DELTA Model® v2.1: Release Notes

Summary

The latest version of the DELTA Model® introduces a number of updates from DELTA Model® v2.0, including:

- Item level adjustment of food production quantities (rather than only food group level in previous versions);
- Updating baseline data to 2020 (from 2018 in previous versions);
- Colour changes to output charts to give greater detail to results;
- Additional helpful comments included to guide the user, which can be switched off in the scenario editor.

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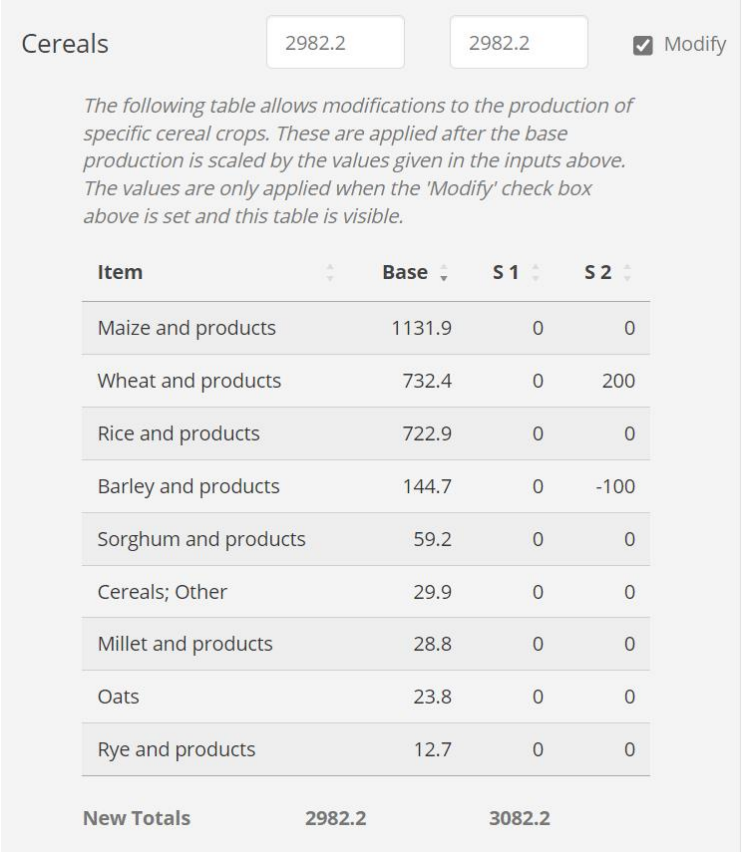
Model Changes

Food Item Production

Version 2.1 introduces the ability for users to specify or modify the production of several primary food commodities at the Food Item rather than the Food Group level. In previous versions, users could only control production totals at the Food Group level.

For example, the Cereals group includes maize, wheat, rice, barley, and a range of other grains, each with different end uses and nutrient profiles. By selecting a Modify checkbox alongside the Food Group the user can add or subtract production of an individual Food Item.

The example below shows a 200 million tonne increase in wheat and a 100 million tonne decrease in barley (*note: this case does raise a warning message as the remaining barley production is insufficient to meet the projected animal feed demand*).



Cereals 2982.2 2982.2 Modify

The following table allows modifications to the production of specific cereal crops. These are applied after the base production is scaled by the values given in the inputs above. The values are only applied when the 'Modify' check box above is set and this table is visible.

Item	Base	S 1	S 2
Maize and products	1131.9	0	0
Wheat and products	732.4	0	200
Rice and products	722.9	0	0
Barley and products	144.7	0	-100
Sorghum and products	59.2	0	0
Cereals; Other	29.9	0	0
Millet and products	28.8	0	0
Oats	23.8	0	0
Rye and products	12.7	0	0
New Totals	**2982.2**		**3082.2**

The cropland model has also been reimplemented to generate predictions of required area based on individual Food Item production rather than the aggregate Food Group production.

New Food Balances and 2020 Baseline

Previously, the DELTA Model® used a mathematical combination of the original FAO food balance sheets (FBS) and the new food balances to produce the reference 2018 data set used as the starting point for user scenarios.

Version 2.1 is entirely based on the new food balances, which currently cover 2010 to 2020. 2020 values are used as the new reference point.

The key impacts of this change are as follows:

Overall Production and Food Supply

- In v2.0 the base food production was 10.71 billion tonnes (animal 1.48, plant 10.66), of which total food supply is 4.75 billion tonnes.
- In v2.1 the total is 10.75 billion (animal 1.51, plant 9.24), of which total food supply is 5.0 billion tonnes.

Nutrient Gaps

- In v2.0 the 2018 nutrient gaps were calcium 34% and vitamin E 19%, which extend to calcium 41%, vitamin E 33%, potassium 11%, iron 10%, zinc 9%, and vitamin A 8% by 2030 without changing the initial production.
- In v2.1 the 2020 nutrient gaps are calcium 32% and vitamin E 14%, which extend to calcium 38%, vitamin E 26%, and vitamin A 6% by 2030 without changing the initial production.
- For 2040, v2.1 finds nutrient gaps for calcium 43%, vitamin E 35%, vitamin A 13%, potassium 11%, iron 9%, zinc 9%, vitamin B12 8%, and riboflavin 6%.

The changes to nutrient gaps are a result of both the change to baseline year, and the change in data source. While it may appear that the supply of potassium, iron, and zinc must have shifted drastically due to their disappearance from the 2030 gaps, they have simply moved to within 5% of the target value, which is the DELTA Model® cutoff for gap reporting.

New Food Item – Skim Milk

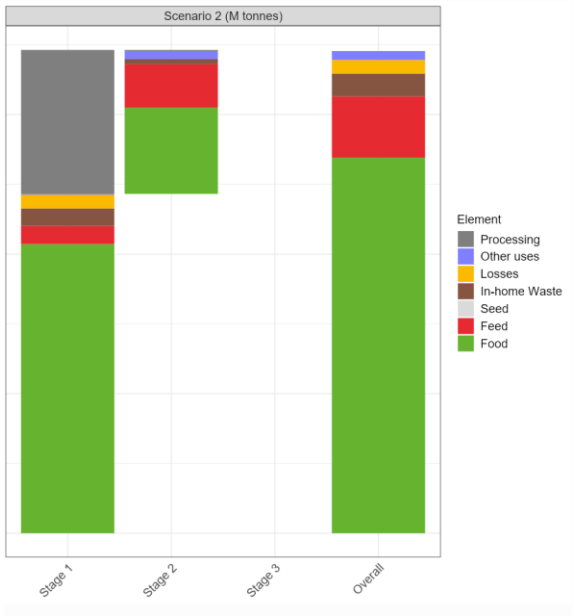
Where food commodities are processed to form another item that also appears in the FBS, this is identified in the Processed element of the balances. Where an item is processed into other food items not included in the balances, then the uses of the subsequent items are incorporated in the parent item as primary commodity equivalent amounts allocated to the remaining elements *(Imports, Exports, Food, Feed, Losses, Other Uses, Tourist Consumption – refer to* New FBS methodology (fao.org)*)*.

Overall, this system works well, but it breaks down when processing of a commodity results in two food products, only one of which is present as an item in the FBS. The end uses of the non-FBS item(s) essentially disappear from the FBS. This does not affect the nutritional measures contained within the FBS itself, as the food use of these products is rolled up into the parent item values for protein, fat, and energy supply. However, in models that only use the mass flows from the FBS – such as the DELTA Model® – the contribution to human nutrition of these secondary products is lost.

This problem occurs in the processing of milk into either Butter/Ghee or Cream *(which are FBS Items)*, which generates a by-product of Skim and/or Buttermilk *(which are not in the FBS)*. Thus, the food and nutritional value of Skim and/or Buttermilk are not accounted for when relying solely on FBS mass flows.

To address this problem, we have used the information in the Supply and Utilisation Accounts (SUA) to generate a proxy FBS Item to capture the end uses of the Skim and Buttermilk. This item has been included for the first time in v2.1.

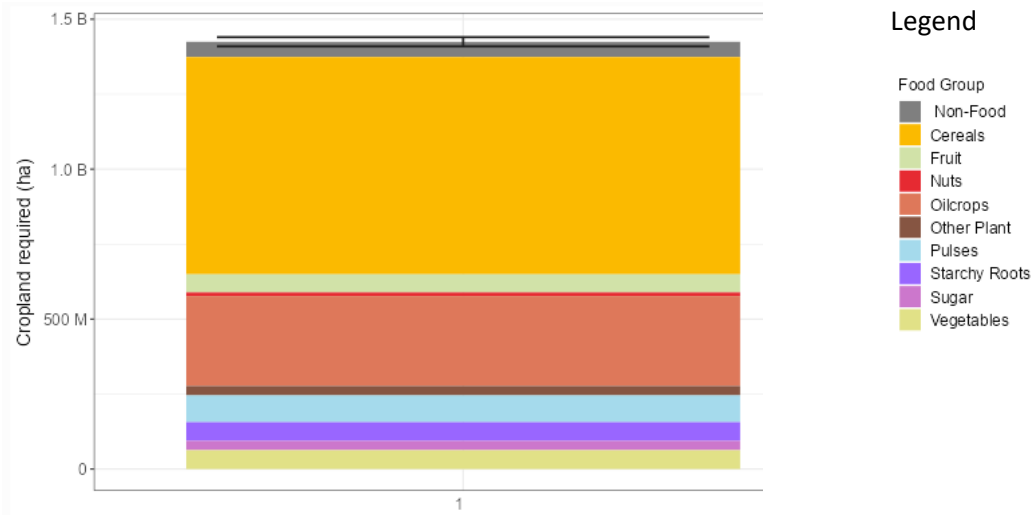
The impact of this change can be seen in the Supply Chain for Dairy (below), which now shows a significant volume of Milk (Stage 1 commodity) being processed into Butter, Cream, and Skim Milk (Stage 2 commodities).



Cropland Use Model

The cropland model in v2.0 operated at the level of the major food groups as this was the only level at which users could alter the pattern of food production. With the shift to enable users to specify production at the food item level for several commodity groups, we have updated the cropland model to operate at the same level of detail.

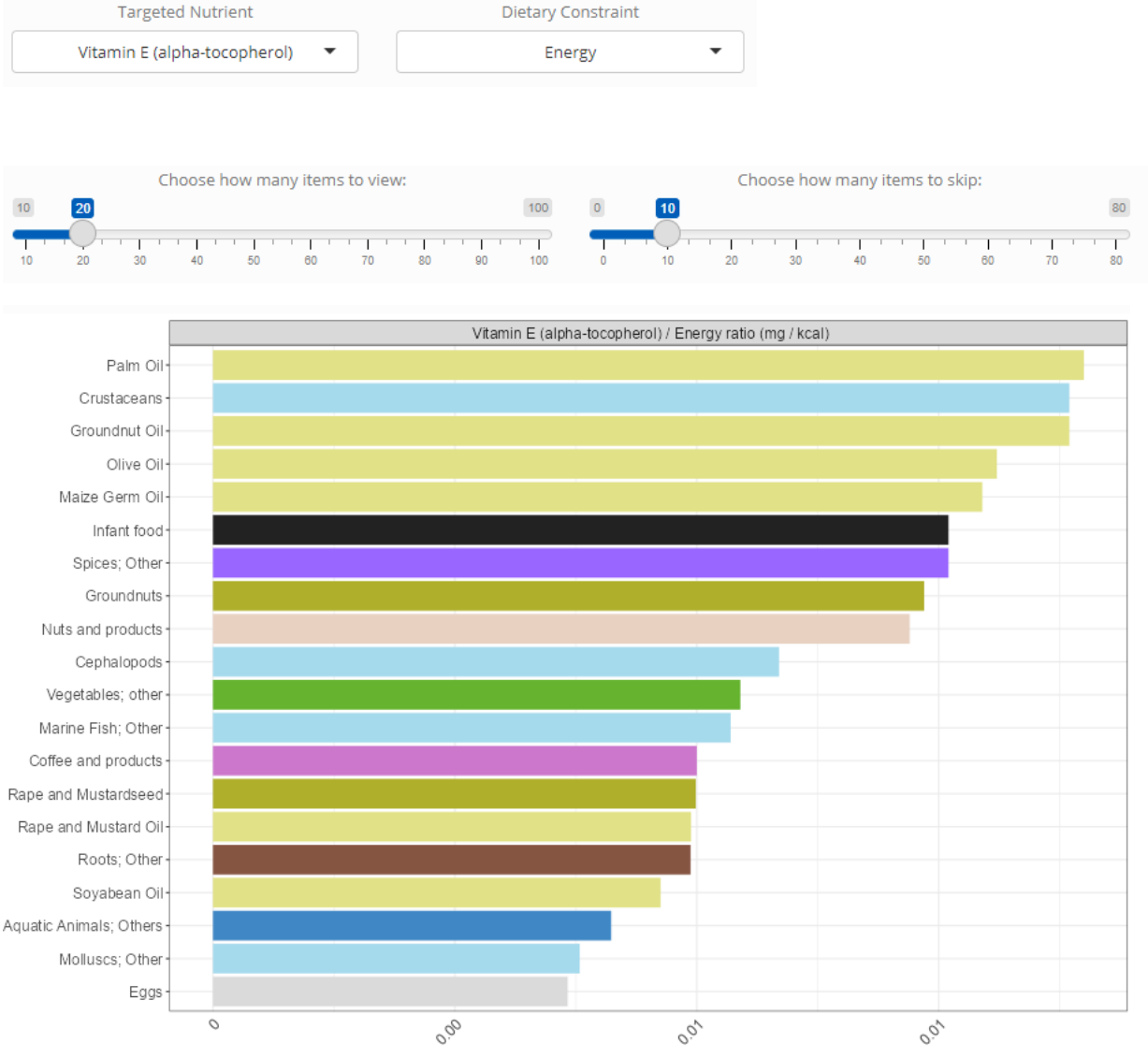
Within the FAO Crop Production Data and the FBS there is typically a difference between the total global production each year – the Production Quantity – and the amount that is available for use in the same year – the Domestic Supply Quantity (DSQ). This difference represents changes in global stocks of commodities that provide continuity of supply between harvests and years. Within the DELTA Model®, we use the DSQ to generate the baseline scenario for estimating nutrient supply and the Production values to assess cropland required. When we convert the DSQ numbers into the cropland required this results in a small difference compared with the Production values. This appears as error bars in the cropland plot, even for the 2020 default scenario (below).



Nutrient Density – Helpful Pages

The Nutrient Density feature has been updated. In v2.0 there was a bug that resulted in some food items appearing out of order within the charts, this has now been fixed. We have also added a second selection slider to the page that enables users to select how many food items – starting from the top – to skip before plotting the results. This enables users to see differences more easily between items in the middle of the pack from a nutrient density perspective.

The example below shows the nutrient density plot of Vitamin E against Energy for items ranked between 11 and 30.



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Nutrient Distribution – Helpful Pages

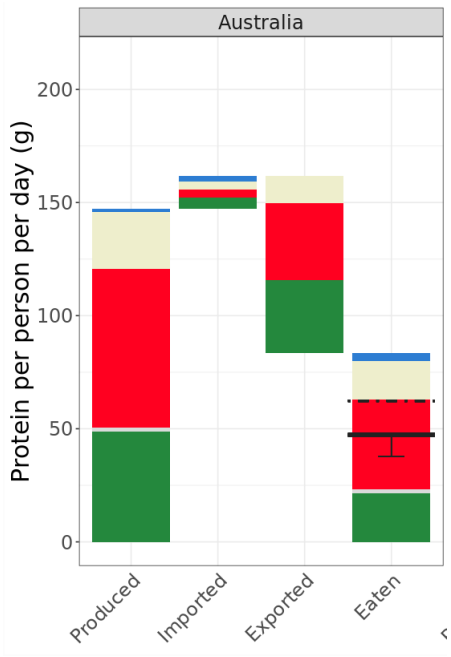
The nutrient distribution charts provide insights into the historical production, flow, and consumption of nutrients at a country level. These are based on historical data and are not impacted by user scenarios. The data analysis behind these charts has been updated in v2.1 to improve the way exported nutrients are handled. These charts have also been updated to use a 2020 reference year instead of 2015 as previously.

In v2.0 the end use of both imports and exports was estimated based on the use of food commodities within the selected country. This is appropriate for imports – which join the pool of a commodity within the country – but does not accurately represent the fate of exports, which are used in different countries. In v2.1 the use of exports is estimated using an import weighted average of end use across all countries that import the food item. This enables us to provide a better estimate of the end fate of exported foods without the need to look at individual commodity trades between pairs of countries. The nutrition produced is then calculated from the amount eaten and the trade flows.

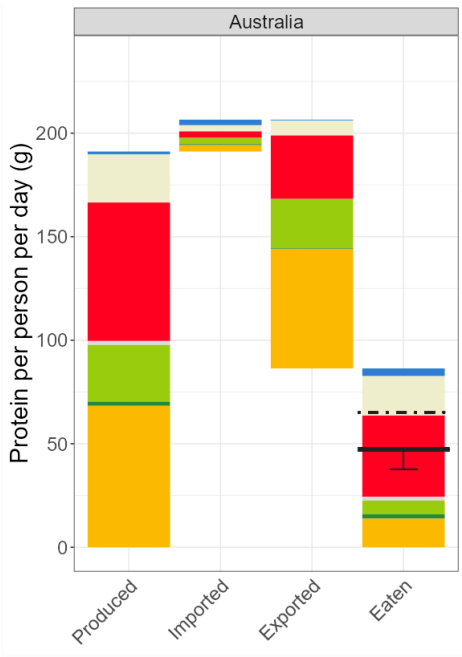
The conceptual model behind this approach is that all exported commodities go into a single global pool from which importing countries draw their requirements. The end fate of all exported volumes of a food item is the same regardless of origin and the influence of use in importing countries depends on their import volumes compared with total global trade.

Using the example of protein production in Australia (below), the revised approach results in a higher estimate of the total food protein production and export flows. The impact of the change is greater than the change in overall production and total commodity trade resulting from the shift to a 2020 reference year. Plant-sourced protein shows more strongly in the exports and production, reflecting greater food use of cereals exported from Australia compared with domestic use.

DELTA 2.0 (2015)

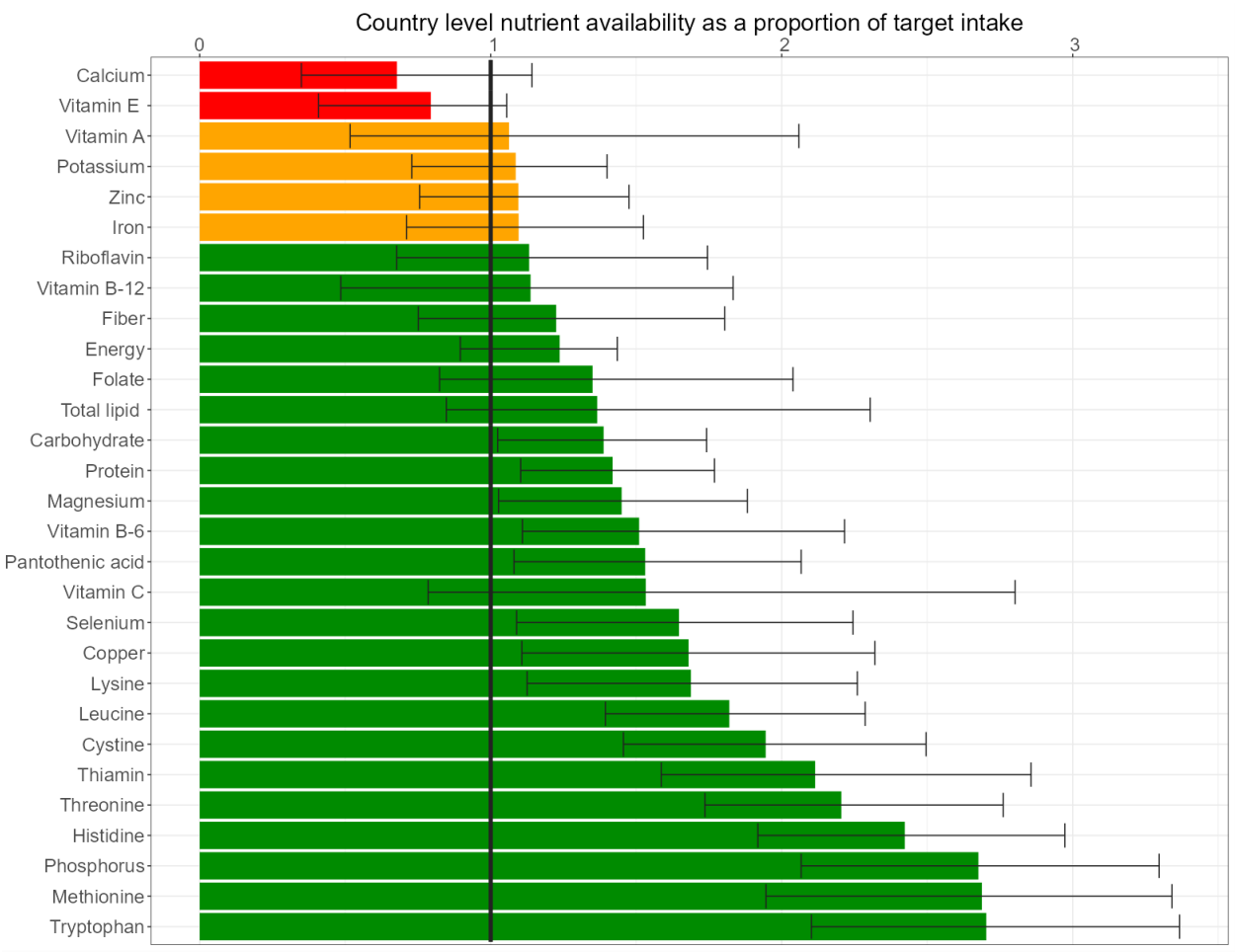


DELTA 2.1 (2020)



Nutrient Variation

The nutrient variation chart that appears when users first open the DELTA Model® (also accessible through Helpful>Nutrient Distribution>Nutrient Variation) has been updated to use 2020 rather than 2015 data. There is a small reordering of nutrients near the top of the chart – with Vitamin A moving ahead of Potassium, Iron, and Zinc as a nutrient at risk – but the overall pattern remains similar.



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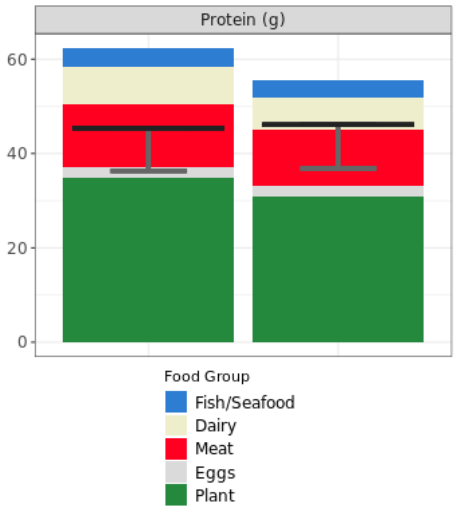
Visual Changes

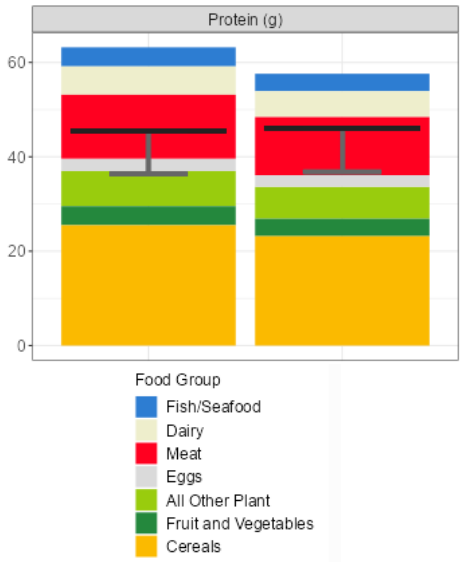
Chart Colours Updated

The colours used for the nutrition charts have been modified to separate plant-sourced food items into three main categories: cereals, fruits and vegetables, and other plants. This provides a more balanced and detailed view than previous versions, where only the animal sourced foods were separated in the top-level nutrition plots. This change also highlights the different roles that the various plant-sourced foods have and the critical role that cereals play in providing many nutrients.

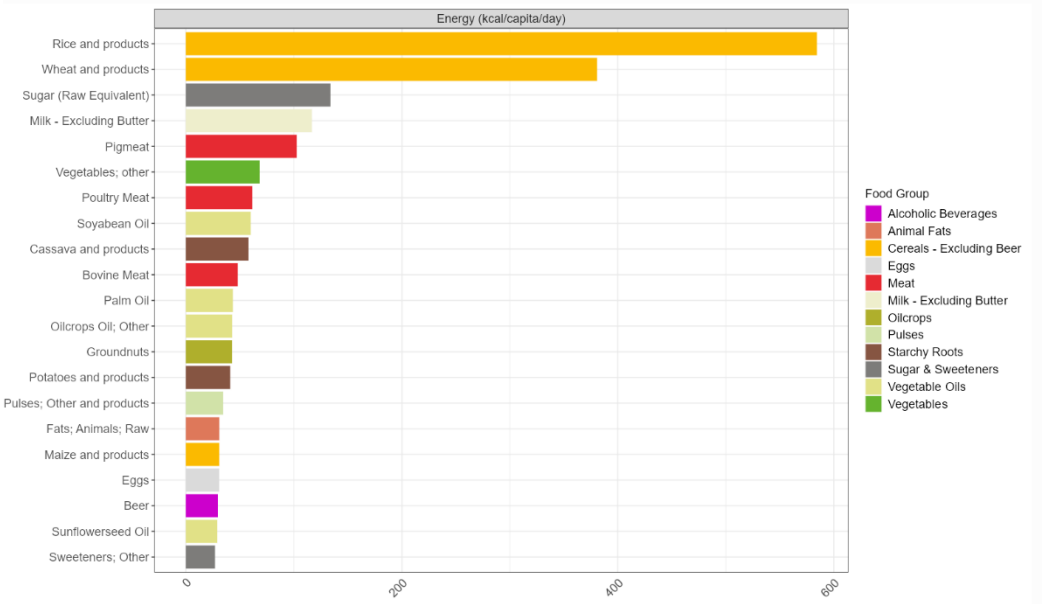
DELTA 2.0



DELTA 2.1



The colours for the next layer of Food Groups have also been updated and standardised for use in more detailed plots such as the nutrient breakdown chart for energy below.



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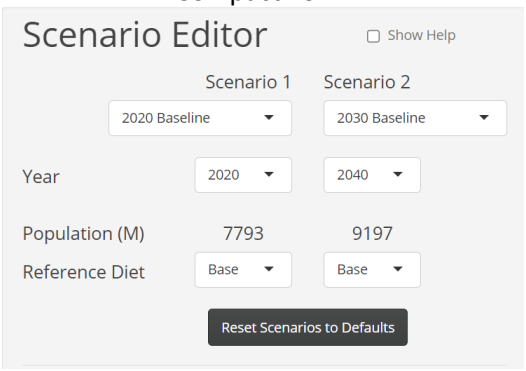
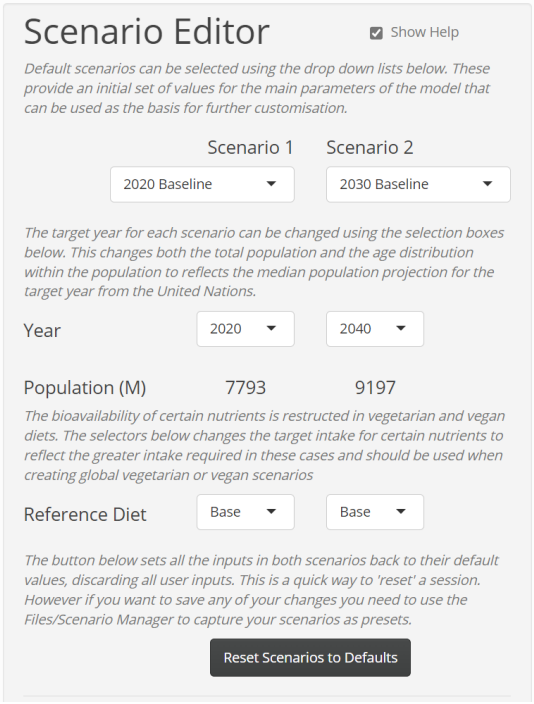
Integrated on-screen help

To help guide unfamiliar users, the interface of DELTA 2.1 contains additional text that better explains the functions of the various fields and controls. This can be turned on or off via a checkbox at the top of the Scenario Editor panel and is on by default when a session starts.

Compact Form



With Help Enabled



Future version planning

Planned future versions of the model will include the following:

- Nutrient distribution comparisons: how is the supply of each nutrient currently split across countries?
- Aquaculture model: the ability to identify and modify the seafood production sourced from aquaculture versus wild catch;
- Animal feed and grazing land model: calculation of grazing land footprints of scenarios, as well as an understanding of feed rations in different production systems;
- Production greenhouse gas emissions.

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