Malnutrition Calculation 1

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Version: DevTreks 2.0.0

A. Introduction

This reference explains how to start to calculate food nutrition input and output data (**2***).

B. Data (3*)

The calculators explained in this reference can be found at:

https://www.devtreks.org/hometreks/preview/smallholders/linkedviewgroup/Food Nutrition Calculators/6/none/

Examples of input and output calculations can be found at the following URLs. All of the food nutrition datasets are owned by the Family Budgeting and Food Nutrition club in the HomeTreks network group (if needed, switch default clubs).

https://www.devtreks.org/hometreks/preview/farmworkers/input/BARLEY,PEARLED,RAW/2147395842/none/

https://www.devtreks.org/hometreks/preview/farmworkers/input/TURKEY BREAST,SLICED,PREPACKAGED/2147391222/none/

https://www.devtreks.org/hometreks/preview/smallholders/output/BARLEY, PEARLED, RAW/2141211289/none/

This reference used the Azure deployment (Version 2.0.0) and localhost, or blue motif, deployments (Version 1.6.3) to document calculations. The source calculations were not changed from Version 1.6.3 to Version 2.0.0.

C. Work Breakdown Structure (WBS) and Rules

The food input and output data used the USDA, Agricultural Research Service (ARS) Standard Reference (SR) WBS. Only the input data contains a complete list of the 7,000+ food items from that reference. Although all of the food items had their nutrient characteristics bulk uploaded into them, only a sample number of calculations have actually been run.

D. Net Present Value (NPV) Calculation and Unit Nutrients

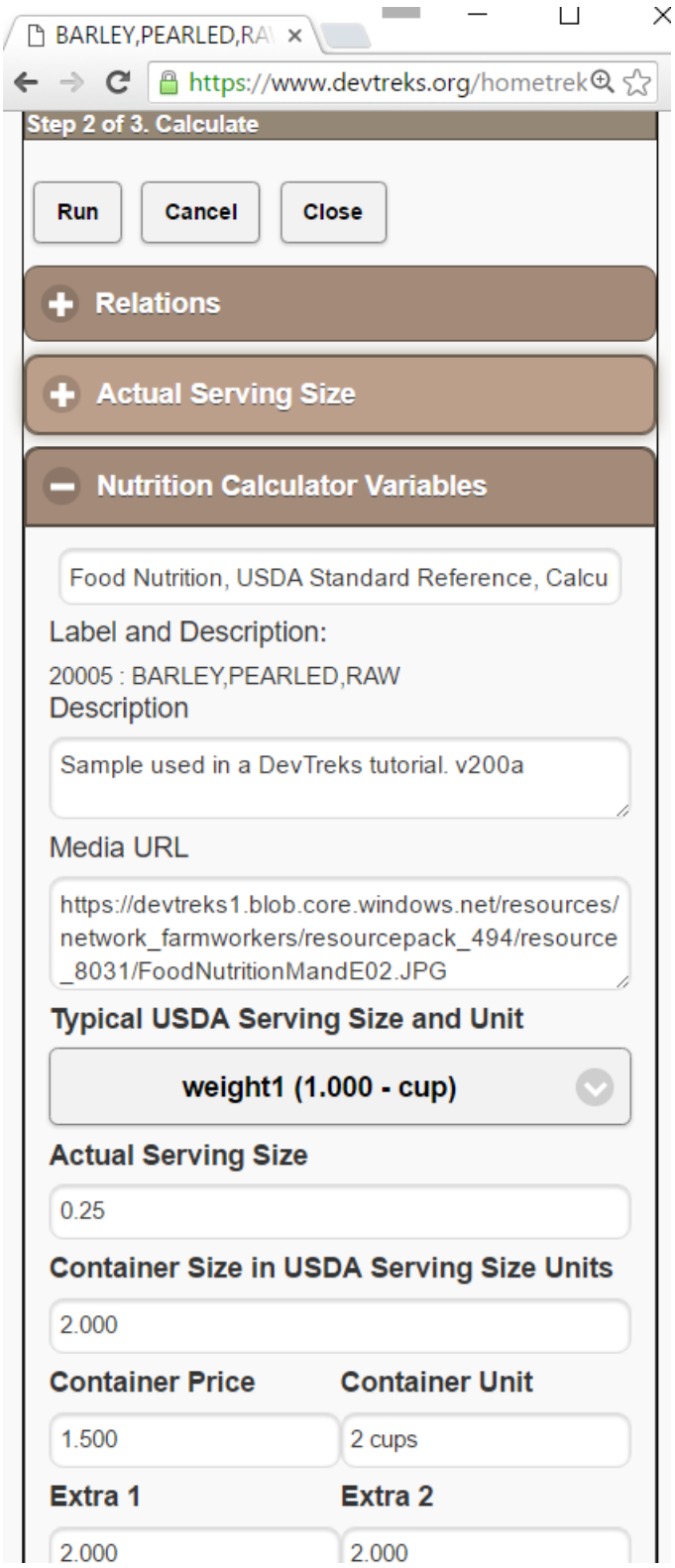
Unlike some calculators (i.e. Machinery) DevTreks' NPV calculators do not "rerun" food nutrition calculations. Food nutrition Input and Output calculations compute "unit nutrients", with an Input and Output Amount equal to 1 unit of actual serving size. That amount should be changed when the Input or Output is added to an Operation, Component, or Outcome.

E. ARS Standard Reference (SR) Food Nutrition Input Calculator

These calculators use the USDA, Agricultural Research Service (ARS) Standard Reference (SR) database to calculate the food nutritional composition of food Inputs. They compute "*unit* nutrient values per *actual* common household measure units". In effect, these calculators compute a type of "unit nutrients" that enable them to be reused in any Operation (or meal) or Component.

Example Input 1. Barley, Pearled, Raw

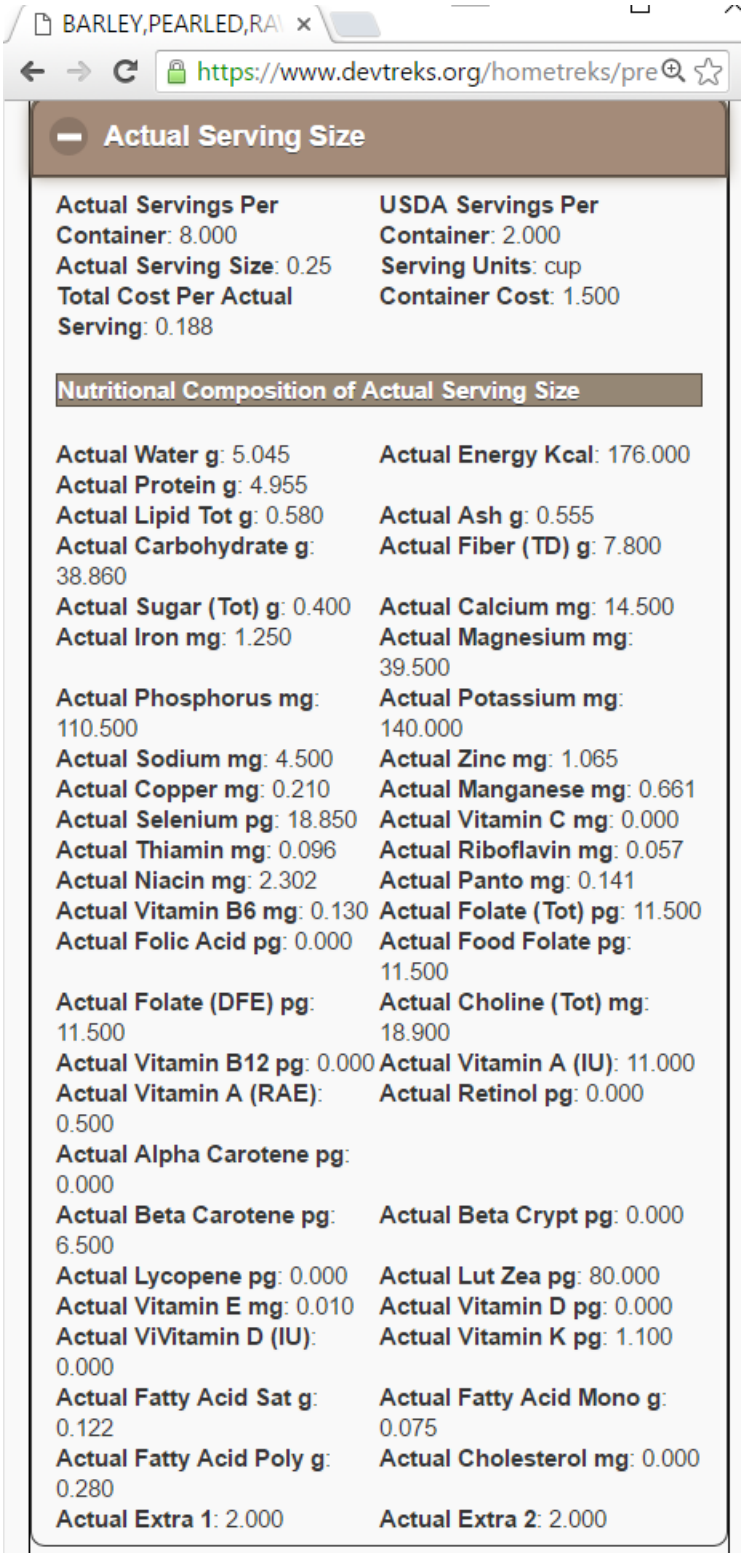
The following image displays the properties entered for this food item.


BARLEY,PEARLED,RA
https://www.devtreks.org/hometrek
Step 2 of 3. Calculate
Run
Cancel
Close
Relations
Actual Serving Size
Nutrition Calculator Variables
Food Nutrition, USDA Standard Reference, Calcu
Label and Description:
20005 : BARLEY,PEARLED,RAW
Description
Sample used in a DevTreks tutorial. v200a
Media URL
https://devtreks1.blob.core.windows.net/resources/network_farmworkers/resourcepack_494/resource_8031/FoodNutritionMandE02.JPG
Typical USDA Serving Size and Unit
weight1 (1.000 - cup)
Actual Serving Size
0.25
Container Size in USDA Serving Size Units
2.000
Container Price
Container Unit
1.500
2 cups
Extra 1
Extra 2
2.000
2.000

These properties are defined as follows:

- **Typical USDA Serving Size and Unit:** The USDA SR food nutrient database contains two typical household portions, or serving, sizes. Either size can be chosen using metric or standard USA imperial units of measurement. Weight 1 is larger, and contains more measurements, than weight 2. Use weight 1 as the default.
- **Actual Serving Size**: Adjust the Typical USDA Serving Size to the actual serving size consumed in a typical meal. In this example, the typical serving size is actually 0.25 cups, rather than the 1 cup Typical Serving Size. In order to keep this a unit cost, the typical meal should not be tied to one particular individual or age group.
- **Container Size in USDA Serving Unit**: The size the container holding this food item. If necessary, convert the container units of measurement to the same units found in the typical serving size units. In this example, the container holds 2 cups of the 1 cup Typical USDA serving size.
- **Container Price and Unit**: Grocery store price of the container. The unit is entered in terms of the USDA serving size, not the actual container unit (i.e. package). For example, if the common household measure is ounce, a one pound container should specify the unit as "16 ounce package". Operating budgets usually use the Actual Serving Size to figure food nutrients consumed and serving cost. Capital budgets can use the container size to figure the "bulk" nutrient composition of foods, but care is needed to use the correct container size (16 ounces).
- **Extra 1 and Extra 2**: Extra nutrients to include in the calculation. The typical and actual quantities will be identical. For example, an analysis of a crop output might want to include the actual Nitrogen content of the crop in subsequent analyses. Use an accompanying story to explain these extra nutrients. See the footnotes about further customization of inputs and outputs.

The following image displays the calculated properties for the actual serving size portion:



Actual Serving Size

Actual Servings Per Container: 8.000	**USDA Servings Per Container**: 2.000
Actual Serving Size: 0.25	**Serving Units**: cup
Total Cost Per Actual Serving: 0.188	**Container Cost**: 1.500

Nutritional Composition of Actual Serving Size

Actual Water g: 5.045	**Actual Energy Kcal**: 176.000
Actual Protein g: 4.955	
Actual Lipid Tot g: 0.580	**Actual Ash g**: 0.555
Actual Carbohydrate g: 38.860	**Actual Fiber (TD) g**: 7.800
Actual Sugar (Tot) g: 0.400	**Actual Calcium mg**: 14.500
Actual Iron mg: 1.250	**Actual Magnesium mg**: 39.500
Actual Phosphorus mg: 110.500	**Actual Potassium mg**: 140.000
Actual Sodium mg: 4.500	**Actual Zinc mg**: 1.065
Actual Copper mg: 0.210	**Actual Manganese mg**: 0.661
Actual Selenium pg: 18.850	**Actual Vitamin C mg**: 0.000
Actual Thiamin mg: 0.096	**Actual Riboflavin mg**: 0.057
Actual Niacin mg: 2.302	**Actual Panto mg**: 0.141
Actual Vitamin B6 mg: 0.130	**Actual Folate (Tot) pg**: 11.500
Actual Folic Acid pg: 0.000	**Actual Food Folate pg**: 11.500
Actual Folate (DFE) pg: 11.500	**Actual Choline (Tot) mg**: 18.900
Actual Vitamin B12 pg: 0.000	**Actual Vitamin A (IU)**: 11.000
Actual Vitamin A (RAE): 0.500	**Actual Retinol pg**: 0.000
Actual Alpha Carotene pg: 0.000	
Actual Beta Carotene pg: 6.500	**Actual Beta Crypt pg**: 0.000
Actual Lycopene pg: 0.000	**Actual Lut Zea pg**: 80.000
Actual Vitamin E mg: 0.010	**Actual Vitamin D pg**: 0.000
Actual ViVitamin D (IU): 0.000	**Actual Vitamin K pg**: 1.100
Actual Fatty Acid Sat g: 0.122	**Actual Fatty Acid Mono g**: 0.075
Actual Fatty Acid Poly g: 0.280	**Actual Cholesterol mg**: 0.000
Actual Extra 1: 2.000	**Actual Extra 2**: 2.000

These numbers are calculated as follows:

Actual Water g:

20.18 g Typical Nutrient Value of Common Measure = 10.09 Typical Water (per 100 grams) * 200 (grams of common measure) / 100

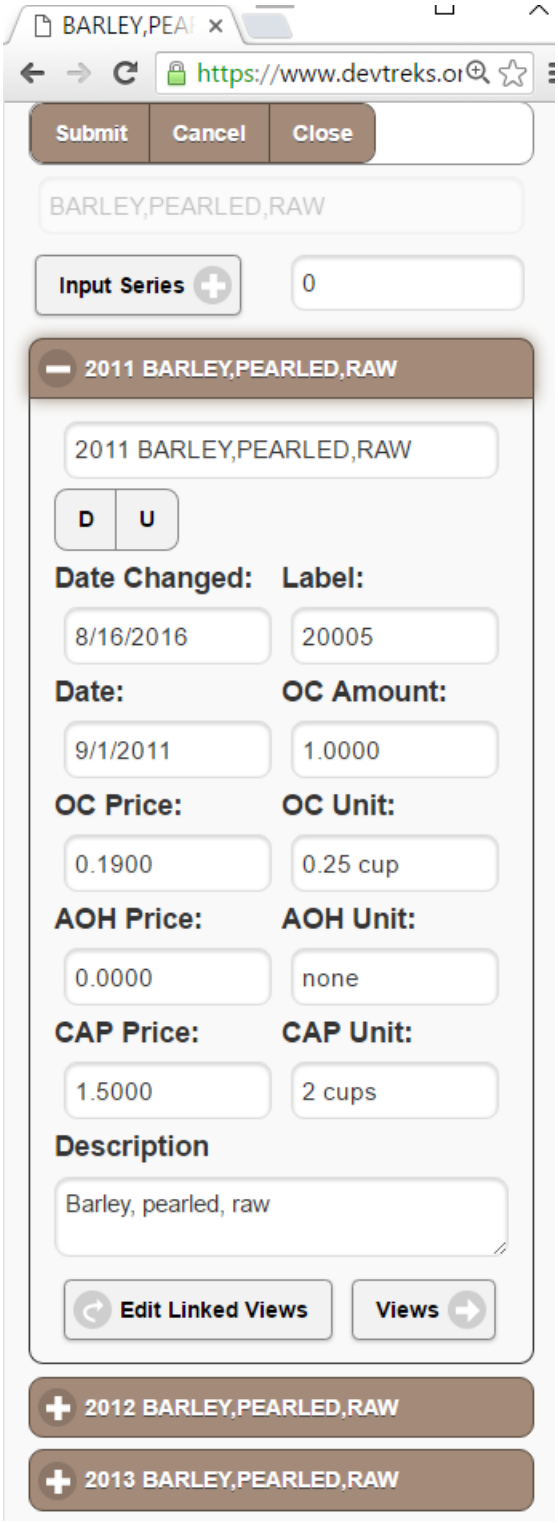
5.045 (Actual nutrients per actual amount of common household measure) = (20.18 g Typical Nutrient Value of Common Measure * 1 cup (common household measure)) * (0.25 cup (actual household serving size) * 1 Input.OCAmount))

5.045 (Actual nutrients per actual amount of common household measure adjusted for waste) = 5.045 * ((100 – 0 (refuse percent) / 100)

8 Actual Servings per Container = 2 cups of USDA Typical Serving (1 cup) per container / 0.25 cups consumed per actual serving

0.19 Total Cost per Actual Serving or Serving Cost = 0.19 Input.OCPrice * 1 Input.OCAmount

The next image shows that the following Input and Series properties are updated:



These properties are automatically updated in base Inputs as follows:

- **Input.OCAmount**: 1 (unit nutrients and prices)
- **Input.OCUnit**: 0.25 cup (Actual Serving Size in Typical Serving Size Units (cups))
- **Input.OCPrice**: 0.19 = 1.50 (2 cup container) / 8 (Actual Servings per Container)
- **Input.CAPPrice** = 1.50 (Container Price)
- **Input.CAPUnit** = 2 cup (Container Size in USDA Serving Unit)

Pay close attention to the Input.OCUnit and Input.CAPUnit. When this Input is added to an Operation or Component, the Input.OCAmount or Input.CAPAmount can be changed to an "actual" amount. If the Input.CAPAmount is set to a value greater than zero, the *container* size will be used to calculate food nutrient composition amounts and serving cost. Otherwise the Input.OCAmount and Input.OCUnits will be used to calculate food nutrient composition amounts and serving cost. The Input.CAPAmount change is appropriate for Capital Budgets that need "bulk food nutrient" data. Operating Budgets should use the Input.OCAmount. Numeric examples can be found in the *Malnutrition Analysis 1* reference. Make sure the amounts reflect the units being used.

F. ARS Standard Reference (SR) Food Nutrition Output Calculator

This calculator works identically to the SR Input Calculator. Why include identical Output and Input Calculators? At least four reasons stand out:

1. **Food Nutrient Production**: Buyers of agricultural products are paying greater attention to the qualitative and quantitative properties of agricultural outputs. They want organic tomatoes that have no pesticide residues, coffee beans that taste better, and subsistence crops that supply more nutrients.
2. **Plant Nutrient Composition**. Crop fertilizer recommendations are commonly based on sampled plant tissues. Two generic nutrient properties (Extra 1 and Extra 2) were added to the ARS food item list to accommodate these types of properties (i.e. Nitrogen).
3. **Nutrient Budget (Food Nutrients Expended)**: Nutrient budgets examine the flow of nutrients entering a system (i.e. an orchard) and the flow of nutrients leaving the system (i.e. fruits). The "system" can be humans. For example, human calorie balances ("The

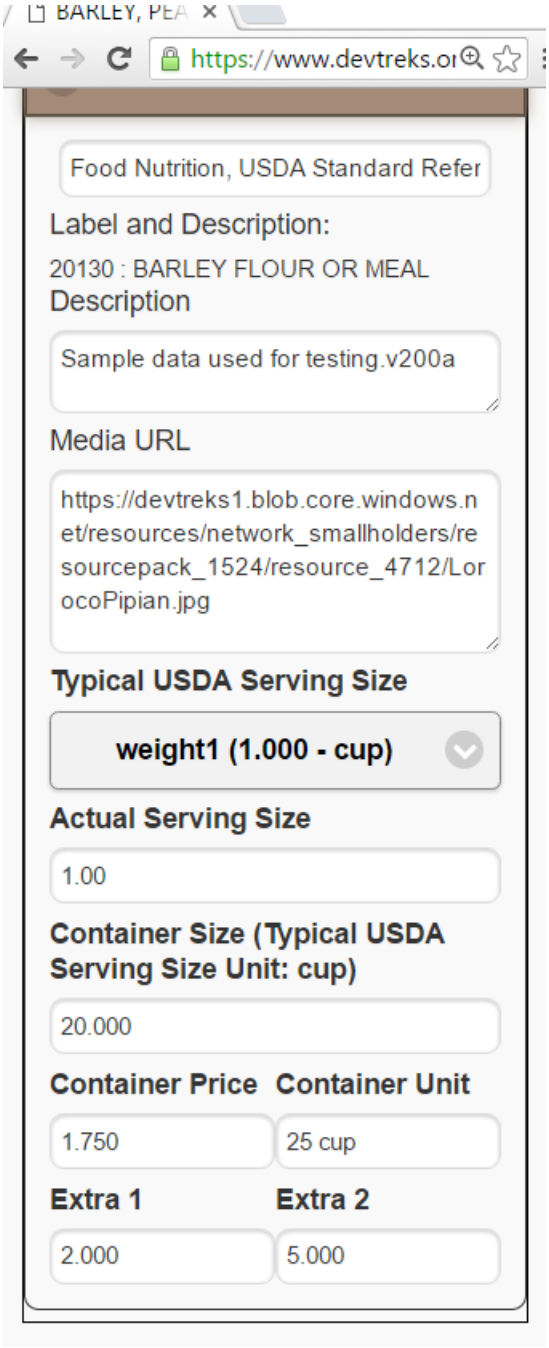
balance between the calories *consumed* in food and the calories *expended* through physical activity and metabolic processes", USDA 2010) can be measured using nutrient budgets. Budgets can also be used to account for food wastes, such as garbage.

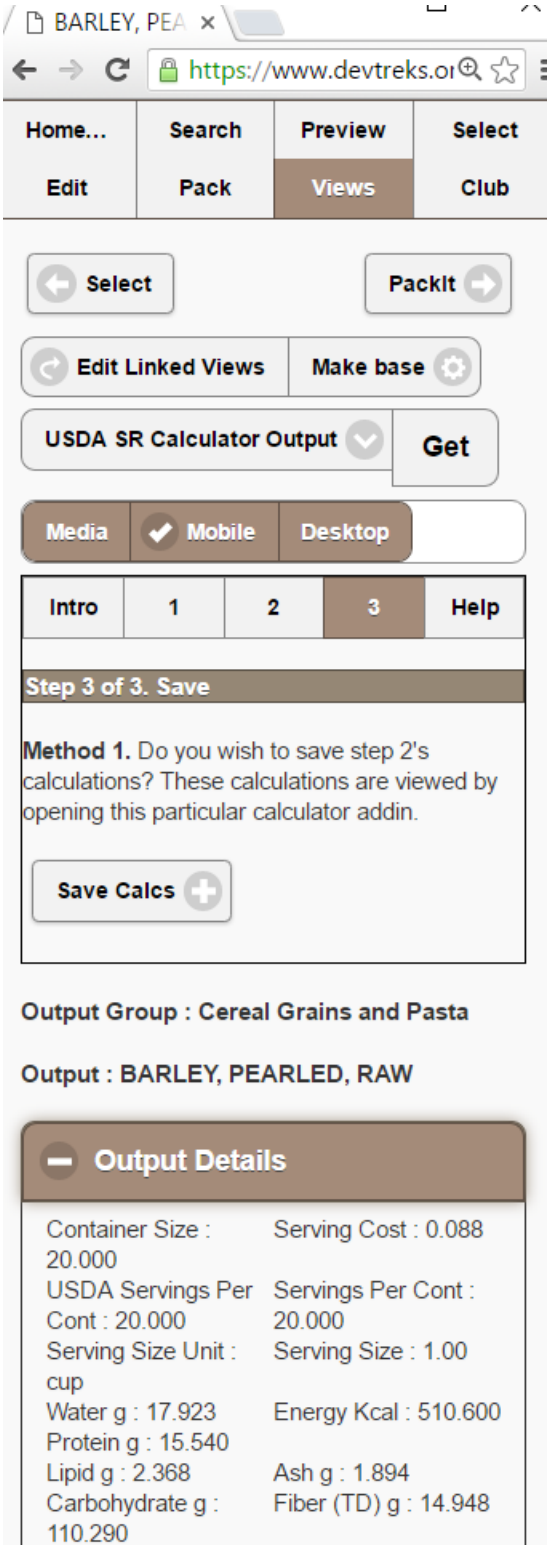
4. **Food Storage and Distribution**: Food storage and distribution studies may want to measure the nutritional losses, or food wasted, attributed to post harvest storage and transportation techniques.

Unlike Inputs, Outputs do not include a list of ARS SR food items (and the cloud's Output nutrient calculations use sample, rather than actual, data). As explained in Footnote 3, those data sets can be bulk uploaded into the database when the need arises.

Example Output 1. Barley, Pearled, Raw

The following images display the same food item, but with different properties than Example Input 1.


BARLEY, PEA
https://www.devtreks.or
Food Nutrition, USDA Standard Refer
Label and Description:
20130 : BARLEY FLOUR OR MEAL
Description
Sample data used for testing.v200a
Media URL
https://devtreks1.blob.core.windows.net/resources/network_smallholders/resourcepack_1524/resource_4712/LorocoPipian.jpg
Typical USDA Serving Size
weight1 (1.000 - cup)
Actual Serving Size
1.00
Container Size (Typical USDA Serving Size Unit: cup)
20.000
Container Price
Container Unit
1.750
25 cup
Extra 1
Extra 2
2.000
5.000


BARLEY, PEA
https://www.devtreks.or
Home...
Search
Preview
Select
Edit
Pack
Views
Club
Select
PackIt
Edit Linked Views
Make base
USDA SR Calculator Output
Get
Media
Mobile
Desktop
Intro
1
2
3
Help
Step 3 of 3. Save
Method 1. Do you wish to save step 2's calculations? These calculations are viewed by opening this particular calculator addin.
Save Calcs
Output Group : Cereal Grains and Pasta
Output : BARLEY, PEARLED, RAW
Output Details
Container Size : 20.000
Serving Cost : 0.088
USDA Servings Per Cont : 20.000
Servings Per Cont : 20.000
Serving Size Unit : cup
Serving Size : 1.00
Water g : 17.923
Energy Kcal : 510.600
Protein g : 15.540
Lipid g : 2.368
Ash g : 1.894
Carbohydrate g : 110.290
Fiber (TD) g : 14.948

The only difference that Outputs have from Inputs are that instead of using Input.OCAmount and Input.OCPrice in the calculations, Output.Amount and Output.Price are used:

Output.Amount: 1 (unit nutrients and prices)

Output.Unit: 0.25 cup (Actual Serving Size in Typical Serving Size Units (cups))

Output.Price: 0.19 = 1.50 (2 cup container) / 8 (Actual Servings per Container)

Output.CompositionAmount: 1 = default value

Output.CompositionUnit: each = default value

Pay close attention to the Output.Unit. When this Output is added to an Outcome, the Output.Amount can be changed to an "actual" amount. Make sure the amount reflects the Output.Unit being used.

G. Input and Output Nutrient Calculations in Analyzers

These food nutrient Input and Output calculations are rerun in the Malnutrition Analyzers explained in the *Malnutrition Analysis 1* reference. The main difference in the calculated amounts involves the Input and Output Amounts used in the food nutrient, serving size, and serving cost calculations. Base Input and Output Analysis always will use an Input.OCAmount = 1 and an Output.Amount = 1. These calculations result in "unit nutrient" calculations that can be added to any Operation, Component, or Outcome and then changed.

Operations and Components can change either the Input.OCAmount for "consumed food" analysis or Input.CAPAmount for "bulk food container" analysis, such as a Capital Budget Analysis. Outcomes can change the Output.Amount property for "produced or expended food" analysis or the Output.CompositionAmount for "distributed food" analyses. The CompositionAmount property is often used in livestock budgets to set the number of head of livestock.

Benchmark comparators used to analyze this data, such as the nutritional goals listed the following chart (USDA, 2010), can be set, at least to some degree, through careful setting of all Inputs and Outputs and their amounts.

APPENDIX 5. NUTRITIONAL GOALS FOR AGE-GENDER GROUPS, BASED ON DIETARY REFERENCE INTAKES AND DIETARY GUIDELINES RECOMMENDATIONS

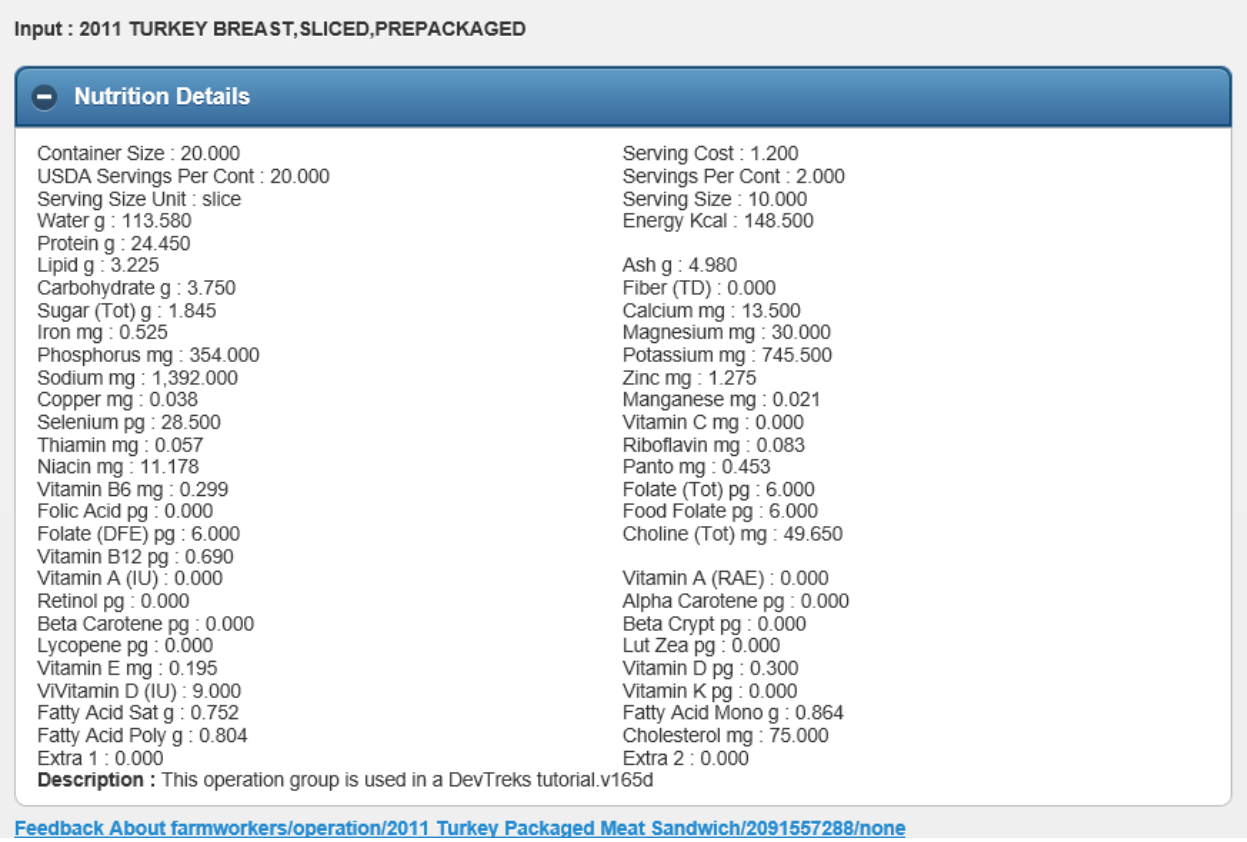
Nutrient (units)	Source of goal[a]	Child 1-3	Female 4-8	Male 4-8	Female 9-13	Male 9-13	Female 14-18	Male 14-18	Female 19-30	Male 19-30	Female 31-50	Male 31-50	Female 51+	Male 51+
Macronutrients														
Protein (g)	RDA[b]	13	19	19	34	34	46	52	46	56	46	56	46	56
(% of calories)	AMDR[c]	5-20	10-30	10-30	10-30	10-30	10-30	10-30	10-35	10-35	10-35	10-35	10-35	10-35
Carbohydrate (g)	RDA	130	130	130	130	130	130	130	130	130	130	130	130	130
(% of calories)	AMDR	45-65	45-65	45-65	45-65	45-65	45-65	45-65	45-65	45-65	45-65	45-65	45-65	45-65
Total fiber (g)	IOM[d]	14	17	20	22	25	25	31	28	34	25	31	22	28
Total fat (% of calories)	AMDR	30-40	25-35	25-35	25-35	25-35	25-35	25-35	20-35	20-35	20-35	20-35	20-35	20-35
Saturated fat (% of calories)	DG[e]	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%
Linoleic acid (g)	AI[f]	7	10	10	10	12	11	16	12	17	12	17	11	14
(% of calories)	AMDR	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10
alpha-Linolenic acid (g)	AI	0.7	0.9	0.9	1.0	1.2	1.1	1.6	1.1	1.6	1.1	1.6	1.1	1.6
(% of calories)	AMDR	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2
Cholesterol (mg)	DG	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300
Minerals														
Calcium (mg)	RDA	700	1,000	1,000	1,300	1,300	1,300	1,300	1,000	1,000	1,000	1,000	1,200	1,200
Iron (mg)	RDA	7	10	10	8	8	15	11	18	8	18	8	8	8
Magnesium (mg)	RDA	80	130	130	240	240	360	410	310	400	320	420	320	420
Phosphorus (mg)	RDA	460	500	500	1,250	1,250	1,250	1,250	700	700	700	700	700	700
Potassium (mg)	AI	3,000	3,800	3,800	4,500	4,500	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
Sodium (mg)	UL[g]	<1,500	<1,900	<1,900	<2,200	<2,200	<2,300	<2,300	<2,300	<2,300	<2,300	<2,300	<2,300	<2,300
Zinc (mg)	RDA	3	5	5	8	8	9	11	8	11	8	11	8	11
Copper (mcg)	RDA	340	440	440	700	700	890	890	900	900	900	900	900	900

Examples of the four calculations are as follows (**6***):

Example 1. Food Consumed Nutrient Content. This is the standard calculation used by Operations and Operating Budgets to calculate food nutrient consumed in meals. The following

2014 image displays the food nutrient calculations for a Turkey Input in an Operation Analysis of a Turkey sandwich. The initial Input.OCAmount for the Turkey is 1 (10 slice unit).

2014 Image with OCAmount = 1



Input : 2011 TURKEY BREAST,SLICED,PREPACKAGED

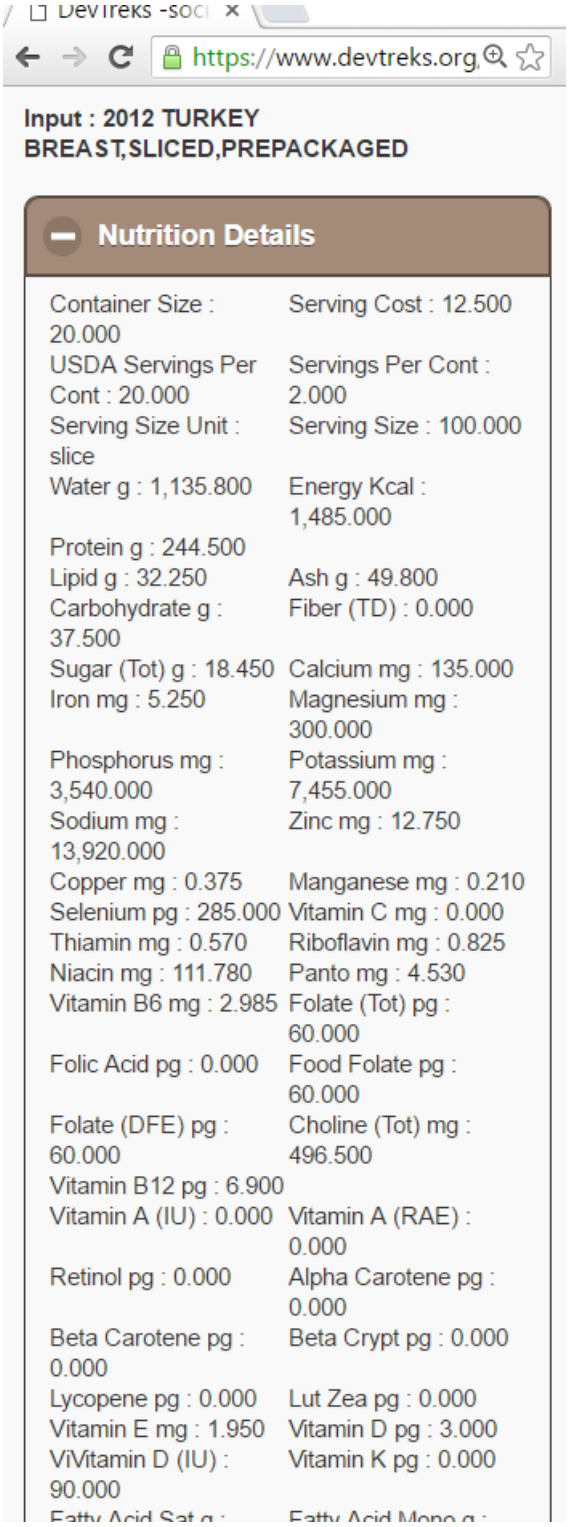
Nutrition Details

Container Size : 20.000	Serving Cost : 1.200
USDA Servings Per Cont : 20.000	Servings Per Cont : 2.000
Serving Size Unit : slice	Serving Size : 10.000
Water g : 113.580	Energy Kcal : 148.500
Protein g : 24.450	
Lipid g : 3.225	Ash g : 4.980
Carbohydrate g : 3.750	Fiber (TD) : 0.000
Sugar (Tot) g : 1.845	Calcium mg : 13.500
Iron mg : 0.525	Magnesium mg : 30.000
Phosphorus mg : 354.000	Potassium mg : 745.500
Sodium mg : 1,392.000	Zinc mg : 1.275
Copper mg : 0.038	Manganese mg : 0.021
Selenium pg : 28.500	Vitamin C mg : 0.000
Thiamin mg : 0.057	Riboflavin mg : 0.083
Niacin mg : 11.178	Panto mg : 0.453
Vitamin B6 mg : 0.299	Folate (Tot) pg : 6.000
Folic Acid pg : 0.000	Food Folate pg : 6.000
Folate (DFE) pg : 6.000	Choline (Tot) mg : 49.650
Vitamin B12 pg : 0.690	
Vitamin A (IU) : 0.000	Vitamin A (RAE) : 0.000
Retinol pg : 0.000	Alpha Carotene pg : 0.000
Beta Carotene pg : 0.000	Beta Crypt pg : 0.000
Lycopene pg : 0.000	Lut Zea pg : 0.000
Vitamin E mg : 0.195	Vitamin D pg : 0.300
ViVitamin D (IU) : 9.000	Vitamin K pg : 0.000
Fatty Acid Sat g : 0.752	Fatty Acid Mono g : 0.864
Fatty Acid Poly g : 0.804	Cholesterol mg : 75.000
Extra 1 : 0.000	Extra 2 : 0.000

Description : This operation group is used in a DevTreks tutorial.v165d

Feedback About farmworkers/operation/2011 Turkey Packaged Meat Sandwich/2091557288/none

The following 2016 image shows that when the Turkey Input.OCAmount is changed from 1 (10 slice unit) to 10 (10 slice unit), the food nutrient composition amounts, serving size, and the serving costs are multiplied by 10.



These calculations are as follows:

- **Input.Times**: 1 (general multiplier)
- **Input.OCAmount**: 10 (unit nutrients and prices)
- **Input.OCUnit**: 10 slice (Actual Serving Size in Typical Serving Size Units (slice))
- **Input.OCPrice**: 1.20 = 2.40 (20 slice container) / 2 (Actual Servings per Container)
- **Input.CAPAmount** = 0
- **Input.CAPPrice** = 2.40 (20 slice container price)
- **Input.CAPUnit** = 20 slice (Container Size in USDA Serving Unit)

Serving Size: 100 slice = 10 slice (actual serving size) * 10 (Input.OCAmount)

12.50 Serving Cost = 1.20 Input.OCPrice * 10 Input.OCAmount

Actual Water g:

11.36 g Typical Nutrient Value of Common Measure = 75.72 Typical Water (per 100 grams) * 15 (grams of common measure) / 100

1,135 (Actual nutrients per actual amount of common household measure) = (11.36 g Typical Nutrient Value of Common Measure * 10 slice (common household measure)) * 20 slice (serving size)

1,135 (Actual nutrients per actual amount of common household measure adjusted for waste) = 1,135 * ((100 – 0 (refuse percent) / 100)

2 Servings per Container = 20 slices of USDA Typical Serving (1 slice) per container / 10 slices (original actual serving size)

Example 2. Food Supplied Container Nutrient Content. This is the standard calculation used by Components and Capital Budgets to calculate the food supplied using containers for measurement. It uses the same Input as the previous example, but the Input.OCAmount has been changed to 0, the Input.Times has been changed to 1, and the Input.CAPAmount has been changed to 2.

Input : 2012 TURKEY BREAST,SLICED,PREPACKAGED

Nutrition Details

Container Size : 20.000	Serving Cost : 5.000
USDA Servings Per Cont : 20.000	Servings Per Cont : 2.000
Serving Size Unit : slice	Serving Size : 40.000
Water g : 454.320	Energy Kcal : 594.000
Lipid g : 12.900	Ash g : 19.920
Carbohydrate g : 15.000	Fiber (TD) : 0.000
Sugar (Tot) g : 7.380	Calcium mg : 54.000
Iron mg : 2.100	Magnesium mg : 120.000
Phosphorus mg : 1,416.000	Potassium mg : 2,982.000
Sodium mg : 5,568.000	Zinc mg : 5.100
Copper mg : 0.150	Manganese mg : 0.084
Selenium pg : 114.000	Vitamin C mg : 0.000
Thiamin mg : 0.228	Riboflavin mg : 0.330
Niacin mg : 44.712	Panto mg : 1.812
Vitamin B6 mg : 1.194	Folate (Tot) pg : 24.000
Folic Acid pg : 0.000	Food Folate pg : 24.000
Folate (DFE) pg : 24.000	Choline (Tot) mg : 198.600
Vitamin B12 pg : 2.760	
Vitamin A (IU) : 0.000	Vitamin A (RAE) : 0.000
Retinol pg : 0.000	Alpha Carotene pg : 0.000
Beta Carotene pg : 0.000	Beta Crypt pg : 0.000
Lycopene pg : 0.000	Lut Zea pg : 0.000
Vitamin E mg : 0.780	Vitamin D pg : 1.200
ViVitamin D (IU) : 36.000	Vitamin K pg : 0.000
Fatty Acid Sat g : 3.006	Fatty Acid Mono g : 3.456
Fatty Acid Poly g : 3.216	Cholesterol mg : 300.000
Extra 1 : 0.000	Extra 2 : 0.000

Description : This operation group is used in a DevTreks tutorial.v165n

Feedback About farmworkers/operation/Turkey Packaged Meat Sandwich/2091557249/none

The 2014 calculations are as follows:

- **Input.Times**: 1 (general multiplier)
- **Input.OCAmount**: 0 (unit nutrients and prices)
- **Input.OCUnit**: 10 slice (Actual Serving Size in Typical Serving Size Units (slice))
- **Input.OCPrice**: 1.20 = 1.20 (20 slice container) / 2 (Actual Servings per Container)
- **Input.CAPAmount** = 2
- **Input.CAPPrice** = 2.20 (20 slice container price)
- **Input.CAPUnit** = 20 slice (Container Size in USDA Serving Unit)

Serving Size: 40 slice = 20 slice (Container Size) * 2 (Input.CAPAmount)

4.80 Serving Cost = 2.40 Input.CAPPrice * 2 Input.CAPAmount

Actual Water g:

11.36 g Typical Nutrient Value of Common Measure = 75.72 Typical Water (per 100 grams) * 15 (grams of common measure) / 100

454.32 (Actual nutrients per actual amount of common household measure) = (11.36 g Typical Nutrient Value of Common Measure * 1 slice (common household measure)) * 40 slice (serving size)

454.32 (Actual nutrients per actual amount of common household measure adjusted for waste) = 454.32 * ((100 – 0 (refuse percent) / 100)

2 Servings per Container = 20 slices of USDA Typical Serving (1 slice) per container / 10 slices (original actual serving size)

Example 3. Food Produced or Expended Nutrient Content. This is the standard calculation used by Outcomes and Operating Budgets to calculate the nutrient content of agricultural *outputs.* They can also measure the food nutrients expended in Outcomes, such as physical activities and metabolic processes. The following 2014 image uses the Barley Output example from above. It shows that when the Output.Amount property is changed from 1 to 2, the food nutrition, serving size, and serving cost properties double (the calculations are similar to Example 1. Food Consumed Nutrient Content).

Outcome : 2011 Barley and Potato Crops(Amount: 1.000; Date: 12/31/2011

Nutrition Details

Container Size : 27.000	Serving Cost : 0.575
USDA Servings Per Cont : 27.000	Servings Per Cont : 33.000
Serving Size Unit : potato, large (3in to 4-1-4in dia)	Serving Size : 1.500
Water g : 229.663	Energy Kcal : 565.098
Protein g : 15.500	
Lipid g : 1.409	Ash g : 4.099
Carbohydrate g : 126.068	Fiber (TD) : 21.689
Sugar (Tot) g : 2.959	Calcium mg : 62.210
Iron mg : 4.659	Magnesium mg : 142.653
Phosphorus mg : 378.748	Potassium mg : 1,445.118
Sodium mg : 25.605	Zinc mg : 2.933
Copper mg : 0.719	Manganese mg : 1.745
Selenium pg : 38.530	Vitamin C mg : 54.520
Thiamin mg : 0.412	Riboflavin mg : 0.203
Niacin mg : 7.521	Panto mg : 1.101
Vitamin B6 mg : 1.076	Folate (Tot) pg : 67.280
Folic Acid pg : 0.000	Food Folate pg : 67.280
Folate (DFE) pg : 67.280	Choline (Tot) mg : 71.287
Vitamin B12 pg : 0.000	
Vitamin A (IU) : 27.535	Vitamin A (RAE) : 1.000
Retinol pg : 0.000	Alpha Carotene pg : 0.000
Beta Carotene pg : 15.768	Beta Crypt pg : 0.000
Lycopene pg : 0.000	Lut Zea pg : 182.140
Vitamin E mg : 0.048	Vitamin D pg : 0.000
ViVitamin D (IU) : 0.000	Vitamin K pg : 7.458
Fatty Acid Sat g : 0.316	Fatty Acid Mono g : 0.155
Fatty Acid Poly g : 0.679	Cholesterol mg : 0.000
Extra 1 : 1.000	Extra 2 : 2.000
Description : v165h	

Output : 2011 BARLEY, PEARLED, RAW

Nutrition Details

Container Size : 2.000	Serving Cost : 0.375
USDA Servings Per Cont : 2.000	Servings Per Cont : 8.000
Serving Size Unit : cup	Serving Size : 0.500
Water g : 10.090	Energy Kcal : 352.000
Protein g : 9.910	
Lipid g : 1.160	Ash g : 1.110
Carbohydrate g : 77.720	Fiber (TD) : 15.600
Sugar (Tot) g : 0.800	Calcium mg : 29.000
Iron mg : 2.500	Magnesium mg : 79.000
Phosphorus mg : 221.000	Potassium mg : 280.000
Sodium mg : 9.000	Zinc mg : 2.130
Copper mg : 0.420	Manganese mg : 1.322
Selenium pg : 37.700	Vitamin C mg : 0.000
Thiamin mg : 0.191	Riboflavin mg : 0.114
Niacin mg : 4.604	Panto mg : 0.282
Vitamin B6 mg : 0.260	Folate (Tot) pg : 23.000

Example 4. Food Distributed Container Nutrient Content. This is the standard calculation used by Components and Capital Budgets to calculate the bulk nutrient content of the food distributed, or wasted, using containers for measurement. It uses the same Output as the original example, with an Output.Amount equal to 1, an Output.Times equal to 1, and an Output.CompositionAmount changed from 1 to 2 (i.e.. to an amount greater than 1). Unlike

Input.CapAmounts that default to 0, CompositionAmounts default to 1. Setting the Output.CompositionAmount property to an amount greater than 1 tells the calculator to use container size and container cost in the calculations (rather than Output.Amount and Output.Price).

Output : 2011 BARLEY, PEARLED, RAW

Nutrition Details

Container Size : 2.000
USDA Servings Per Cont : 2.000
Serving Size Unit : cup
Water g : 80.720
Protein g : 79.280
Lipid g : 9.280
Carbohydrate g : 621.760
Sugar (Tot) g : 6.400
Iron mg : 20.000
Phosphorus mg : 1,768.000
Sodium mg : 72.000
Copper mg : 3.360
Selenium pg : 301.600
Thiamin mg : 1.528
Niacin mg : 36.832
Vitamin B6 mg : 2.080
Folic Acid pg : 0.000
Folate (DFE) pg : 184.000
Vitamin B12 pg : 0.000
Vitamin A (IU) : 176.000
Retinol pg : 0.000
Beta Carotene pg : 104.000
Lycopene pg : 0.000
Vitamin E mg : 0.160
ViVitamin D (IU) : 0.000
Fatty Acid Sat g : 1.952
Fatty Acid Poly g : 4.480
Extra 1 : 1.000
Description : v165g

Serving Cost : 3.000
Servings Per Cont : 8.000
Serving Size : 4.000
Energy Kcal : 2,816.000

Ash g : 8.880
Fiber (TD) : 124.800
Calcium mg : 232.000
Magnesium mg : 632.000
Potassium mg : 2,240.000
Zinc mg : 17.040
Manganese mg : 10.576
Vitamin C mg : 0.000
Riboflavin mg : 0.912
Panto mg : 2.256
Folate (Tot) pg : 184.000
Food Folate pg : 184.000
Choline (Tot) mg : 302.400

Vitamin A (RAE) : 8.000
Alpha Carotene pg : 0.000
Beta Crypt pg : 0.000
Lut Zea pg : 1,280.000
Vitamin D pg : 0.000
Vitamin K pg : 17.600
Fatty Acid Mono g : 1.192
Cholesterol mg : 0.000
Extra 2 : 2.000

Output : 2011 POTATO, FLESH and SKN, RAW

Nutrition Details

Container Size : 25.000
USDA Servings Per Cont : 25.000

Serving Cost : 0.200
Servings Per Cont : 25.000

These 2014 calculations are as follows:

- **Output.Times**: 1 (general multiplier)
- **Output.Amount**: 1 (unit nutrients and prices)
- **Output.Unit**: 0.25 cup (Actual Serving Size in Typical Serving Size Units (cups))
- **Output.Price**: 1.50 (2 cup container price)

- **Output.CompositionAmount:** 2 (2 cups per container)
- **Output.CompositionUnit:** 2 cups (Container Size in USDA Serving Unit)

Serving Size: 4 cup = 2 cups (Container Size) * 2 (Output.CompositionAmount)

3.00 Serving Cost = 1.50 Output.Price * 2 Output.CompositionAmount

Actual Water g:

20.18 g Typical Nutrient Value of Common Measure = 10.09 Typical Water (per 100 grams) * 200 (grams of common measure) / 100

80.7 (Actual nutrients per actual amount of common household measure) = (20.18 g Typical Nutrient Value of Common Measure * 1 cup (common household measure)) * 4 cups (serving size)

80.7 (Actual nutrients per actual amount of common household measure adjusted for waste) = 80.7 * ((100 – 0 (refuse percent) / 100)

8 Servings per Container = 2 cups of USDA Typical Serving per container / 0.25 (original actual serving size)

H. **Multimedia (Resources)**

People will have an easier grasp of food nutrition by including pictures and videos that help to explain the calculations and analyses. Pictures of food items are logical multimedia to include with calculations.

I. **Stories (Linked Views)**

Stories should accompany each food nutrient calculation and explain the calculations or analyses. Stories, such as food recipes, are particularly important when conducting malnutrition analyses.

J. Analyzers

The data generated by these calculators can be aggregated and further analyzed using the analyzers explained in the *Malnutrition Analysis 1* reference.

K. Knowledge Bank Standards

All malnutrition calculations should be entered into online knowledge banks where knowledge about malnutrition can be stored and passed down to future generations.

Summary

Food nutrients are a critical resource needed by everyone. When they get out of balance and malnutrition ensues, children go hungry, adolescents become obese, adults develop diabetes, and workers work less hard. This reference demonstrates how to calculate the basic nutritional value of Inputs and Outputs. These numbers may help people to manage malnutrition in ways that help them to improve their lives and livelihoods.

Footnotes

1. The author has studied malnutrition as an important, but ancillary topic, in his agricultural education at Cornell University, USA and U.C. Davis, USA. He is not an expert in the field. The tools introduced in this reference were kept basic for that reason.
2. Analysts have developed a large number of techniques for calculating malnutrition. This reference introduces basic malnutrition calculation. Some of the more advanced techniques will be included in future releases.
3. All of the 7200+- SR24 food nutrient Inputs were uploaded at once to the database. Under most circumstances, this type of data should not be entered by manually adding nutrients for each Input or Output. Standard database techniques can be used to bulk upload the data. Retain the uploaded data files in case another club wants to work with their own data set. The logistics of uploading cloud computing data by non-database administrators is a technical matter.

4. Alternative tools were designed (and almost built) that could measure actual household nutrient consumption and production, but their result could not easily be reused as "unit nutrients". DevTreks decided that these types of "advanced" tools need to be vetted by experts in this field. Customers who need those types of tools can contract with DevTreks or participate in the open source project.
5. The second ARS data set consists of 7200 food items that include combinations of food, such as mashed potatoes and gravy. Customers who need to calculate and analyze these types of data sets can contract with DevTreks for new calculators and analyzers.

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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.

A video tutorial explaining this reference can be found at:

https://www.devtreks.org/commontreks/preview/commons/resourcepack/Malnutrition Analysis 1/450/none/