Malnutrition Calculation 1

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Version: DevTreks 2.2.0

A. Introduction

This reference explains how to start to calculate food nutrition input and output data (**2***). **Appendix A. Introduction to Malnutrition** provides context for this topic.

B. Data URLs (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).

[The pdf version of this reference may add spaces to URLs with linebreaks. Remove the space before going to the URL.]

https://www.devtreks.org/hometreks/preview/farmworkers/input/BARLEY,PEARLED,RAW/21 47395842/none/

https://localhost:5001/hometreks/preview/farmworkers/input/BARLEY,PEARLED,RAW/21474 08123/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/

https://localhost:5001/hometreks/preview/smallholders/output/2011 BARLEY, PEARLED, RAW/2141211289/none

This reference used the Azure deployment (Version 2.1.0) and localhost, or blue motif, deployments (Version 1.6.3 and 2.2.0) to document calculations. The source calculations were not changed from Version 1.6.3 to Version 2.1.0, but the latter Version refactored the underlying calculator and analyzer patterns. The video tutorial also uses Version 2.2.0 because of further advancements in code and tutorials.

C. Work Breakdown Structure (WBS) and Rules

The food input and output data derive from the USDA, Agricultural Research Service (ARS) datasets, including Standard Reference (SR) and Food And Nutrient Database For Dietary Studies, 5.0 (FNDDS5). Only the input data contains a complete list of the 7,000+ SR food items from that reference. Although all of the SR food items had their nutrient characteristics bulk uploaded into them, only a sample number of calculations have actually been run. The localhost database includes a 2nd ARS dataset, FNDDS5 (i.e. from 2010), but does not include the bulk uploaded calculators. The SR dataset has capitalized names, while FNDDS5 does not.

D. Malnutrition and Sustainable Food Stock Balances

The Resource Stock tutorial explained the importance of maintaining the balances of community capital stocks, including food system stocks, to ensure the well-being of households and their only planet. The tutorial introduced a basic resource stock accounting framework consisting of:

Time Period 1: Stock Ending Balance = Stock Starting Balance + Stock Flows (i.e. Stock Credits – Stock Debits).

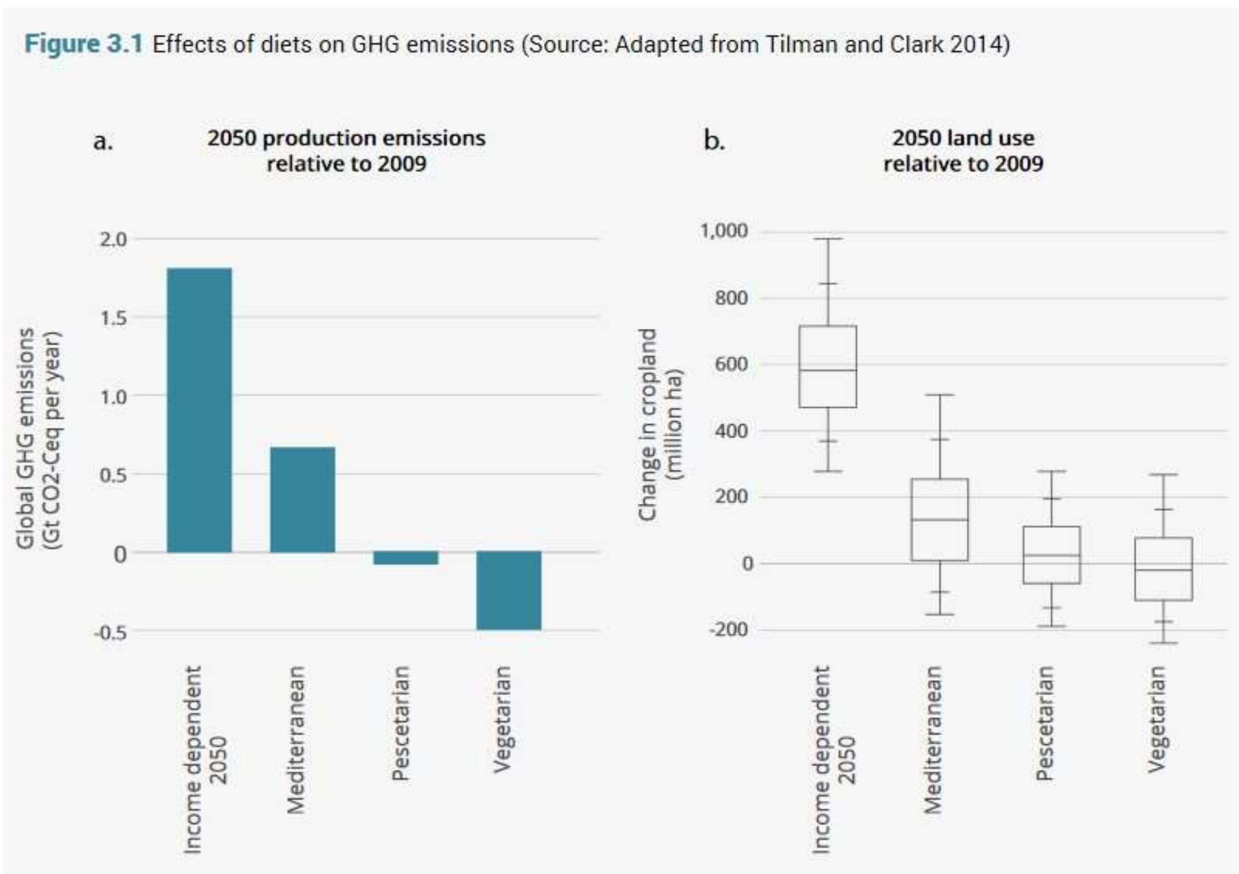
The Resource Stock calculators and analyzers are used to conduct the following types of assessments.

> Conservation Technology Assessment (CTA) is the analysis of resource stock flows and balances, and conservation technologies that are designed to prevent or correct imbalances in the stocks.

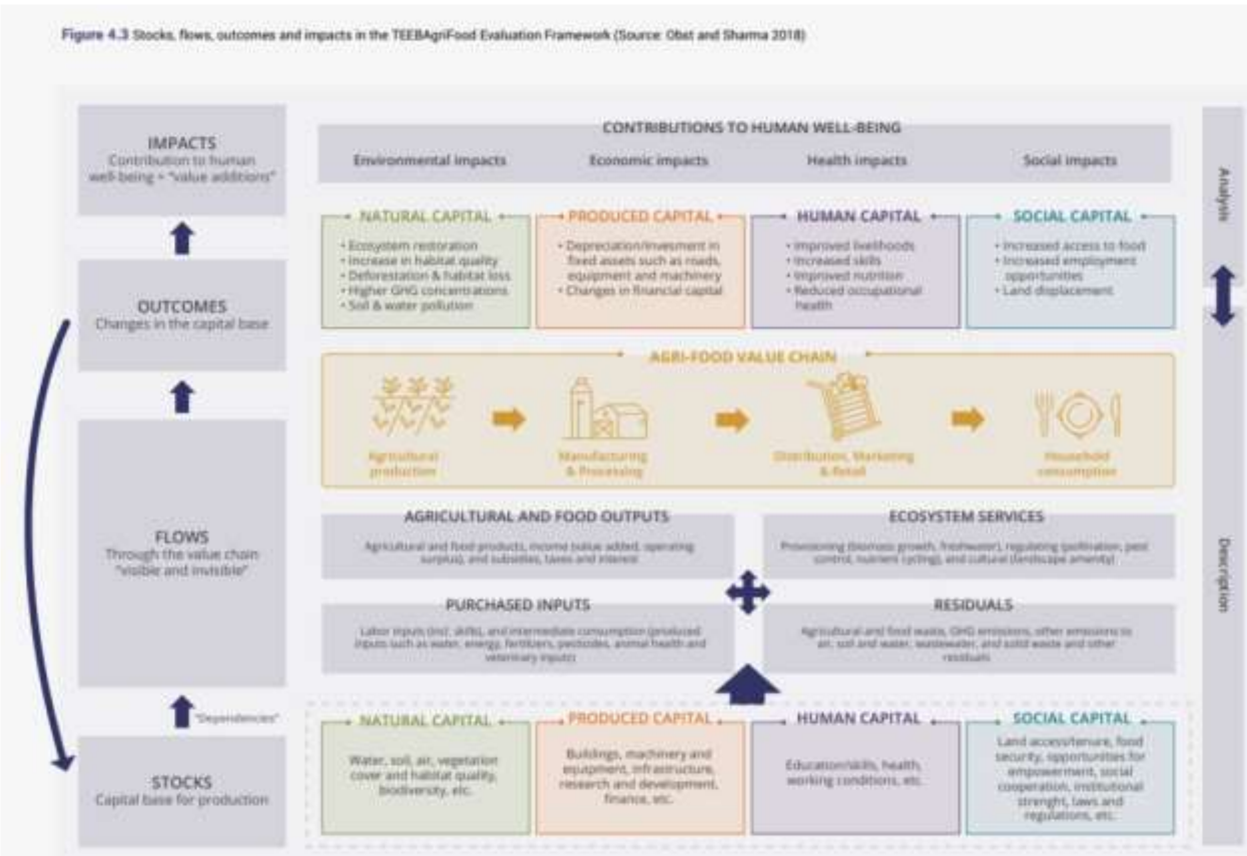
This reference introduces calculators that support the following examples of this stock accounting, as applied in CTAs, which are relevant to malnutrition analysis:

1. **Food Nutrient Input and Output Analysis**: 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. Farmers and agricultural advisors are actively seeking better inputs and management practices that lessen external environmental impacts including eutrophication, GHG, air quality, sediment runoff, acidification, water withdrawals, and biodiversity loss.

2. **Nutrient Budget Balances**: 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, USDA 2010) defines human calorie balances as "The balance between the calories consumed in food and the calories expended through physical activity and metabolic processes". These studies help producers manage achieve better balance between the inputs expended in production and the left over residues.
3. **Carbon and Ecological Footprint Balances**: The following image (TEEB, 2018) shows the relation between diets and climate change (**9***). The accompanying Malnutrition Analysis reference demonstrates how to conduct simple natural capital stock balances (i.e. GHG emissions and Ecological footprints). Version 2.2.0 added new References (Poore et al, 2019; Rose et al., 2018) that include databases containing actual emission amounts that can be used with these properties.



4. **Agriculture and Food System Analysis**: The following image (TEEB, 2018) provides context for helping consumers and producers make sustainable food system choices. The RCA Value Framework, which is explained in the Social Performance Analysis tutorial, incorporates this framework (as of Version 2.2.0). In summary, the overall goal of any production or consumption system is to achieve a higher quality of life for households by using impact pathways to better understand resource stock flows and balances so that mitigation and adaptation actions can be taken that prevent or correct imbalances in the stocks (i.e. preventing GHG from wrecking our planet). Example 12 in the Social Performance Analysis tutorial demonstrates how to conduct these analyses.



5. **Household Quality of Life Assessments**. The USDA (2015) uses the following Healthy Eating Index, HEI-2015, to help consumers assess the healthiness of their diets. Example 12 in the Social Performance Analysis tutorial demonstrates using general sustainability assessments of household quality of life that include these types of indexes.

HEI-2015[1] Components and Scoring Standards

Component	Maximum points	Standard for maximum score	Standard for minimum score of zero
Adequacy:			
Total Fruits[2]	5	≥0.8 cup equivalent per 1,000 kcal	No Fruit
Whole Fruits[3]	5	≥0.4 cup equivalent per 1,000 kcal	No Whole Fruit
Total Vegetables[4]	5	≥1.1 cup equivalent per 1,000 kcal	No Vegetables
Greens and Beans[4]	5	≥0.2 cup equivalent per 1,000 kcal	No Dark-Green Vegetables or Legumes
Whole Grains	10	≥1.5 cup equivalent per 1,000 kcal	No Whole Grains
Dairy[5]	10	≥1.3 cup equivalent per 1,000 kcal	No Dairy
Total Protein Foods[4]	5	≥2.5 cup equivalent per 1,000 kcal	No Protein Foods
Seafood and Plant Proteins[4,6]	5	≥0.8 cup equivalent per 1,000 kcal	No Seafood or Plant Proteins
Fatty Acids[7]	10	(PUFAs + MUFAs)/SFAs ≥2.5	(PUFAs + MUFAs)/SFAs ≤1.2
Moderation:			
Refined Grains	10	≤1.8 ounce equivalent per 1,000 kcal	≥4.3 ounce equivalent per 1,000 kcal
Sodium	10	≤1.1 grams per 1,000 kcal	≥2.0 grams per 1,000 kcal
Added Sugars	10	≤6.5% of energy	≥26% of energy
Saturated Fats	10	≤8% of energy	≥16% of energy

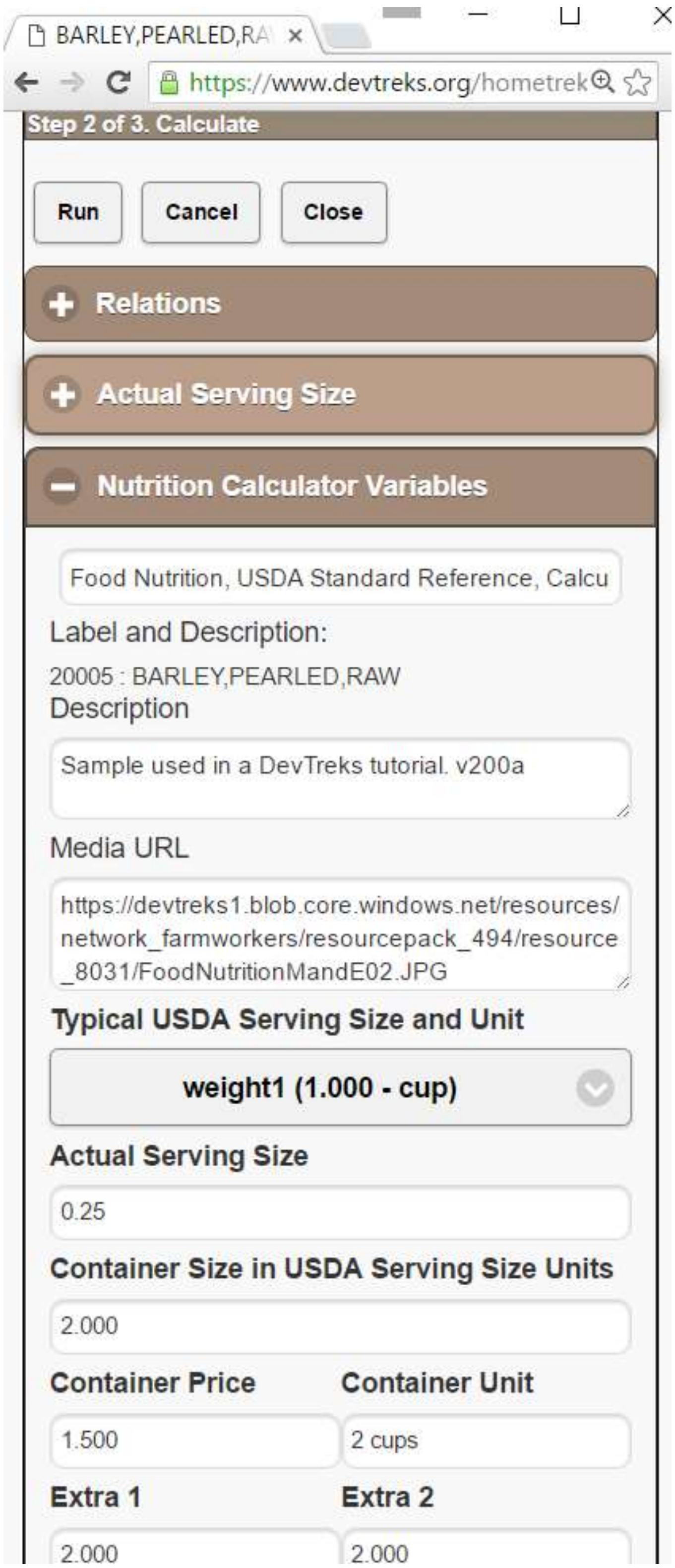
[1] Intakes between the minimum and maximum standards are scored proportionately.
[2] Includes 100% fruit juice.
[3] Includes all forms except juice.
[4] Includes legumes (beans and peas).
[5] Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages.
[6] Includes seafood, nuts, seeds, soy products (other than beverages), and legumes (beans and peas).
[7] Ratio of poly- and mono-unsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs).

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

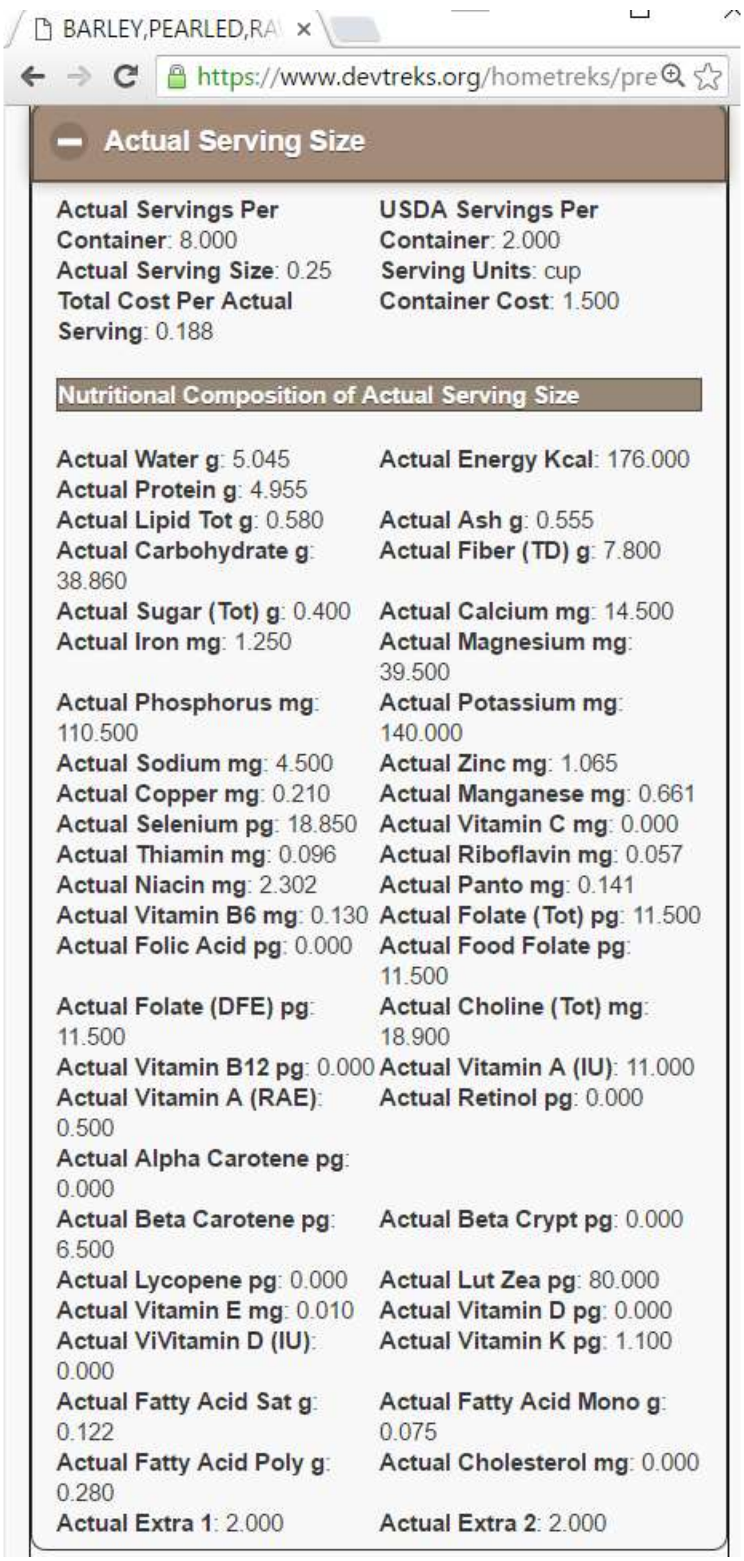
The following image displays the properties entered for this food item.


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 parameters to include in the calculations. Version 2.2.0 upgraded these properties to use the same adjustment for actual serving size as all other nutrients. The accompanying Malnutrition Analysis tutorial demonstrates how to use these properties to conduct simple carbon footprint balances (i.e. GHG emissions and energy use). Use an accompanying story to explain these extra properties.

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

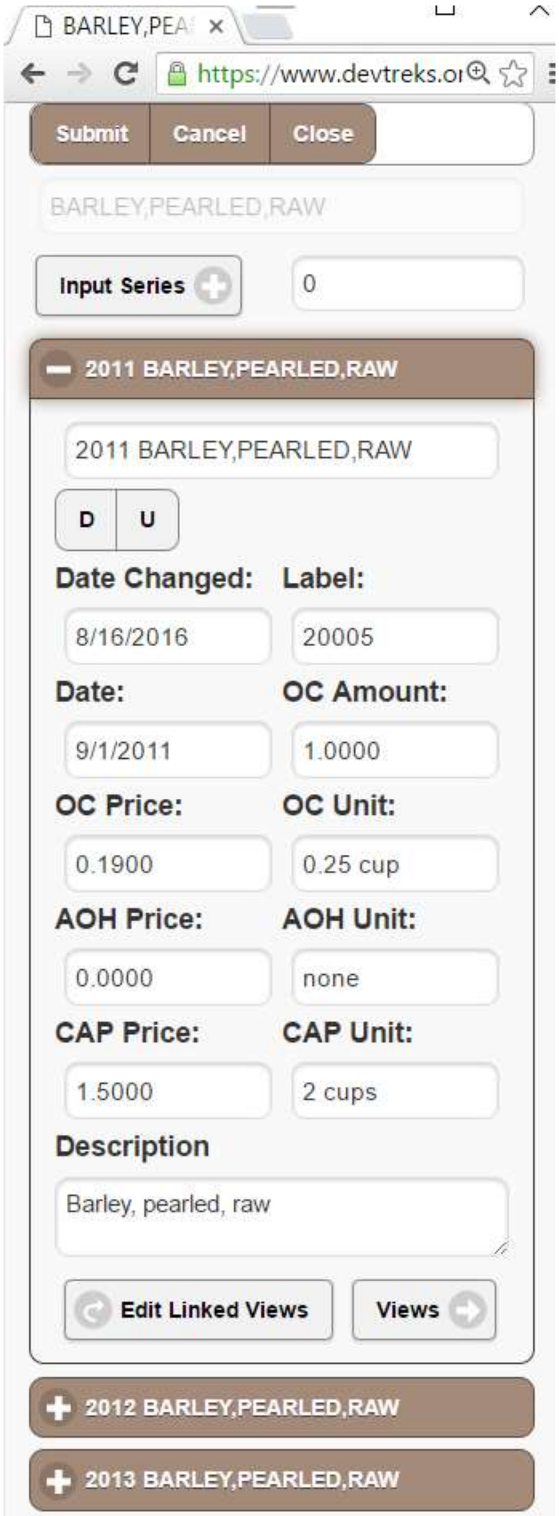
5.045 (Actual nutrients per actual amount of common household measure) = (20.18 g Typical Nutrient Value of Common Measure * 1 cup (common household measure)) * (0.25 cup (actual household serving size) * 1 Input.OCAmount))

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)

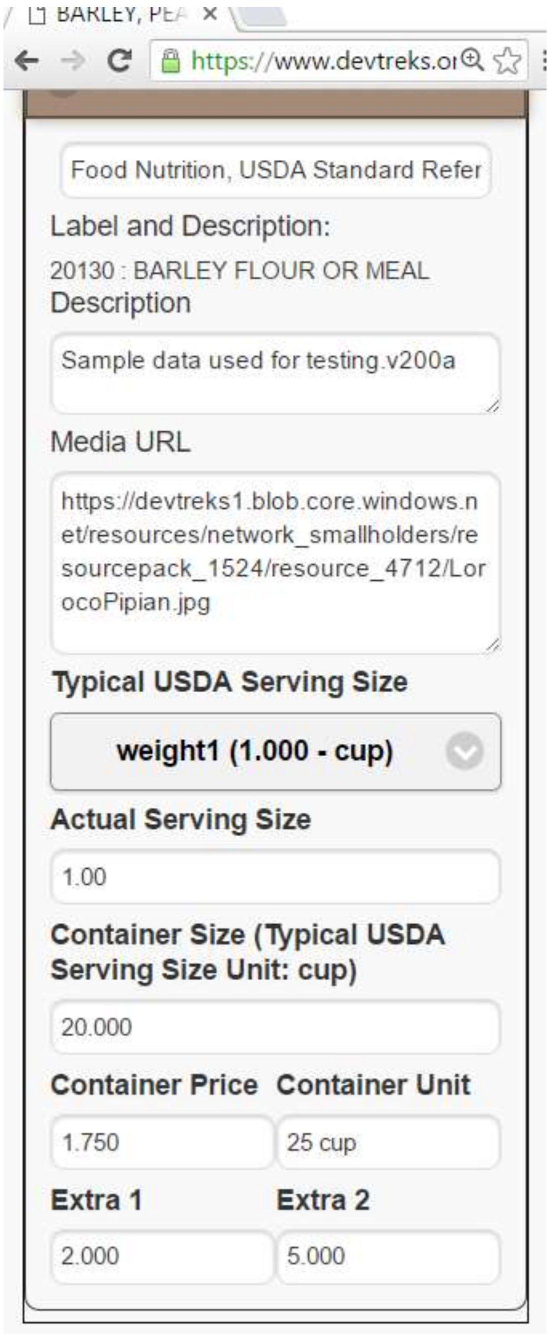
Pay close attention to the Input.OCUnit and Input.CAPUnit. When this Input is added to an Operation or Component, the Input.OCAmount or Input.CAPAmount can be changed to an "actual" amount. If the Input.CAPAmount is set to a value greater than zero, the container size will be used to calculate food nutrient 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.

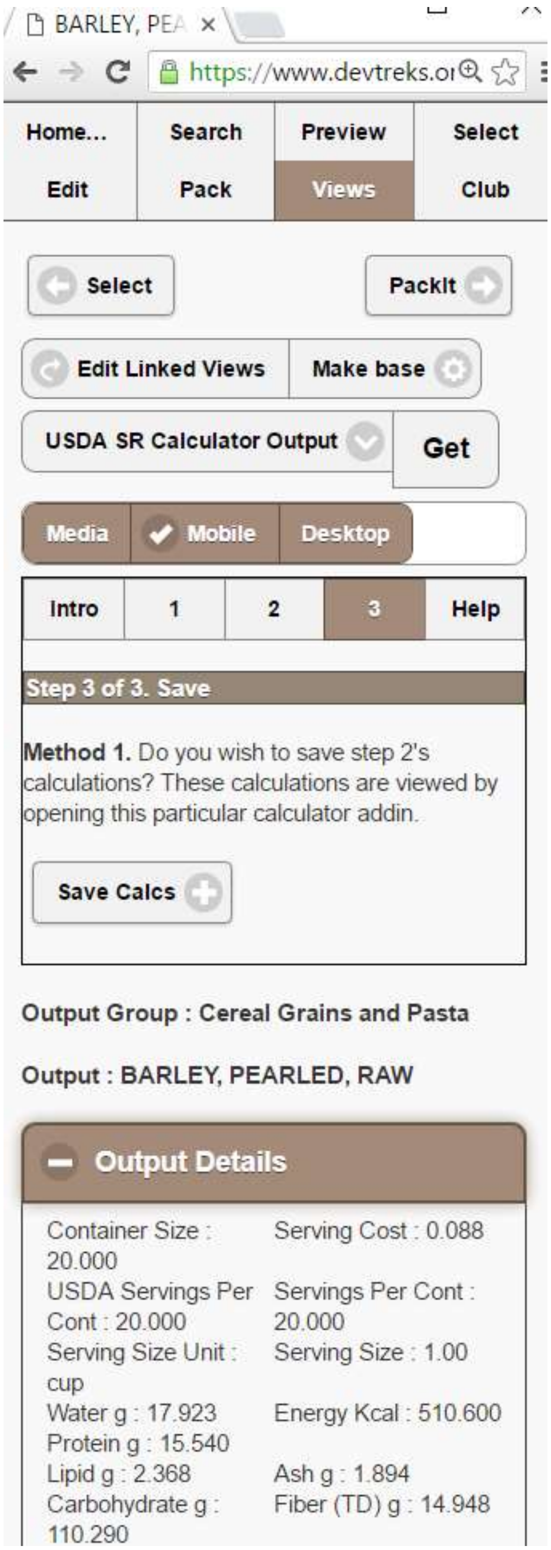
F. ARS Standard Reference (SR) Food Nutrition Output Calculator

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 and 7, 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 SR Nutrient Calculations in Analyzers

The ARS SR 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, 2015), can be set, at least to some degree, through careful setting of all Inputs and Outputs and their amounts.

Table A7-1.

Daily Nutritional Goals for Age-Sex Groups Based on Dietary Reference Intakes & *Dietary Guidelines* Recommendations

	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+
Calorie Level(s) Assessed		1,000	1,200	1,400, 1,600	1,600	1,800	1,800	2,200, 2,800, 3,200	2,000	2,400, 2,600, 3,000	1,800	2,200	1,600	2,000
Macronutrients														
Protein, g	RDA	13	19	19	34	34	46	52	46	56	46	56	46	56
Protein, % kcal	AMDR	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
Carbohydrate, % kcal	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
Dietary Fiber, g	14 g/ 1,000 kcal	14	16.8	19.6	22.4	25.2	25.2	30.8	28	33.6	25.2	30.8	22.4	28
Added Sugars, % kcal	DGA	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%
Total Fat, % kcal	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, % kcal	DGA	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%
Linoleic Acid, g	AI	7	10	10	10	12	11	16	12	17	12	17	11	14
Linolenic Acid, g	AI	0.7	0.9	0.9	1	1.2	1.1	1.6	1.1	1.6	1.1	1.6	1.1	1.6

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

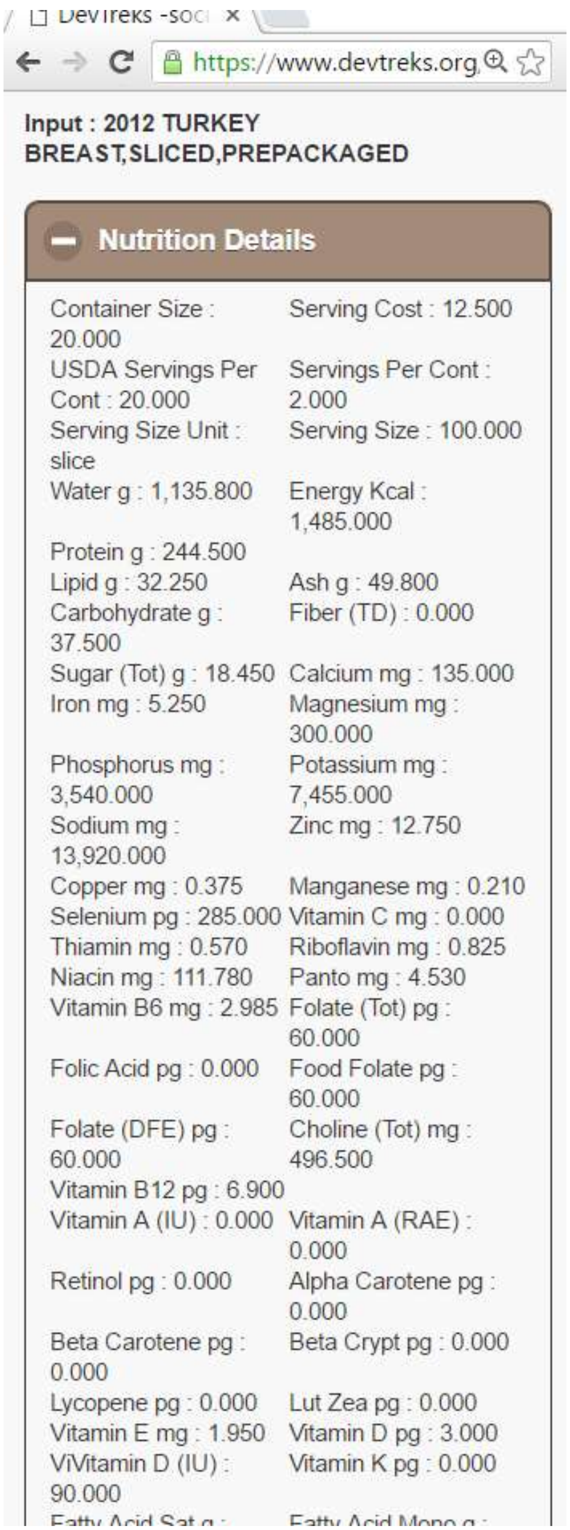
Nutrition Details

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.



DevTreks -soci ×

https://www.devtreks.org

Input : 2012 TURKEY BREAST,SLICED,PREPACKAGED

Nutrition Details

Container Size : 20.000	Serving Cost : 12.500
USDA Servings Per Cont : 20.000	Servings Per Cont : 2.000
Serving Size Unit : slice	Serving Size : 100.000
Water g : 1,135.800	Energy Kcal : 1,485.000
Protein g : 244.500	
Lipid g : 32.250	Ash g : 49.800
Carbohydrate g : 37.500	Fiber (TD) : 0.000
Sugar (Tot) g : 18.450	Calcium mg : 135.000
Iron mg : 5.250	Magnesium mg : 300.000
Phosphorus mg : 3,540.000	Potassium mg : 7,455.000
Sodium mg : 13,920.000	Zinc mg : 12.750
Copper mg : 0.375	Manganese mg : 0.210
Selenium pg : 285.000	Vitamin C mg : 0.000
Thiamin mg : 0.570	Riboflavin mg : 0.825
Niacin mg : 111.780	Panto mg : 4.530
Vitamin B6 mg : 2.985	Folate (Tot) pg : 60.000
Folic Acid pg : 0.000	Food Folate pg : 60.000
Folate (DFE) pg : 60.000	Choline (Tot) mg : 496.500
Vitamin B12 pg : 6.900	
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 : 1.950	Vitamin D pg : 3.000
ViVitamin D (IU) : 90.000	Vitamin K pg : 0.000
Fatty Acid Sat g :	Fatty Acid Mono g :

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	

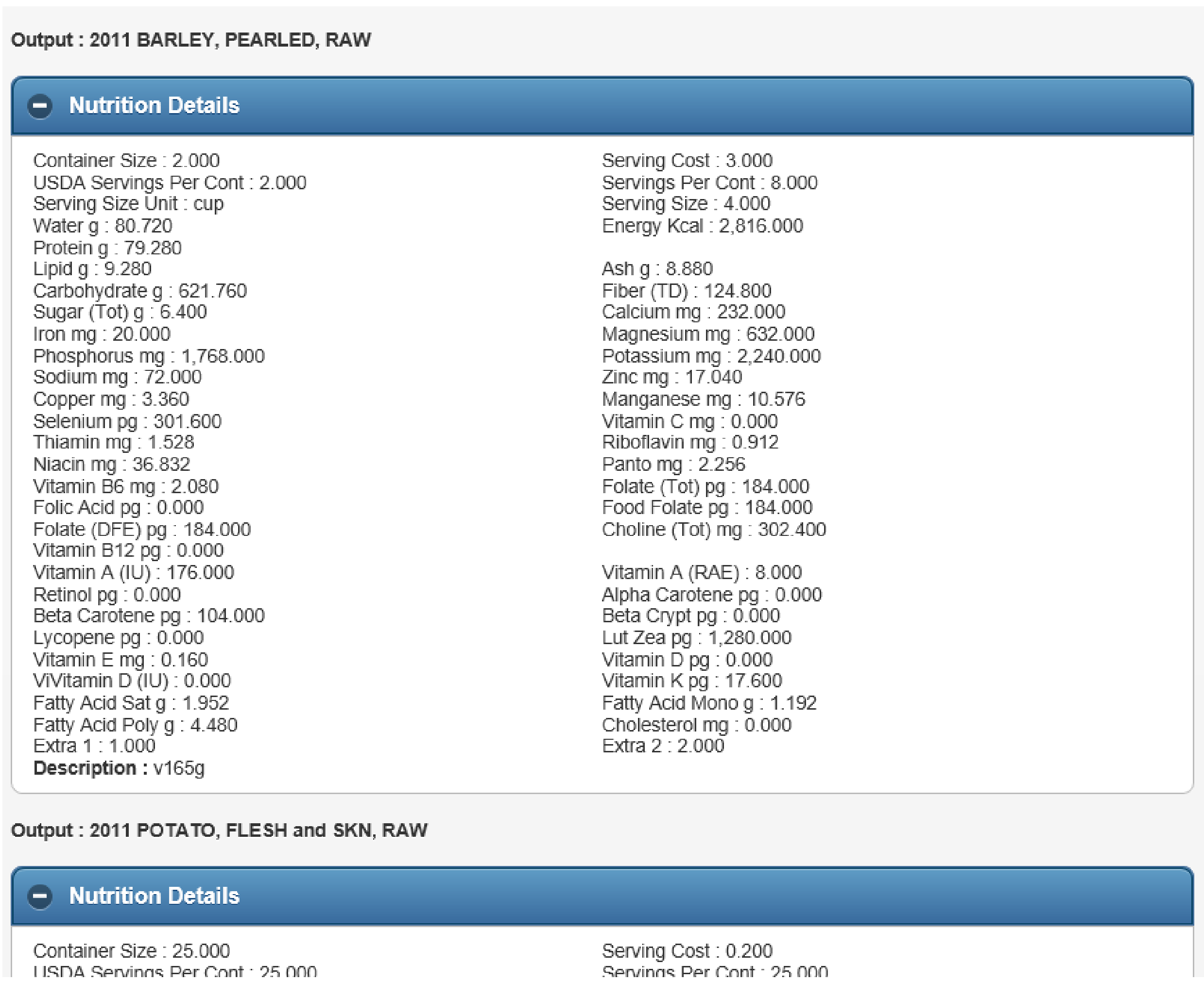
Output : 2011 BARLEY, PEARLED, RAW

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).



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)

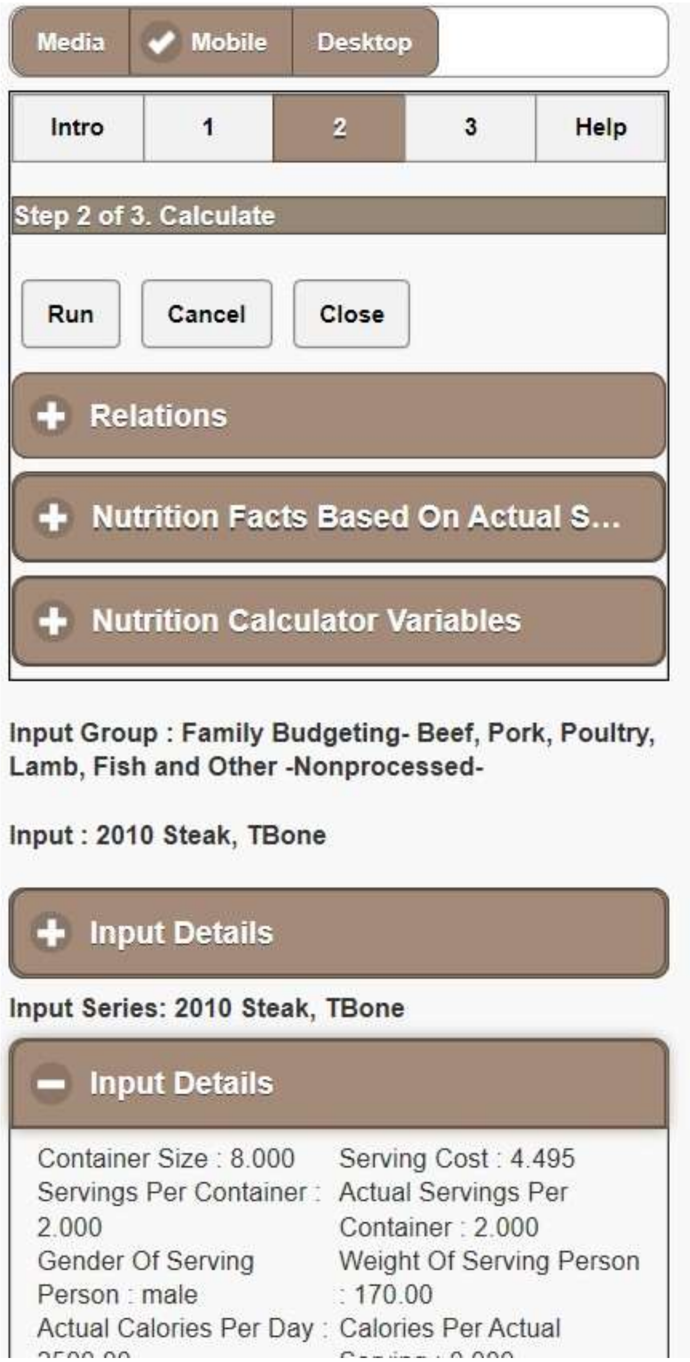
80.7 (Actual nutrients per actual amount of common household measure adjusted for waste) = 80.7 * ((100 – 0 (refuse percent) / 100)

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

H. Additional Food Nutrition and Food Systems Calculations and Analyses (6*)

The Technology Assessment, Performance Analysis, and Social Performance Analysis tutorials demonstrate additional ways to calculate and analyze scientific data related to food systems. Specifically, many of the examples in those tutorials use a software pattern consisting of a metadata Indicator user interface, TEXT datasets that store both the data to calculate and the calculated results, custom algorithms for running the calculations and analyses, and backend statistical libraries for assisting with the analyses. Although the domain-specific calculation pattern demonstrated in this reference retains its utility, in the long run the alternative pattern will probably support more flexible and advanced food system analysis, including machine learning techniques (**8***).

The following image shows that, although not documented, another food calculator, along with related analyzers, is available in DevTreks (i.e. the FoodFacts calculator in the FoodNutrition extension). This calculator is used with the information available on the back of food containers in the USA. It is not currently supported (because of labor constraints). Refer to Footnotes 7 and 8 about additional sources of food data and potential future calculator development (i.e. uploading the USDA branded food database for use with this calculator).


Media
Mobile
Desktop
Intro
1
2
3
Help
Step 2 of 3. Calculate
Run
Cancel
Close
Relations
Nutrition Facts Based On Actual S…
Nutrition Calculator Variables
Input Group : Family Budgeting- Beef, Pork, Poultry, Lamb, Fish and Other -Nonprocessed-
Input : 2010 Steak, TBone
Input Details
Input Series: 2010 Steak, TBone
Input Details
Container Size : 8.000
Serving Cost : 4.495
Servings Per Container : 2.000
Actual Servings Per Container : 2.000
Gender Of Serving Person : male
Weight Of Serving Person : 170.00
Actual Calories Per Day :
Calories Per Actual

I. Support for Digital Malnutrition Improvement

The Version 2.1.0 video tutorial attempted to “make purposeful mistakes” so that customers understood the need to directly work with software developers to “fix the bugs”. Version 2.2.0 fixed the following bugs.

The following bug arose from setting the Typical Serving Size property incorrectly.

```
private void UpdateBaseInputUnitPrices(
     CalculatorParameters calcParameters)
{
    //check illegal divisors
    this.ContainerSizeInSSUnits = (this.ContainerSizeInSSUnits == 0)
        ? -1 : this.ContainerSizeInSSUnits;
    //220 potential bugs
    this.TypicalServingSize = (this.TypicalServingSize == 0)
        ? -1 : this.TypicalServingSize;
    if (this.TypicalServingSize == -1)
    {
        double dbCM = this.SetPortionWeightAndUnit();
    }
    this.ActualServingSize = (this.ActualServingSize == 0)
        ? -1 : this.ActualServingSize;
    this.TypicalServingsPerContainer = this.ContainerSizeInSSUnits / this.TypicalServingSize;
```

This boolean had been set to false rather than true, causing the calculated results to be saved incorrectly at times.

```
else if (docToCalcURI.URIDataManager.AppType
    == DataHelpers.GeneralHelpers.APPLICATION_TYPES.prices)
{
    bool bNeedsSummaryPriceDocs
        = DataAppHelpers.Prices.NeedsSummaryPriceDocs(docToCalcURI);
    if (bNeedsSummaryPriceDocs)
    {
        //220 bug fix (that's why it takes software testers)
        bStillNeedsSave = true;
    }
}
```

The video recommends that source code adopters work in properly funded teams to deal with common IT issues, including these types of bugs. Although DevTreks itself does not accept donations and prefers nonconventional approaches to software development (i.e. to freely criticize the culprits, **8***), we recommend that teams employ better practices for nonprofit businesses, software development, and tutorial support.

Summary and Conclusions

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 the sustainability of their lives and livelihoods.

Footnotes

1. The author has studied malnutrition as an important, but ancillary topic, in his agricultural science education at Cornell University, USA (B.S.) and U.C. Davis, USA (M.S.). 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 (see footnote 7). For example, Example 5 in the Social Performance Analysis 3 reference demonstrates how to tie domain-specific calculations to complementary population algorithms to account for socioeconomic factors influencing food production and consumption.
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. DevTreks encourages source code users to build their own calculators, algorithms, and tutorials that meet the needs of their own stakeholders.
5. The second ARS data set, FNDDS5, consists of 7200 food items that include combinations of food, such as mashed potatoes and gravy. Ditto –source code users need to be experimenting and increasing their experience in this field if malnutrition and food sustainability are to be tackled at global scale in affordable and fair ways.
6. Version 2.1.6 investigated the development of a lighter weight version of DevTreks. We concluded that viable alternatives might employ a metadata user interface, a document storage database that holds TEXT input and output files, custom algorithms, and an advanced search engine, with specific focus on sustainable supply chain analysis. We also concluded that this type of consumer software for conducting consequential digital activism was more appropriate for consumer oriented software development companies (i.e. but then again).
7. Version 2.2.0 began using the calculators' Extra properties to conduct carbon and ecological footprint balances. The references used for those balances (Poore et al, 2019; Rose et al., 2018) show that new food databases are becoming available that include nutritional, environmental, and socioeconomic factors that can be used in sustainability studies. Additional food databases are documented in the following source: https://www.ers.usda.gov/about-ers/partnerships/strengthening-statistics-through-the-icars/food-related-data-sources/

   DevTreks will consider bulk uploading datasets that focus on food supply chain sustainability in future releases (i.e. Footnote 13 in the SDG Plan reference in the Social Performance Analysis tutorial provides context and motivation).
8. The Poore and Nemecek (2019) supply chain database highlights the heroic efforts currently needed to build international supply chain databases that can be used to make

sustainable production and consumption choices (i.e. see their supplementary authors' reference). The inaccessibility of the Rose et al (2019) database (i.e. as of November, 2019) demonstrates the added difficulty of using socioeconomic data in support of sustainability decision making. The 2 efforts explain DevTreks continual criticism of conventional institutions misuse of modern IT. Global problems, particularly climate change and biodiversity loss, won't be solved by thousands of scientists, researchers, government agencies, private businesses, non-profits, and individual volunteers, collecting scientific evidence consisting of thousands of incompatible datasets published in peer-siloed journals or added to proprietary data "places". Although several scientific organizations have taken efforts to address specific parts of the problem (i.e. IPCC's GHG inventories, IPBES's proposed data platform, EU's EEA approach, USDA's central food platform at https://fdc.nal.usda.gov/), the underlying institutional IT failure suggests the need for a "next generation" of digitally savvy institutions staffed by IT professional who know how to use standard, open source, digital, algorithm platforms.

9. Within the past year the author switched from a standard Irish meat and potato diet to a 90% vegetarian diet for this reason. Climate change specialists who don't believe consumers need to be taking similar actions don't understand the importance of social norms (i.e. refer to the Social Performance Analysis tutorial) or recent science (i.e. refer to the TEEB and WRI references to those tutorials).

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IPPC, 2014. Climate Change 2014, Impacts, Adaptation, and Vulnerability, Part A Global and Sectoral Aspects. Working Group 2 Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Field, Barnes, Barros, Dockken, Mach, Mastrandrea, Bilir, Chatterjee, Ebi, Estrada, Genova, Girma, Kissel, Levy, MacCracken, Mastrandea, and White (EDS)].

J. Poore and T. Nemecek, Reducing food's environmental impacts through producers and consumers. Science 360, 987–992 (2018) 1 June 2018 and Erratum published February, 2019

Donald Rose, Martin C Heller, Amelia M Willits-Smith, and Robert J Meyer. Carbon footprint of self-selected US diets: nutritional, demographic, and behavioral correlates. Am J Clin Nutr 2019;109:526–534.

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USDA and United States Department of Health and Human Services. Dietary Guidelines for Americans, 2015-2020. 8th Edition. Washington DC. US GPO, December, 2015

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US CDC. last accessed Nov. 14 2019:
https://www.cdc.gov/nchs/healthy_people/hp2020/hp2020_indicators.htm

Related site: US Deparment of Health and Human Services. Office of Disease Prevention and Health Promotion. last accessed Nov. 14 2019: https://www.healthypeople.gov/

World Health Organization. Interventions on Diet and Physical Activity: What Works. Summary Report. 2009

World Bank. Improving Nutrition through Multisectoral Approaches. 2013

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:

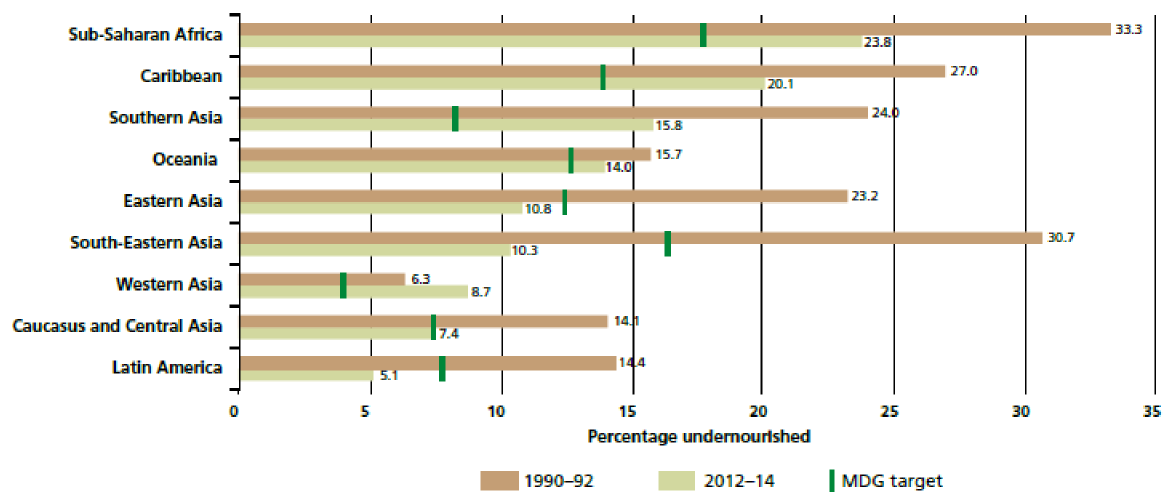
https://www.devtreks.org/commontreks/preview/commons/resourcepack/Malnutrition Analysis 1/450/none/

Appendix A. Introduction to Malnutrition

Substantial progress has been achieved in recent years in reducing malnutrition throughout the world. The following image (FAO 2014) demonstrates that, even with that progress, substantially more work needs to be done to alleviate malnutrition.

FIGURE 3

Undernourishment trends: progress made in almost all regions, but at very different rates



Note: Data for 2012–14 refer to provisional estimates.
Source: FAO.

The following image comes from the Social Performance references and introduce sustainable accounting system goals, targets, and indicators that the international community wants tackled by 2030. Many of these goals relate directly to the improved delivery of malnutrition-related and food system services, including No Poverty and Zero Hunger.

A1.4 Hotspots Analysis and the Sustainable Development Goals

At the United Nations Sustainable Development Summit on 25th September 2015, world leaders adopted the 2030 Agenda for Sustainable

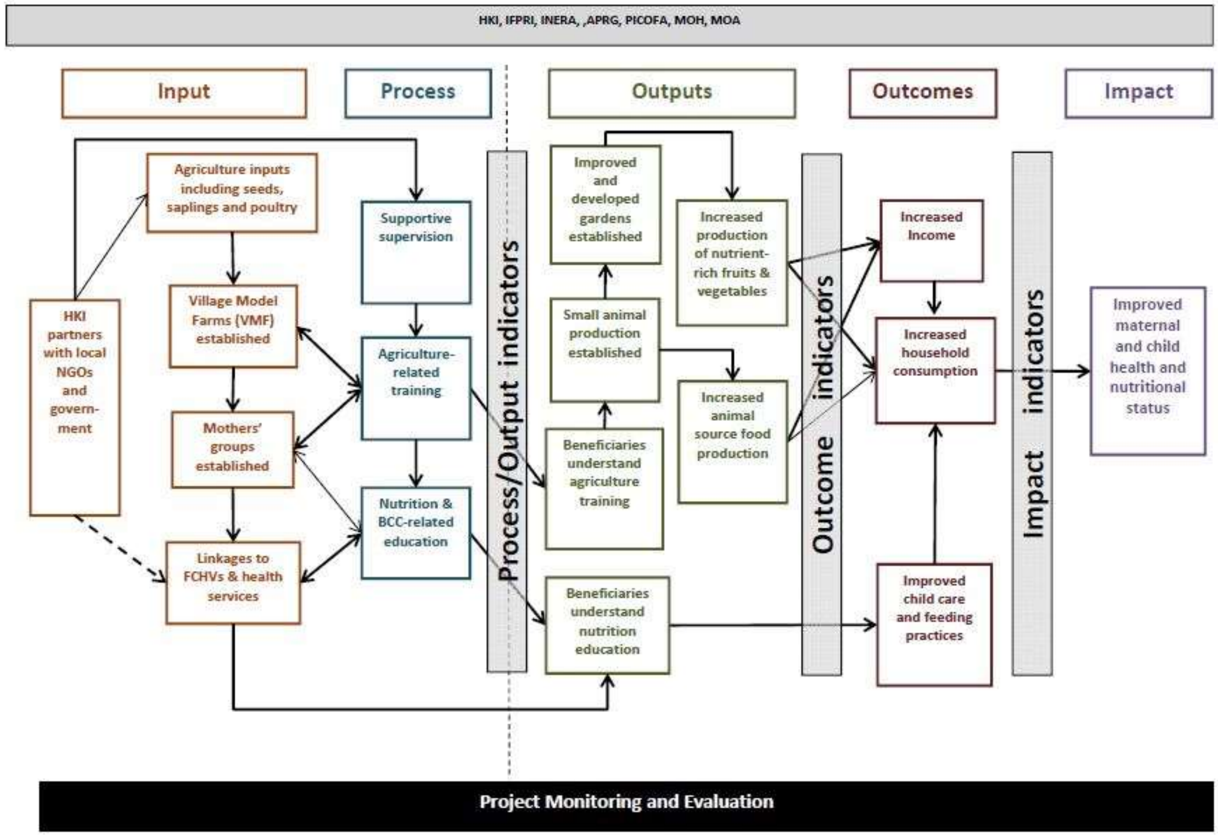
Goal 11 on sustainable cities and communities is implicitly linked to identifying poverty hotspots and addressing these in an inclusive and participatory manner. Goal 12, in particular target 12.8 aimed at ensuring that people everywhere

15 http://socialhotspot.org/
16 http://bookshop.europa.eu/en/social-sustainability-in-trade-and-development-policy-pbLBNA26483/

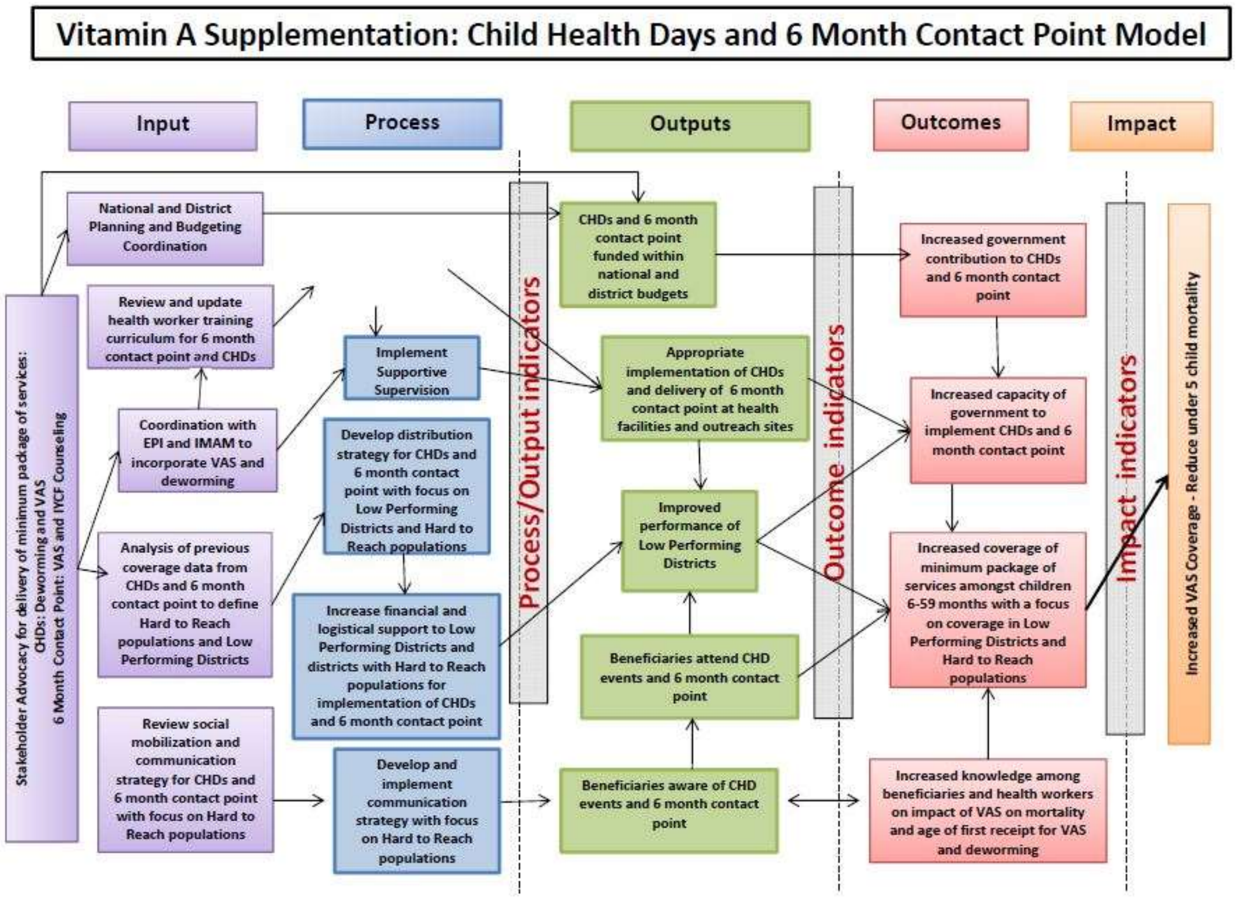
Figure 19: UN Sustainable Development Goals

The objective of malnutrition improvement interventions is to support decisions that involve scenarios similar to the following agricultural development and malnutrition project (USAID, 2012). The image shows that malnutrition projects may need to be integrated into other development purposes as well, such as agricultural development, or health care, programs.

:



The following graphic (USAID, 2012) shows a malnutrition intervention with a tightly focused goal –decrease Vitamin A deficiency in targeted children.



The following image (WHO 2009) demonstrates the health care sector's Health Technology Assessment approach to studying health care, which emphasize the metadata analysis of randomized control trial data, can also be applied to understanding effective malnutrition interventions (i.e. technologies).

Interventions

School settings

OVERVIEW

"Of particular concern are unhealthy diets, inadequate physical activity and energy imbalances in children and adolescents."

"School policies and programmes should support the adoption of healthy diets and physical activity. Schools influence the lives of most children in all countries."

The largest number of studies evaluated was on school-based interventions. One hundred and seven peer-reviewed articles provided information on 55 interventions, mostly from North America *(65, 108)*. Minimal research came from low- or middle-income countries, although 14 interventions targeted disadvantaged communities within high-income countries. Common among the reviewed studies were comprehensive, multi-component programmes with interventions targeting the school environment and its food services and classroom curriculum. Many interventions combined diet and physical activity, and encouraged parental involvement

Summary of the evidence from the systematic review	
Effective interventions	• High-intensity school-based interventions that focus on diet and/or physical activity, are comprehensive, multi-component and include: - curriculum on diet and/or physical activity taught by trained teachers *(65, 66, 68, 69, 71, 72, 77, 78, 81, 82, 84, 85, 87, 88, 97- 99, 100-106, 109, 110, 112, 113, 115--126, 129 - 131, 134, 136, 138, 141, 142, 145-147, 154 -162, 165, 166, 169, 170)*; - supportive school environment/policies *(70, 92, 109, 119, 134,137)*; - a physical activity programme *(121,127, 128, 154, 155)*; - a parental/family component *(65, 66, 72, 77, 78, 81, 82, 84, 85, 97, 100, 106, 110, 113, 115-118, 120-123, 125, 126, 129-131, 136, 138, 141, 142, 145-148, 154, 155, 158-162, 166, 169, 170)*; - healthy food options available through school food services: cafeteria, vending machines, etc. *(77, 78, 81-84, 92, 93, 98, 99, 100, 104-107, 110, 115-118, 125, 126, 129-131, 133, 136-139, 141-144, 146-148, 156- 159, 166)*.
Moderately effective interventions	• A focused approach, for example programmes aimed at reducing sedentary behaviour and increasing participation in physical activity, accompanied by supportive activities within the curriculum *(127, 128, 149, 150)*. • A formative assessment that addresses the needs of the school and cultural contexts *(73, 78, 142, 147, 156, 157, 159)*.

The following image (World Bank 2013) demonstrates that many malnutrition interventions must take place across the entire health sector of targeted regions.

Health

Table 2. Indicators to measure the impact of nutrition interventions*

Nutrition Objective	Sample Nutrition Indicators
1. Reduce micronutrient deficiencies among the most vulnerable groups	• Proportion of children ages 6-23 months who have received a micronutrient supplement, e.g., vitamin A supplements/multiple micronutrient powders/ iodized oil capsules • Proportion of health centers that have adequate stock levels of micronutrients as per micronutrients included in child/maternal insurance package
2. Reduce the prevalence of anemia in pregnant and lactating women, and children 0-24 months	• Proportion of pregnant women/children <59 months who are anemic • Proportion of health centers that have adequate stock levels of anemia-prevention supplies, e.g., iron folic acid supplements, multiple micronutrient powders, and insecticide treated bednets (ITN), intermittent preventive treatment (IPT), malaria drugs, etc.
3. Promote good feeding and nutritional care practices for the most vulnerable groups	• Existence of a national code for breastmilk substitutes/baby-friendly community initiative/ baby-friendly hospital initiative/baby-friendly hospital care/national code for breastmilk substitutes • Proportion of women who exclusively breastfed their child for 6 months/bring their child to attend monthly growth monitoring and promotion sessions/ provide an adequate complementary diet for their children 6-23 months
4. Treat and prevent illness	• Proportion of health care staff at ANC/PNC/well-child/routine, etc. contacts giving counseling on handwashing/breastfeeding/feeding during illness • Proportion of clinics with sufficient supply of ITNs/IPT/anti-malarials/ARVs/TB drugs/zinc supplements/ORT/child immunizations
5. Reduce low birth weight	• Proportion of pregnant women who received free or low-cost antenatal care services (through insurance or government provision mechanism) • Proportion of women with a live birth that received antenatal care at least 4 times by a health provider, and at least once by a skilled professional
6. Improve reproductive health and family planning	• Proportion of women of reproductive age who receive free or low-cost family planning services through insurance mechanism or government provision • Proportion of health clinics that have adequate stock levels of contraceptives
7. Treat moderate and severe acute malnutrition in children	• Proportion of children with severe acute malnutrition who have access to/are receiving appropriate treatment including therapeutic foods • Proportion of health facilities implementing/facility staff trained in CMAM

* *Additional sample indicators are available in the full version of the Health guidance note.*

Box 3. Delivery mechanisms for nutrition interventions

1. Public health campaigns, such as Child Health Days.
2. Routine health service contacts/ Well-child health contacts.
3. Sick child contacts.
4. Community outreach.
5. Antenatal care contact (ANC).
6. Intrapartum/ Postnatal care (PNC).
7. Emergency health services.

Improving Nutrition Through **Multisectoral** Approaches

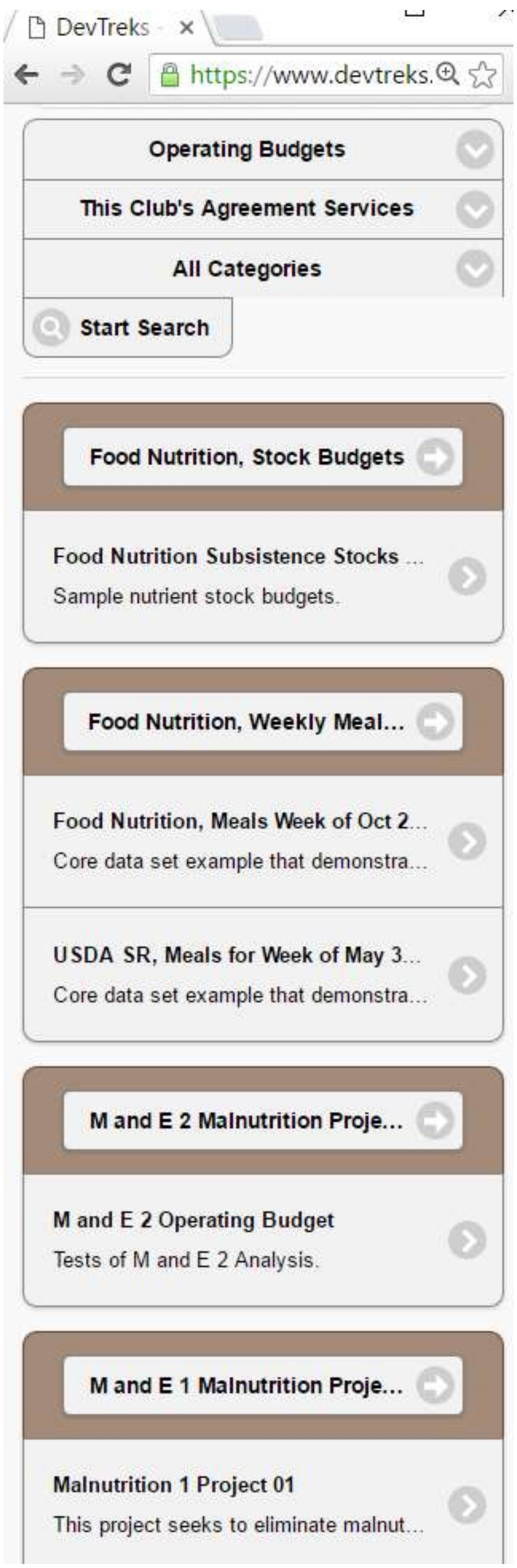
The following image (IPCC WG2 2014) demonstrates that many regions will need to adapt new food security strategies for dealing with the planet's climate change crisis.

Table 7-3: Schematic key risks for food security and the potentials for adaptation in the near- and long-term for high and low levels of warming.

Key risk	Adaptation issues and prospects	Climatic drivers	Supporting ch. sections	Timeframe	Risk for current and high adaptation
Reductions in mean crop yields because of climate change and increases in yield variability (*high confidence*)	With or without adaptation, negative impacts on average yields become likely from the 2030s with median yield impacts of 0 to -2% per decade projected for the rest of the century, and after 2050 the risk of more severe impacts increases.		7.2, 7.3,7.4, 7.5, Box 7-1	Present Near-term (2030-2040) Long-term (2080-2100) 2°C / 4°C	Very low — Medium — Very high

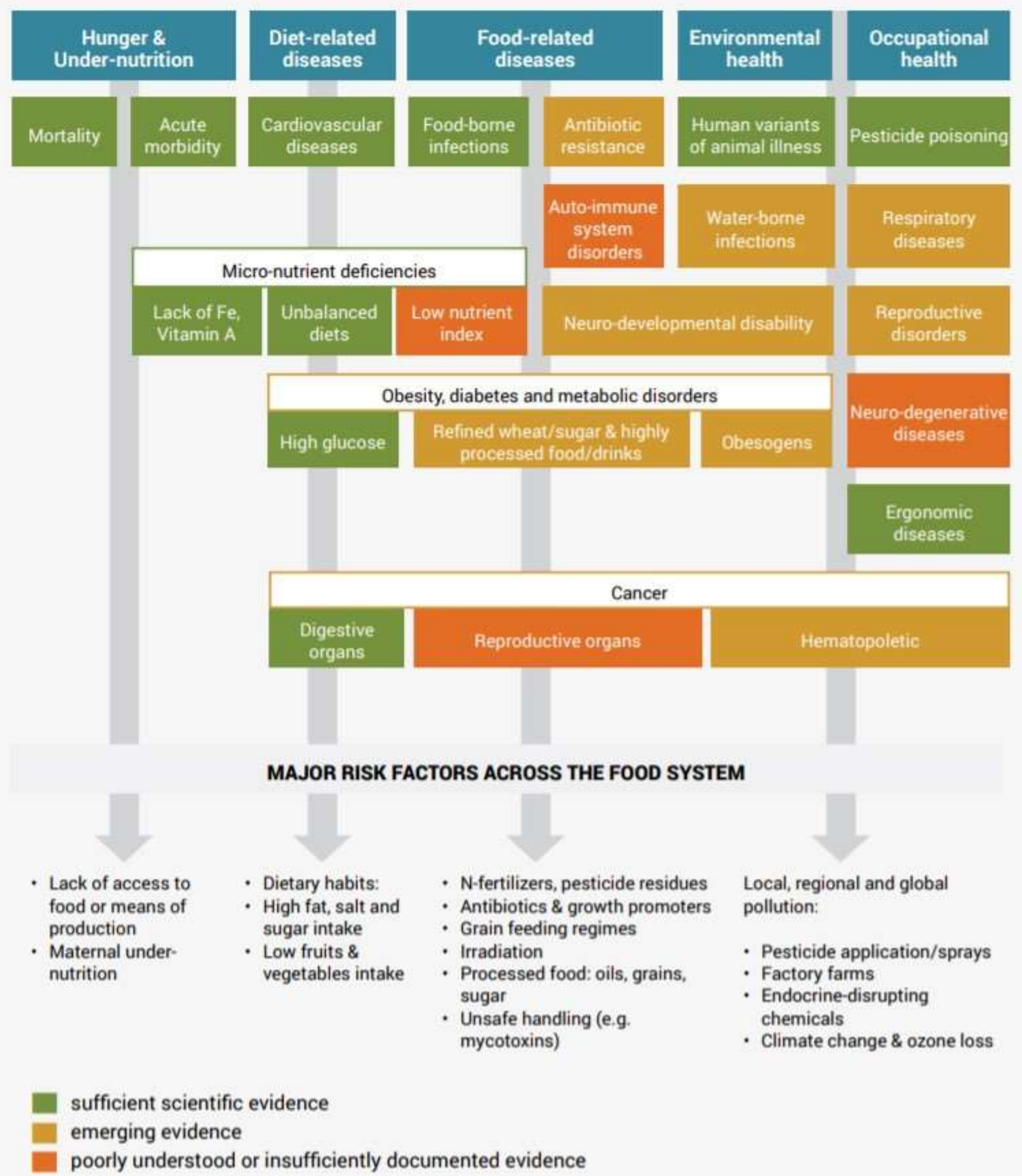
Climatic drivers of impacts						Risk & potential for adaptation
Warming trend	Extreme temperature	Drying trend	Extreme precipitation	Carbon dioxide concentration	Ocean acidification	Potential for adaptation to reduce risk Risk level with **high** adaptation Risk level with **current** adaptation

The following image illustrates DevTreks Knowledge Bank approach to malnutrition.


DevTreks
https://www.devtreks.
Operating Budgets
This Club's Agreement Services
All Categories
Start Search
Food Nutrition, Stock Budgets
Food Nutrition Subsistence Stocks ...
Sample nutrient stock budgets.
Food Nutrition, Weekly Meal...
Food Nutrition, Meals Week of Oct 2...
Core data set example that demonstra...
USDA SR, Meals for Week of May 3...
Core data set example that demonstra...
M and E 2 Malnutrition Proje...
M and E 2 Operating Budget
Tests of M and E 2 Analysis.
M and E 1 Malnutrition Proje...
Malnutrition 1 Project 01
This project seeks to eliminate malnut...

TEEB (2018) use the following image to show the current state of scientific evidence that supports understanding the source of the risks associated with health and food systems.

Figure 3.2 Food ecology and health (Source: adapted from Scialabba forthcoming)



These graphics demonstrate that professional malnutrition analysis requires a comprehensive approach with a comprehensive set of cloud computing tools. This reference only addresses one of the tools in any malnutrition toolkit –food nutritional analyses. These analyses will often be used in conjunction with additional nutrition decision support information, such as the socioeconomic factors documented in the following nutritional goal chart from the USDA (2015) (7*).

Table A7-1.

Daily Nutritional Goals for Age-Sex Groups Based on Dietary Reference Intakes & *Dietary Guidelines* Recommendations

	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+
Calorie Level(s) Assessed		1,000	1,200	1,400, 1,600	1,600	1,800	1,800	2,200, 2,800, 3,200	2,000	2,400, 2,600, 3,000	1,800	2,200	1,600	2,000
Macronutrients														
Protein, g	RDA	13	19	19	34	34	46	52	46	56	46	56	46	56
Protein, % kcal	AMDR	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
Carbohydrate, % kcal	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
Dietary Fiber, g	14 g/ 1,000 kcal	14	16.8	19.6	22.4	25.2	25.2	30.8	28	33.6	25.2	30.8	22.4	28
Added Sugars, % kcal	DGA	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%
Total Fat, % kcal	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, % kcal	DGA	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%	<10%
Linoleic Acid, g	AI	7	10	10	10	12	11	16	12	17	12	17	11	14
Linolenic Acid, g	AI	0.7	0.9	0.9	1	1.2	1.1	1.6	1.1	1.6	1.1	1.6	1.1	1.6

Several tutorials demonstrate additional tools available to tackle more comprehensive malnutrition interventions (**3***). For example, the Ag Production Analysis 1 tutorial demonstrates how to collect and analyze full agricultural production data sets. The nutrient stock budgeting techniques demonstrated by this reference can also be applied to other nutrient budgets, such as soil and plant nutrient budgeting (**4***). The Construction Analysis 1 tutorial demonstrates how to track cost and benefit data for sanitation improvement investment projects. The Health Care Analysis 1 tutorial demonstrates how to collect and analyze health care data sets. The Monitoring and Evaluation tutorials demonstrate how to collect and analyze full data for malnutrition food distribution and delivery programs. The Resource Stock Analysis and Technology Assessment tutorials demonstrate how to collect and analyze full data for climate change mitigation and adaptation technologies.

Version 2.1.0 introduced a new Social Performance Analysis tutorial demonstrating how to assess the sustainability of agricultural production and food system supply chains. The tutorial assists producers to take sustainable production actions and consumers to make sustainable consumption choices.

The tutorial also explains how to uses Indicators similar to those shown in the following image (FAO, 2014?), to help with the safety of our neighbors and friends.

Annex 2

Progress on food security indicators in the developing world

Suite of food security indicators

FIGURE A2.1

The suite of food security indicators, 2014

FOOD SECURITY INDICATORS	DIMENSION
Average dietary energy supply adequacy Average value of food production	AVAILABILITY
Share of dietary energy supply derived from cereals, roots and tubers Average protein supply Average supply of protein of animal origin	AVAILABILITY
Percentage of paved roads over total roads Road density Rail lines density	ACCESS
Gross domestic product per capita (in purchasing power equivalents)	ACCESS
Domestic food price index	ACCESS
Prevalence of undernourishment Share of food expenditure of the poor* Depth of the food deficit* Prevalence of food inadequacy*	ACCESS
Cereal import dependency ratio Percent of arable land equipped for irrigation Value of food imports over total merchandise exports	STABILITY
Political stability and absence of violence/terrorism	STABILITY