generated after saving NPV calculations –file names end with the name of the principal base element being analyzed. In this example, since Operating Budgets are being analyzed, files ending with "_budget.xml" or "budget_full.xml" must be uploaded. When files with both names exist, the "full" suffix means a full dataset, the other file is a summary dataset. Also note the size of the "full" document –it's often the largest file size.

Edit Linked Views Workflow: The following image explains why this workflow differs substantially from regular base elements.

AgTreks	Search	Preview	Select
Edit	Pack	Views	Club

Select

Edit Linked Views

Plot 03, 1991, Corn------ ⌄   Get

Net Present Value Operati ⌄   Get

| Media | Mobile | ✔ Desktop |

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Your calculations have been saved. The calculations can be viewed whenever this calculator addin is opened.

Budget Group : Crop Management, MLRA 104, Kenyon Series, Nashua Research Plots 1 to 3

Document Status : underreview

Description :

Label : 8.3	Budget Type : 18
Date : 06/03/2005	Last Changed :

Budget :Plot 03, 1991, Corn

Label 1	Label 2	Last Modif.	Init. Value	Salv. Value	Interest Rates	Nom. Rate	
CS	NT		0	0		0.0650	0

This image shows that the base element that is loaded into the Views panel (in this case, a DevPack named Treatment 02) displays its children elements and their linked views, rather than its own. When a selection is made in the top drop down selection list (i.e. Plot 02, Plot 03), the bottom list (NPV Budget Calculator) is filled with linked views associated with that selection, *not the parent DevPack* (Treatment 02).

The following image shows that when a selection is made in the top drop down selection list and that list consists of DevPackParts (i.e. Plot 02, Plot 03), the document displayed below the calculator is the base DevPackPart that was uploaded (in this image, a budget that was built in a

precursor to DevTreks). This view is convenient for checking that all edits have been made correctly. If the list contains DevPacks, nothing will be displayed. Calculations cannot be run using this step –a specific calculator or analyzer must be chosen from the second drop down list.

When a Linked View is selected from the second drop down selection list (NPV Budget Calculator), the document displayed below the calculator is the calculated results (see the first image in this section).
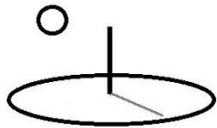
The advantage to this workflow is that a large number of calculations and analysis can be run without having to navigate to and open each one. The disadvantage is that care is needed when using the Edit Linked Views workflow (at the top of the form). In the image above, that workflow is associated with the parent DevPack (Treatment 02). In order to link calculators to each of the DevPackParts displayed in the top selection list (Plot 02, Plot 03), the Edit Linked Views workflow must be accessed from the Edit panel where those elements can be edited. This version does not support the automatic insertion or updating of children calculators and analyzers.

The Edit Linked Views command button in the previous image opens the following list of Linked Views. This form is used to add and delete the Linked Views associated with DevPack and DevPackPart base elements. This list differs from non-DevPack lists because it does not allow calculators and analyzers to be opened directly from this form –it's missing the 4th Views command button (DEL, UNDEL, VIEW, VIEWS). This version requires opening linked calculators and analyzers from the Preview panel.

Select Existing DevPack Workflow: This workflow allows existing DevPacks and DevPackParts to be selected and then reused in new data sets. This workflow is not available in this version. It may become available if a need arises. On a related note, the reason that the forms used to edit DevPacks contain 2 sections, with the bottom section being an "Owners Properties", is because when this feature was first built (over a dozen years ago), the top section allowed existing DevPacks to be renamed for alternative uses.

Testing on localhost:5000: If testing on localhost, the devpackpart base document may need to be uploaded. In addition, NPV calculations need to be rerun if the base document is edited in any
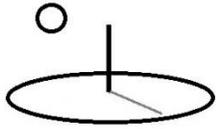
manner. The NPV calculator will store stateful files in file/blob storage for subsequent analyses. The current version lacks seasoning and may return unnecessary error messages that may need to be ignored.

D. NPV Calculation and Resource Stock Analysis

DevPacks support the Resource Stock calculators and analyzers documented in *the Resource Stock Calculation and Analysis* references. NPV calculators are run for each DevPackPart prior to running Stock analyzers for the DevPacks. The NPV calculators process edits made to the base documents uploaded into DevPackParts. New NPV calculators do not need to be linked or run for DevPackParts when the base xml documents already have good NPV calculations. The following image demonstrates that the Media View works exactly the same in DevPacks analysis.
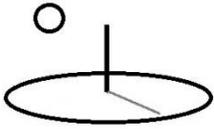
GreenTreks	Search	Preview	Select
Edit	Pack	Views	Club

Select

Edit Linked Views

3 Non-Sibling Orange Conv   Get

Stock Totals-------------   Get

✔ Media   Mobile   Desktop

Dataset: Carbon Budgeting DevPack Group IRI needs description

Disaster-Decision-Support2

Figure 20: Climate change impact
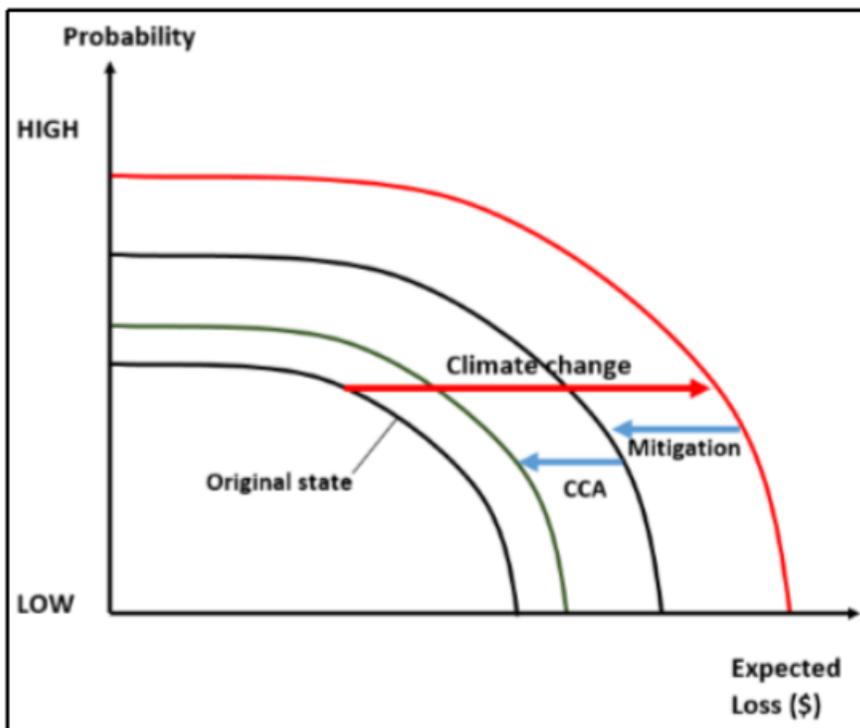
The following image displays the result of running a Resource Stock Operating Budget Totals Analysis from a DevPack base element. This example can be found in Appendix C of the *Resource Stock Analysis* reference. This example demonstrates how to use DevPacks for the
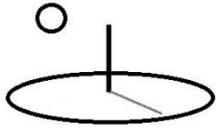
Resource Stock Analysis of non-sibling Operating Budgets. Version 2.1.4 changed the datasets in this example to demonstrate the recommended calculator pattern when using Resource Stock and M&E calculators (i.e. the pattern employed by many types of Health Technology Assessments):

Indicator metadata – TEXT datasets – custom algorithm – mathematical/statistical library

The Resource Stock Calculations used with these Inputs and Outputs employed TEXT datasets holding the NO3 and CO2 Indicators. The 2nd Indicator used PRA techniques (i.e. subalgorithm1). The remaining Indicators were ignored (i.e. and led to the consequent mistakes in Indicator alignment in the Change Analyses). This data is owned by the Carbon Emission club in GreenTreks.

http://localhost:5000/greentreks/linkedviews/carbon/devpackgroup/Carbon Budgeting DevPack Group/43/none

GreenTreks	Search	Preview	Select
Edit	Pack	**Views**	Club

Select

Edit Linked Views

3 Non-Sibling Orange Conv ⌄   Get

Stock Totals------------- ⌄   Get

Media ✔ Mobile Desktop

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Resource Stock Operating or Capital Budget Analyzer Views

Stock Totals

Introduction
This tool generates a variety of basic resource stock stock statistics for DevTreks capital budgets and operating budgets.

Calculation View Description
v200a

Version: 1.9.0

Feedback About carbon/devpackgroup/Carbon Budgeting DevPack Group/43/none

Budget Group : C Organic vs Convention Orange

➖ Indicators

Math Expression: (I1.Q6M+I2.Q6M)/2	Observations: 6.0
Score Amount: 269.1528	Score Unit: environmental performance
Score D1 Amount: 291.0250	Score D1 Unit: mean
Score D2 Amount: 41.2500	Score D2 Unit: stand dev
Distribution Type: normal	Math Type: algorithm1
Score Most Amount: 290.4566	Score Most Unit: mean
Score Low Amount: 289.9253	Score Low Unit: lower 90% ci
Score High Amount: 290.9879	Score High Unit: upper 90% ci
Iterations: 10000	Score Math Sub Type: subalgorithm1

Score Math Result: sampled descriptive statistics N,Total,Mean,Median,StdDev,Var,Min,Max
10000, 8104.6676, 0.8105, 0.8112, 0.0743, 0.0055, 0.5219, 1.0738, sampled cumulative density
function 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00

The following image shows that when NPV calculated results are directly uploaded to each DevPackPart, individual NPV calculations do not need to be rerun for each DevPackPart. This analysis took less than 5 minutes to set up and run.
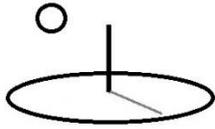
Edit Linked Views

3 Non-Sibling Orange Conv ⌄   Get

Operating Budget Stock To ⌄   Get

Media ✔ Mobile   Desktop

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Resource Stock Operating or Capital Budget Analyzer Views

Stock Totals

Introduction
This tool generates a variety of basic resource stock stock statistics for DevTreks capital budgets and operating budgets.

Calculation View Description
v200a

Version: 1.9.0

Feedback About carbon/devpackgroup/Carbon Budgeting DevPack Group/43/none

Budget Group : C Organic vs Convention Orange

➕ Indicators

Budget : A Conventional Orange

➕ Indicators

Time Period : 2012 Conventional Orange

➖ Indicators

Math Expression: (I1.Q6M+I2.Q6M)/2   Observations: 2.0
Score Amount: 269.1528   Score Unit: environmental performance
Score D1 Amount: 267.2250   Score D1 Unit: mean
Score D2 Amount: 27.8400   Score D2 Unit: stand dev
Distribution Type: normal   Math Type: algorithm1
Score Most Amount: 267.4032   Score Most Unit: mean
Score Low Amount: 266.9466   Score Low Unit: lower 90% ci
Score High Amount: 267.8598   Score High Unit: upper 90% ci

A second dataset was built using this same data, but the 1st DevPack element contains 2 children DevPacks (i.e. Treatment 01, Treatment 02). The children DevPacks each contain the same 3 DevPackParts holding NPV-calculated budgets. No calculators were run for the DevPackParts
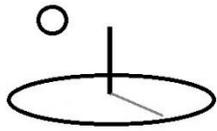
because the files uploaded held NPV-calculated results. The image demonstrates that the Time Period elements in both budgets have been added to the same budget (2012). The data was structured in this manner because that was deemed the best way to analyze the original 504 budget dataset used to test DevPacks. The associated reference, in the References section, explains more about using Labels to aggregate data. As mentioned, this version has not been tested using large datasets.
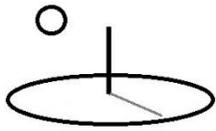
Time Period : 2012 Conventional Orange

+ Indicators

Outcomes

Outcome : 2012 Conventional Orange Crop Outcome(Amount: 1.000; Date: 12/31/2012

+ Indicators

Output : 2012 Orange, Conventional

+ Indicators

Operations

Operation : 2012 Conventional Orange Crop Operation

+ Indicators

Input : 2012 Fertilizer, Orange, Conventional

+ Indicators

Time Period : 2012 Conventional Orange

+ Indicators

Outcomes

Outcome : 2012 Conventional Orange Crop Outcome(Amount: 1.000; Date: 12/31/2012

+ Indicators

Output : 2012 Orange, Conventional

− Indicators

Math Expression: (I1.Q6M+I2.Q6M)/2   Observations: 1.0

E. NPV Calculation and Monitoring and Evaluation (M&E) Analysis

DevPacks support the M&E calculators and analyzers documented in *the M&E Calculation and Analysis* references. NPV calculators are run for each DevPackPart prior to running M&E analyzers for the DevPacks (i.e. unless the base documents already contain good NPV
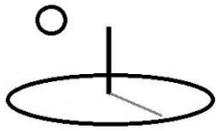
DevTreks –social budgeting that improves lives and livelihoods

calculations). The following image highlights the public goods context behind DevTreks and the aspirations that customers should have when using the software.

The following image displays the result of running an M&E 2 Operating Budget Totals Analysis from a DevPacks data service. The underlying datasets employ pre-2.0.4 calculations and are missing the Lower and Upper Estimate properties. This data is owned by the Food Nutrition club in HomeTreks.
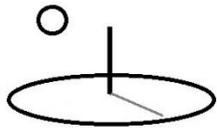
http://localhost:5000/hometreks/preview/smallholders/devpackgroup/M and E RCT Tests/78/none

Investment Group : ME2 Malnutrition Projects ; 02/13/2014			
Investment	All	Alt. 0	Alt. 1
Name		ME2 Project 01	ME2 Project 02
Date		11/28/2016	11/28/2016
Label		BUD01	BUD02
Alternative		A	B
Indicator 0		Food Security Score	Food Security Score
Observations		1.0	1.0
Date		11/01/2016	11/01/2016
Label		I122	I122
Most Unit		security score	food security score
Most		96,554.2192	340,793.8931
Most Amount Change		0.00	0.00
Most Percent		0.00	0.00
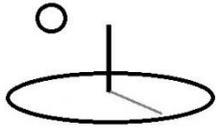
localhost:5000/hometreks/:

Time Period	All	Alt. 0	Alt. 1
Name		2013 BM Progress	2013 Actual Food Security
Date		12/31/2013	12/31/2013 12:00:0 AM
Label		TP122	TP122
Alternative		A	B
Indicator 0		Food Security Score	Food Security Scor
Observations		2.0	2.0
Date		11/01/2016	11/01/2016
Label		I122	I122
Most Unit		security score	food security score
Most		193,108.4384	681,587.7862
Most Amount Change		0.00	0.00
Most Percent Change		0.00	0.00
Most Base Change		0.00	488,479.35
Most Base Percent Change		0.00	252.96
Lower Unit		lower 80 % ci	lower 80 % ci
Lower		191,635.8404	673,017.7124
Lower Amount Change		0.00	0.00
Lower Percent Change		0.00	0.00
Lower Base Change		0.00	481,381.87
Lower Base		0.00	251.20

DevTreks recommends using the calculator pattern introduced with the Resource Stock example for advanced M&E analysis (i.e. store the Indicator data in TEXT datasets). The following image
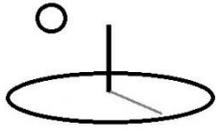
uses the CTA Output TEXT DevPack at the same URL to carry out an M&E Totals Analysis of Indicator data stored in background TEXT files. The base document was uploaded to the devpackpart after running an M&E Output Calculator for the base Output Series.
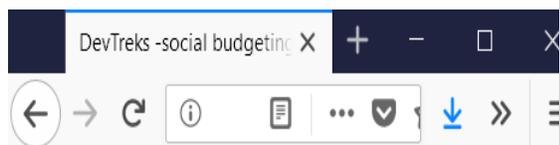
CTA Output w TEXT-------- ⌄   Get

M and E 2 Output Totals A ⌄   Get

Media ✓ Mobile Desktop

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Output M and E Analyzer Views

M and E 2 Output Analyzer

Introduction
This tool generates a variety of basic statistics for DevTreks standard monitoring and evaluation uris. The analyses include totals, statistics, incremental change, and progress.

Analysis View Description
v214a

Version: 2.0.4

[Feedback About smallholders/devpackgroup/M and E RCT Tests/78/none](#)

Output Group: M and E CTA Tests

Output : CTA Data URL 1

— Indicators Details

M and E Stage: **realtime**
Indic 0 Name: Total   Label: CO2

Indic 1 Name: CO2 Emission   Label: 1
Date: 11/03/2016   Rel Label: CO2D
Math Type: algorithm1   Dist Type: none
Math Sub Type: subalgorithm1   Base IO: none
Q1 Amount: 1.0000   Q1 Unit: x1
Q2 Amount: 2.0000   Q2 Unit: x2
Q3 Amount: 3.0000   Q3 Unit: x3
Q4 Amount: 4.0000   Q4 Unit: x4
Q5 Amount: 5.0000   Q5 Unit: x5
Math Express: Math Operator: equalto
I1.Q1.X1*I1.Q2.X2*I1.Q3.X3*I1.Q4.X4
QT Amount: 11.0803   QT Unit: total
QT D1 Amount: 0.0000   QT D1 Unit: none
QT D2 Amount: 0.0000   QT D2 Unit: none
QT Most Amount: 11.0803   QT Most Unit: total
QT Low Amount: 10.7296   QT Low Unit: lower 80 % ci
QT High Amount: 11.4310   QT High Unit: upper 80 % ci
Observations: 1.0
Indic 1 Description: CTA test.
Indic 2 Name: Global Warming Potential   Label: 2
Date: 11/03/2016   Rel Label: NO3D
Math Type: algorithm1   Dist Type: none
Math Sub Type: subalgorithm1   Base IO: none
Q1 Amount: 10.0000   Q1 Unit: x1
Q2 Amount: 20.0000   Q2 Unit: x2
Q3 Amount: 30.0000   Q3 Unit: x3
Q4 Amount: 40.0000   Q4 Unit: x4
Q5 Amount: 50.0000   Q5 Unit: x5
Math Express: Math Operator: equalto
I2.Q1.X1*I2.Q2.X2*I2.Q3.X3*I2.Q4.X4
QT Amount: QT Unit: total
61.317.631.1516
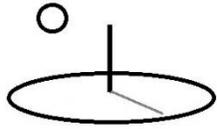
F. NPV Calculation and Malnutrition Analysis

DevPacks support the Malnutrition calculators and analyzers documented in *the Malnutrition Calculation and Analysis* references. NPV calculators are run for each DevPackPart prior to running Malnutrition analyzers for the DevPacks (i.e. unless the base documents already contain good NPV calculations).. The NPV calculators process edits made to the base documents uploaded into DevPackParts. The following image demonstrates typical decision supported by these types of analysis.

FIGURE 5-1. How Do Typical American Diets Compare to Recommended Intake Levels or Limits?

DevPack tests of malnutrition data.

Download Resource

The following image displays the result of running a Malnutrition Operating Budget Totals Analysis from a DevPacks data service. This data is owned by the Food Nutrition club in HomeTreks.
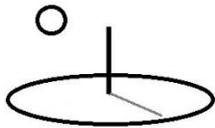
DevTreks –social budgeting that improves lives and livelihoods

http://localhost:5000/hometreks/preview/smallholders/devpackgroup/Food Nutrition RCT Tests/79/none
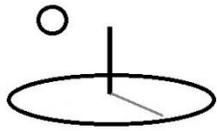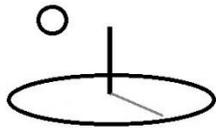
Nutrition Treatment 01--- ⌄   **Get**

FN ARS SR Total Analyzer ⌄   **Get**

Media | **Mobile** | ✔ **Desktop**

Intro	1	2	3	Help

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

Budget Group : Food Nutrition, SR Budget Analyses

224.200	11.137	224.200	-346.160	potato, large (3in to 4-1-4in dia)	119.825	-447.656	-959.731	54.728 30.695
-619.726	-124.667	47.859	105.867	-8.402	-509.728	1,957.560	-2,899.183	17,573.
-4.029	-6.855	255.869	-472.959	0.841	1.708	97.824	-0.145	-5.070
377.452	-301.474	338.847	96.540	7.452	-158.415	6.930	13.480	0.000
0.000	0.000	-930.015	4.701	3.240-97.200	-51.937	10.592	19.024-15.401	810.000

Description : v200a

Budget : Nutrition Budget 01 Benchmark

Container Size	Serving Cost	USDA Servings Per Cont	Servings Per Cont	Serving Size Unit	Serving Size	Water g	Energy Kcal	Lipid g Ash g
Carbohydrate g	Fiber (TD) g	Sugar (Tot) g	Calcium mg	Iron mg	Magnesium mg	Phosphorus mg	Potassium mg	Sodium
Copper mg	Manganese mg	Selenium pg	Vitamin C mg	Thiamin mg	Riboflavin mg	Niacin mg	Panto mg	Vitamin mg
Folic Acid pg	Food Folate pg	Folate (DFE) pg	Choline (Tot) mg	Vitamin B12 pg	Vitamin A (IU)	Vitamin A (RAE)	Retinol pg	Alpha Carotei pg
Beta Crypt pg	Lycopene pg	Lut Zea pg	Vitamin E mg	Vitamin D pg - IU	Vitamin K pg	Fatty Acid Sat g	Fatty Acid Mono g - Poly g	Choles mg
57.000	2.879	57.000	-84.230	potato, large (3in to 4-1 4in dia)	30.920	-117.922	-246.553	14.028 7.928

G. Net Present Value (NPV) Calculation and NPV Analysis
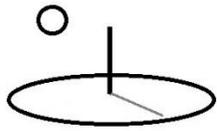
DevPacks support the NPV calculators and analyzers documented in *the NPV Calculation and Analysis* references. The images in Section A show the type of Treatments used to conduct this analysis. The following image demonstrates one potential way to tie scientific theory to concrete evidence

AgTreks	Search	Preview	Select
Edit	Pack	Views	Club

Select

Edit Linked Views

Treatment 12 new--------- | Get

NPV Op Budget Totals Anal | Get

✔ Media | Mobile | Desktop

Dataset: **Iowa, Nashua Conservation Tillage 108 Corn and Soybean Budget data set IRI** ARS, Nashua tillage datasets combining treatments 01 to 12 into crop/tillage treatments.

ProfitMaximization

Profit Maximization
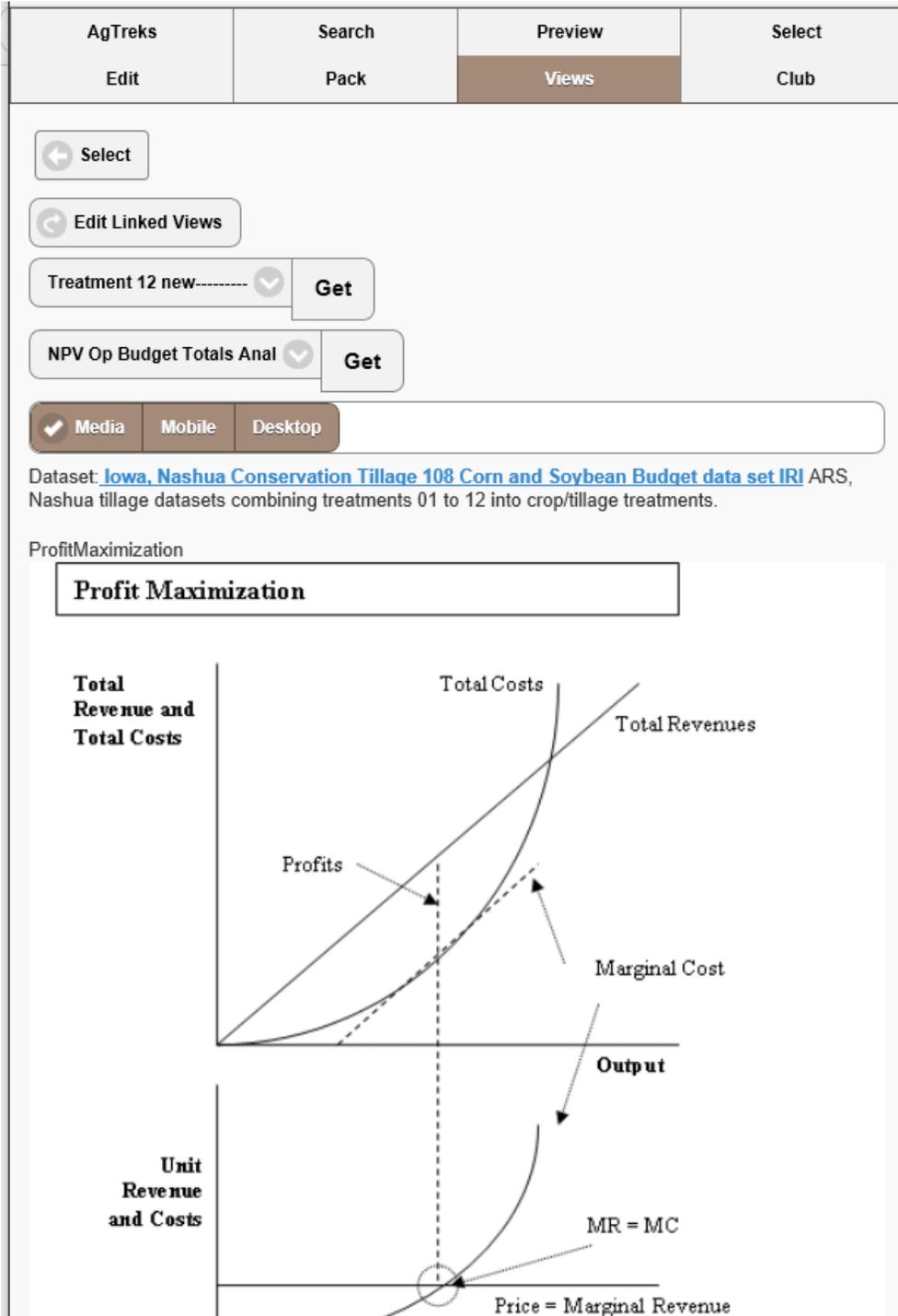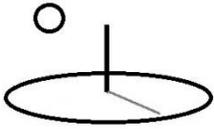
The following image displays the result of running a NPV Totals Analysis for the parent DevPack (Treatment 12 new) holding the budgets displayed in the previous image. This data is owned by the Iowa Corn and Soybean club in AgTreks.

Only Treatment 12 new in the following dataset (the machinery analysis reflects this deprecated budget structure)

http://localhost:5000/agtreks/preview/cropsconservation/devpack/Iowa, Nashua Conservation Tillage 108 Corn and Soybean Budget data set/117/none

Treatment 12 new--------- | Get

NPV Op Budget Totals Anal | Get

Media | Mobile | ✔ Desktop

| Intro | 1 | 2 | 3 | Help |

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

Budget Group : Operating Budgets, Common Agricultural Examples 8.3 12/31/200

Benefits

Output Name	Unit	Price	Amount	Compos Unit	Compos Amount	Total Benefit	
Soybeans	bushel	232.10	644.00	none	11.00	1,968.98	

Costs and Nets

Total OC	Total AOH	Total CAP	Total Cost	Net Returns	Total Incent	Net Incent Returns	
1,124.66	1,191.62	0.00	2,316.31	-347.33	2,316.31	-347.33	

Budget : 2- Corn Soybean Rotation none 04/10/2014

Benefits

Output Name	Unit	Price	Amount	Compos Unit	Compos Amount	Total Benefit	
Soybeans	bushel	232.10	644.00	none	11.00	1,968.98	

Costs and Nets

## H. NPV Calculation and Life Cycle Analysis (LCA)
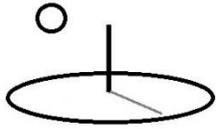
DevPacks support the LCA calculators and analyzers documented in *the LCA Calculation and Analysis* references. The following image emphasizes that the purpose for most CTA analysis is to increase performance and to conserve scarce resources.

The following image displays the result of running a LCA Capital Budget Totals Analysis from a DevPacks data service. This data is owned by the Reconstruction Science club in BuildTreks.
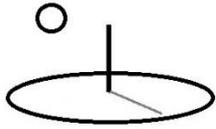
http://localhost:5000/buildtreks/preview/commercial/devpack/Treatment 01/309/none

SubTreatment 01---------- Get

LCA InvestTotals Analyzer Get

Media ✓ Mobile Desktop

| Intro | 1 | 2 | 3 | Help |

Life Cycle Stock Analyzer Views

Totals

Introduction
This tool generates a variety of basic life cycle stock statistics for DevTreks capital budgets and operating budgets.

Calculation View Description
v200a

Version: 1.7.0

Feedback About commercial/devpack/Treatment 01/309/none

Investment Group : Public Infrastructure Analysis Example

— Benefit Details

|	
Total Revenue : 8704.97	Total LCB : 8704.97
Total EAA : 0.00	Total Unit : 217.62
SubBen 1 Name : Willingness To Pay	SubBen 1 Amount : 22.953
SubBen 1 Unit : visitor	SubBen 1 Price : 855.00
SubBen 1 Total : 1,064.06	SubBen 1 Unit Cost : 26.60
SubBen 1 Description : These calculations derive from ...	SubBen 1 Label : wtp01
SubBen 2 Name : Habitat Alteration Potential	SubBen 2 Amount : 41.328
SubBen 2 Unit : TE species count equivs	SubBen 2 Price : 0.00
SubBen 2 Total : 0.00	SubBen 2 Unit Cost : 0.00
SubBen 2 Description : These calculations derive from ...	SubBen 2 Label : habitat01
SubBen 3 Name : Nature Education Capital	SubBen 3 Amount : 41.328
SubBen 3 Unit : person	SubBen 3 Price : 3,710.00
SubBen 3 Total : 6,766.41	SubBen 3 Unit Cost : 169.16
SubBen 3 Description : These calculations derive from ...	SubBen 3 Label : educate01
SubBen 4 Name : Willingness To Pay	SubBen 4 Amount : 18.375
SubBen 4 Unit : visitor	SubBen 4 Price : 326.00
SubBen 4 Total : 874.50	SubBen 4 Unit Cost : 21.86
SubBen 4 Description : These calculations	SubBen 4 Label : wtp02

I. **NPV Calculation and Capital Input Analysis**
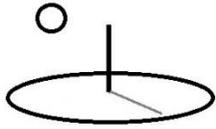
DevPacks support the Capital Input calculators and analyzers documented in the *Capital Input Calculation and Analysis* references. The following image stresses the importance of using multimedia to communicate the results of complex calculations to target audiences.

This data is owned by the Iowa Corn and Soybean Science club in AgTreks.

Only Treatment 12 new in the following dataset (the machinery analysis reflects this deprecated budget structure)

http://localhost:5000/agtreks/preview/cropsconservation/devpack/Iowa, Nashua Conservation Tillage 108 Corn and Soybean Budget data set/117/none
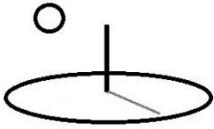
AgTreks	Search	Preview	Select
Edit	Pack	**Views**	Club

⬅ Select

⬅ Edit Linked Views

Treatment 12 new--------- ⌄   Get

Machinery Totals Analyzer ⌄   Get

✔ Media | Mobile | Desktop

Dataset: **Iowa, Nashua Conservation Tillage 108 Corn and Soybean Budget data set IRI** ARS, Nashua tillage datasets combining treatments 01 to 12 into crop/tillage treatments.

corn-soybean-machinery-productivity2

Machinery Costs per Dollar Corn Soybean Revenue

0.01
0.13
0.29
0.10
0.00
0.17

■ Fuel Cost   ■ Labor Cost   ■ Lube and Oil Cost
■ Repair Cost   ■ Capital Recovery Cost   ■ Taxes Housing Insurance

ARS, Nashua tillage datasets combining treatments 01 to 12 into crop/tillage treatments.

Download Resource

The following image displays the result of running a Capital Input Operating Budget Totals Analysis from a DevPacks data service.

J. Conservation Technology Assessment (CTA)

The health care sector uses Health Technology Assessments, or HTAs, to determine the worth of health care technologies. These assessments often involve the meta-analysis of randomized control trial data. HTAs require large amounts of professional staff time to complete –largely
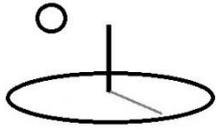
because of the need to find and interpret the data. The *Resource Stock Analysis* tutorial explains that DevTreks uses the complementary term, Conservation Technology Assessment, or CTAs. This reference demonstrates one way to store CTA data and run basic analyses. For example, by using the standard calculator pattern: Indicator metadata – TEXT datasets – custom algorithm – mathematical library pattern (i.e. the pattern employed by many types of Health Technology Assessments). One reasonably trained professional club is capable of collecting and managing the data and running the CTA. Future releases will expand the types of analyses that can be run, eventually supporting full scale CTAs.

The following image derived from DevPacks RCT data documented in the References and demonstrates a typical CTA along with full multimedia support for analytic content.
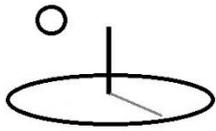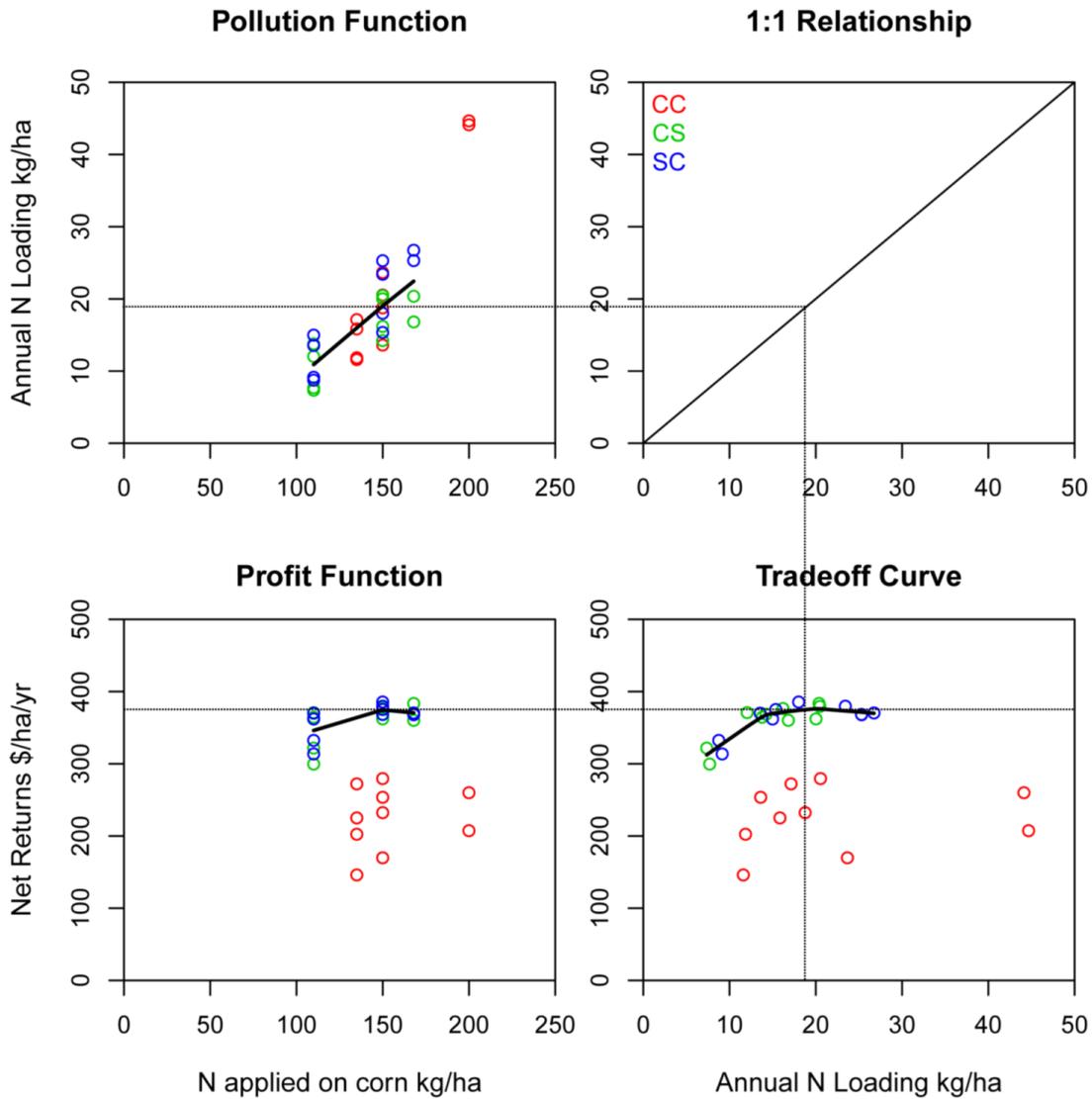
The original dataset used to conduct this analysis can be found at:

https://www.devtreks.org/agtreks/select/cropsconservation/devpack/Iowa, ARS-NRCS 2, Treatments 1 through 35, Full Set/80/none/

The following list demonstrate the steps taken to produce this data set include (further information about this data set can be found in the References (**3***)). A current example can be found in the *Resource Stock Analysis* reference.

1. Use standard base elements and calculators to build a base data set. In this example, the base data set included 108 crop budgets that documented the basic technology employed in each plot over 14 years (12 plots x 9 base budgets = 108). Note that these crop budgets were built with a precursor to DevTreks –they are not consistent with the current structure of operating budgets and cannot be used for current analysis.

2. Copy an appropriate base document into a corresponding RCT treatment. Make copies for each observation in the treatment. Use standard file system folders for this purpose.

3. Edit each observation according to the actual data results (**4***). The data for each observation often matched more than 95% of the data found in the base document data. The remaining 5% required changing a small number of input and output quantities, such as fertilizer amounts, corn yield, dates, or nitrate emissions.

4. Build a hierarchical DevPacks data set that corresponds to the RCT data structure (see the URL for examples). The sample data set required 36 DevPack Treatments and 504 DevPackPart budgets.

5. Upload an edited observation document into a corresponding DevPackPart. Add one or more ResourcePacks to each part containing any necessary multimedia support, such as an image that can enhance the display of previewed parts.

6. Link each DevPackPart to an NPV calculator needed to carry out new calculations. Run and save each calculated result. This example required linking NPV operating budget calculators to the 504 DevPackParts.

7. Link appropriate analyzers to Treatments, or DevPacks base elements. Run and save the analyses. In this example, NPV Statistical Analyzers were run for the parent treatment that held the 36 individual treatments. A total of 504 budgets were analyzed.

8. Use the Pack panel to download the analytic results. Upload them into statistical analysis packages and run any statistics needed for the RCT analysis. Produce graphics and tables summarizing the results.

9. Add the graphics and tables to a multimedia, or Resources, data service. Use the Linked Views data service to link the multimedia to a story. Link the story to the root element in the DevPacks data set.
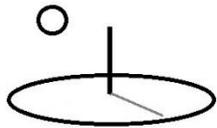
K. Sustainable Supply Chain Analysis (Production and Consumption Analysis)

DevPacks support the sustainable supply chain analyses introduced in the Performance and Social Performance Analysis (SPA) tutorials. Modern decision support software must help producers to make sustainable production decisions and consumers to make sustainable consumption choices. Many consumers do not want their money going to private sector companies and their executives who undermine their value systems. Many producers recognize the business opportunities this opens up to sustainable production practitioners.

The SPA techniques included Life Cycle Impact Analysis, Product Life Cycle Analysis, Organization Life Cycle Analysis, Social Life Cycle Analysis, Life Cycle Cost and Benefit Budgeting, Incremental Cost Effectiveness Analysis, and custom algorithms related to population impact states, Performance Monitoring, Impact Evaluation, and Machine Learning.

The following example employs the dataset introduced in Example 6 of the Social Performance Analysis 3 reference. This example carries out a custom Disaster Risk Reduction Totals Analysis of 2 devpackparts, each of which represents 1 stage of a 2 part disaster risk reduction chain (i.e. interpreted anyway you choose). Each base document employed 7 Indicators with data stored in Indicator.URL and MathResult.URL.

Supply Chain RCA Value DevPack in:

https://www.devtreks.org/greentreks/select/carbon/devpackgroup/RCT Emissions and Env Performance/48/none

http://localhost:5000/greentreks/preview/carbon/devpackgroup/Carbon Budgeting DevPack Group/43/none
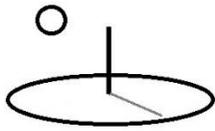
Supply Chain RCA Value--- ⌄   **Get**

M and E 2 Output Totals A ⌄   **Get**

Media	✔ Mobile	Desktop

Intro	1	2	3	Help

Output M and E Analyzer Views

M and E Output Analyzer

Introduction
This tool generates a variety of basic statistics for DevTreks standard monitoring and evaluation uris. The analyses include totals, statistics, incremental change, and progress.

Analysis View Description
DevPacks supply chain example. v214a

Version: 2.0.4

[Feedback About carbon/devpackgroup/Carbon Budgeting DevPack Group/43/none](#)

Output Group: RCA Output Examples

Output : Disaster Risk Management, Example 6

⊖ Indicators Details

M and E Stage: **baseline**

⊖ Indicators Details

M and E Stage: **baseline**

Indic 0 Name: DRM Evaluation	Label: Score1
Date: 03/07/2018	Rel Label: none
Math Type: algorithm1	Dist Type: none
Math Sub Type: subalgorithm17	Base IO: none
Math Express: I1.QTM	Math Operator: equalto
QT Amount: 29.1034	QT Unit: target high score
QT D1 Amount: 3.0000	QT D1 Unit: actual certainty1
QT D2 Amount: 4.0000	QT D2 Unit: actual certainty2
QT Most Amount: 16.9464	QT Most Unit: actual most score
QT Low Amount: 9.6616	QT Low Unit: actual low score
QT High Amount: 27.8032	QT High Unit: actual high score

Observations: 2.0
Indic 0 Description:
Score Math Result: http://localhost:5000/resources/network_carbon/resourcepack_545/resource_1951/Score-Watershed-Results.csv

Indic 1 Name: DRM 2017 to 2018	Label: DRM1
Date: 03/07/2018	Rel Label: none
Math Type: algorithm1	Dist Type: none
Math Sub Type: subalgorithm17	Base IO: none
Q1 Amount: 15.8512	Q1 Unit: benchmark most score
Q2 Amount: 9.0372	Q2 Unit: benchmark low score
Q3 Amount: 26.0064	Q3 Unit: benchmark high score
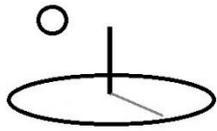
L. Multimedia and Stories

DevPacks contain the most complex data and analyses. Explanatory stories explaining the data is particularly important.

DevPack tests of malnutrition data.

M. Knowledge Bank Standards

Most DevPack data should be entered into online knowledge banks (i.e. production servers as contrasted to development servers) that can be used to analyze the data. 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 discuss how these knowledge banks will evolve (i.e. semantic data, forecasts) to support future decision making needs. The flexibility offered by DevTreks in managing DevPack data 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 Conservation Technology Assessment (CTA) data. Clubs can solicit help understanding this data better and share structured evidence explaining the best technologies identified by CTAs. Networks can build knowledge banks of CTA data and pass that knowledge down to future generations. The result may be Indian smallholders who use CTAs to adapt effectively to changing monsoons, Somalian health care administrators who routinely carry out CTAs in support of efficient health care delivery, NYC city managers who use CTAs to mitigate rising sea levels more efficiently, and people who can make decisions that improve their lives and livelihoods in sustainable ways.

Footnotes

1. DevPacks Analyses are somewhat harder to carry out than standard analyses. Consider using them when resources are particularly scarce and money really does need to be saved. A casual glance at newspaper stories suggest this circumstance may not happen very often in some countries –in many cases, accountability for budget expenditures is mostly a talking point.
2. Arbitrary hierarchies of structured xml data support a wide assortment of content management services, such as the Randomized Control Trial data used in advanced
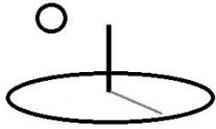
Conservation Technology Assessments (CTAs). RCT data is especially feasible when the structured xml data holds metadata analysis of TEXT Data URL datasets, such as those demonstrated in the CTAs, CTAP, and M&E references. Arbitrary structures of hierarchical URLs is also powerful and supported through the Resource Stock calculators and analyzers. Precursors to the current DevPacks data services were first built and tested more than a dozen years ago, but were not fully rebuilt and documented until Version 1.7.0.

3. The accompanying reference, *Using Social Budgeting Web Software ...,* used a 504 RCT budget set for its analysis. The current version used much smaller data sets for testing. Full scale testing using larger data sets will be carried out when a particular need arises (such as the receipt of funds to pay for the analysis). In addition, this version only tested DevPacks holding Operating Budgets and Capital Budgets –the remaining base elements –Inputs, Outputs, Operations, Components, and Outcomes- must still be tested.

4. The precursor to DevTreks allowed the edits to be completed using the software, but 1.7.0 requires that the edits be completed in some other text editor before being uploaded.

References

K. P. Boyle, P. Heilman, R. W. Malone, L. Ma, and R. S. Kanwar. Using Social Budgeting Web Software and Natural Resources Software Models to Improve Agricultural Economics Data Collection, Dissemination, and Analysis. DevTreks Working Paper 01. January, 2012. (the pdf file can be found in this tutorial)

Improvements, Errors, and New Features

Please notify DevTreks (devtrekkers@gmail.com) if you find errors or can recommend improvements.

Video tutorials explaining this reference can be found at:

https://www.devtreks.org/commontreks/preview/commons/resourcepack/DevPacks Analysis/1535/none/

DevTreks –social budgeting that improves lives and livelihoods