Food Balance Sheets

## Wheat

For this example, we'll first consider the full process for creating a food balance sheet for wheat. We start off with an empty table:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat flour | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bulgur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakfast cereals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat starch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat bran | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Production

For production data, we first fill in the table with any available official figures. To impute production, we must also consider yield and area harvested data as yield is defined as production divided by area harvested (and thus with any two elements the third is uniquely defined). Suppose we have the following official data:

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Area Harvested | Yield | Production |
| Wheat | 18496174 | 0 | 0 |
| Wheat flour | NA | NA | 18652048 |

In this case, the production value is only known for wheat flour (it is missing for wheat), and for wheat we are also missing the yield value. The first step in the imputation process is to impute the yield, using the previously described production imputation methodology.

ADD SOMETHING HERE SHOWING THE IMPUTATION EXAMPLE!!!

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Area Harvested | Yield | Production |
| Wheat | 18496174 | 2.9422 | 0 |
| Wheat flour | NA | NA | 18652048 |

Now, we have enough information to compute the production data:

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Area Harvested | Yield | Production |
| Wheat | 18496174 | 2.9422 | 54418808 |
| Wheat flour | NA | NA | 18652048 |

Next, we fill in the table with our production values. Production is only imputed for primary products (and occassionally official figures are provided for processed products, as is the case here). So, in this case, no additional values are filled in outside of wheat and flour.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | **54418808** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat flour | **18652048** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bulgur | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakfast cereals | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat starch | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat bran | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Trade

For this example, we take the country totals of all imports and exports and insert into this table.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | **1999076** | **32789894** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat flour | 18652048 | **341529** | **572794** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bulgur | - | **182485** | **524471** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakfast cereals | - | **307172** | **217289** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat starch | - | **624947** | **224528** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat bran | - | **258937** | **2343712** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Stock Changes

We now estimate the stock changes. Note that for most products, we assume that countries do not hold stocks. Generally, stocks will only be held for primary level products, and not even all of these products. The numbers below represent the estimated stock changes (by the stock imputation methodology described previously) for the example country we're considering.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | **-230630** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat flour | 18652048 | 341529 | 572794 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bulgur | - | 182485 | 524471 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakfast cereals | - | 307172 | 217289 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat starch | - | 624947 | 224528 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat bran | - | 258937 | 2343712 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Food

The allocation to food, on the other hand, can potentially be considered at any processing level, although some commodities (such as wheat) are assumed to not be eaten as such. We impute food consumption numbers for the example country and update the SUA table below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | **-** | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat flour | 18652048 | 341529 | 572794 | - | **18539484** | 0 | 0 | 0 | 0 | 0 | 0 |
| Bulgur | - | 182485 | 524471 | - | **3684** | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakfast cereals | - | 307172 | 217289 | - | **98131** | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat starch | - | 624947 | 224528 | - | **-** | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat bran | - | 258937 | 2343712 | - | **-** | 0 | 0 | 0 | 0 | 0 | 0 |

### Feed

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | 0 | **4898000** | 0 | 0 | 0 | 0 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | **-** | 0 | 0 | 0 | 0 |
| Bulgur | - | 182485 | 524471 | - | 3684 | 0 | **-** | 0 | 0 | 0 | 0 |
| Breakfast cereals | - | 307172 | 217289 | - | 98131 | 0 | **-** | 0 | 0 | 0 | 0 |
| Wheat starch | - | 624947 | 224528 | - | - | 0 | **-** | 0 | 0 | 0 | 0 |
| Wheat bran | - | 258937 | 2343712 | - | - | 0 | **3355525** | 0 | 0 | 0 | 0 |

### Losses

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | 0 | 4898000 | **560306** | 0 | 0 | 0 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | **-** | 0 | 0 | 0 |
| Bulgur | - | 182485 | 524471 | - | 3684 | 0 | - | **-** | 0 | 0 | 0 |
| Breakfast cereals | - | 307172 | 217289 | - | 98131 | 0 | - | **-** | 0 | 0 | 0 |
| Wheat starch | - | 624947 | 224528 | - | - | 0 | - | **-** | 0 | 0 | 0 |
| Wheat bran | - | 258937 | 2343712 | - | - | 0 | 3355525 | **-** | 0 | 0 | 0 |

### Seed

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | 0 | 4898000 | 560306 | **1904246** | 0 | 0 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | - | **-** | 0 | 0 |
| Bulgur | - | 182485 | 524471 | - | 3684 | 0 | - | - | **-** | 0 | 0 |
| Breakfast cereals | - | 307172 | 217289 | - | 98131 | 0 | - | - | **-** | 0 | 0 |
| Wheat starch | - | 624947 | 224528 | - | - | 0 | - | - | **-** | 0 | 0 |
| Wheat bran | - | 258937 | 2343712 | - | - | 0 | 3355525 | - | **-** | 0 | 0 |

### Industrial Utilization

For most commodities, industrial utilization will be zero. This element can be important when considering commodities related to biofuels and vegetable oils, but for wheat it is irrelevant.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | 0 | 4898000 | 560306 | 1904246 | **-** | 0 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | - | - | **-** | 0 |
| Bulgur | - | 182485 | 524471 | - | 3684 | 0 | - | - | - | **-** | 0 |
| Breakfast cereals | - | 307172 | 217289 | - | 98131 | 0 | - | - | - | **-** | 0 |
| Wheat starch | - | 624947 | 224528 | - | - | 0 | - | - | - | **-** | 0 |
| Wheat bran | - | 258937 | 2343712 | - | - | 0 | 3355525 | - | - | **-** | 0 |

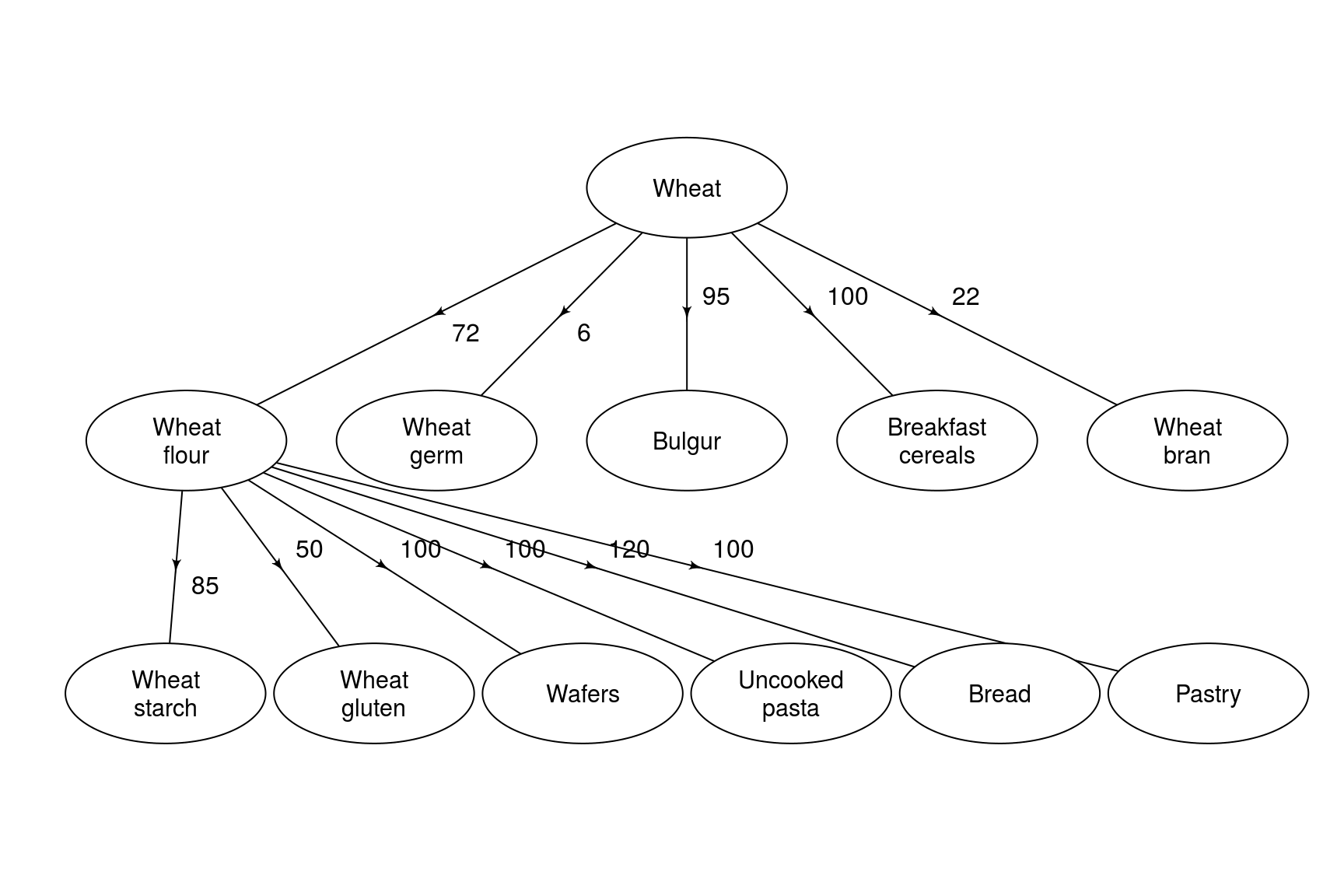
### Tourist Consumption

The tourist consumption estimation approach uses tourist data from the WTO as well as last year's consumption patterns to estimate the impact of tourism on local consumption. Note that tourist consumption can be negative; as an extreme example consider a case where many nationals travel abroad but no tourists enter. In this case, the country will have a negative ``tourist consumption'' because more calories will be consumed abroad than locally.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | 0 | 4898000 | 560306 | 1904246 | - | **67** |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | - | - | - | **-29201** |
| Bulgur | - | 182485 | 524471 | - | 3684 | 0 | - | - | - | - | **-** |
| Breakfast cereals | - | 307172 | 217289 | - | 98131 | 0 | - | - | - | - | **-** |
| Wheat starch | - | 624947 | 224528 | - | - | 0 | - | - | - | - | **-** |
| Wheat bran | - | 258937 | 2343712 | - | - | 0 | 3355525 | - | - | - | **-** |

### Standardization and Balancing

Now, suppose we have the following commodity tree:



We first start with the pre-standardized table:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | 0 | 4898000 | 560306 | 1904246 | - | 67 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | - | - | - | -29201 |
| Bulgur | - | 182485 | 524471 | - | 3684 | 0 | - | - | - | - | - |
| Breakfast cereals | - | 307172 | 217289 | - | 98131 | 0 | - | - | - | - | - |
| Wheat starch | - | 624947 | 224528 | - | - | 0 | - | - | - | - | - |
| Wheat bran | - | 258937 | 2343712 | - | - | 0 | 3355525 | - | - | - | - |

We then compute the required ``production'' of each of the processed products to satisfy any deficits due to exports or consumption (note that we can allow production to be zero if supply exceeds utilization).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | 0 | 4898000 | 560306 | 1904246 | - | 67 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | - | - | - | -29201 |
| Bulgur | **345670** | 182485 | 524471 | - | 3684 | 0 | - | - | - | - | - |
| Breakfast cereals | **8247** | 307172 | 217289 | - | 98131 | 0 | - | - | - | - | - |
| Wheat starch | **0** | 624947 | 224528 | - | - | 0 | - | - | - | - | - |
| Wheat bran | **5440300** | 258937 | 2343712 | - | - | 0 | 3355525 | - | - | - | - |

Since wheat starch is produced from wheat flour, we would first need to ensure the wheat flour "food to processing" can cover any deficits of wheat starch. However, since wheat starch imports exceed exports plus food, we don't have to worry about this requirement. Instead, we can just standardize all the first processed level products back to food to processing of wheat.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Production (processed) | SD(Production) | Wheat Equivalent | SD(Wheat Equivalent) |
| Wheat flour | 18652048 | 0 | 25905622 | 0 |
| Bulgur | 345670 | 884 | 363863 | 931 |
| Breakfast cereals | 8247 | 1481 | 8247 | 1481 |
| Wheat bran | 5440300 | 167776 | 24728638 | 762619 |

Now, we wish to compute the distribution for the "food to processing" element for wheat. The main requirement is in the wheat flour and bran, and it should be noted that the 26 million kilogram requirement for wheat flour will automatically be satisfied if the 35 million kilogram requirement for wheat bran is satisfied (as they are produced together). Thus, the food to processing element for wheat has a mean of 35 million kilograms (the sum of the last three) and a standard deviation of 2.55 million kilograms (the square-root of the sum of the squares of the last three standard deviations). Thus, we now have the following table:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 54418808 | 1999076 | 32789894 | -230630 | - | **26277929** | 4898000 | 560306 | 1904246 | - | 67 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | - | - | - | -29201 |
| Bulgur | 345670 | 182485 | 524471 | - | 3684 | 0 | - | - | - | - | - |
| Breakfast cereals | 8247 | 307172 | 217289 | - | 98131 | 0 | - | - | - | - | - |
| Wheat starch | 0 | 624947 | 224528 | - | - | 0 | - | - | - | - | - |
| Wheat bran | 5440300 | 258937 | 2343712 | - | - | 0 | 3355525 | - | - | - | - |

Now, we must balance this table. To do this, we need to extract the computed standard deviations of each element. The table below shows the expected value and estimated standard deviation for each of the elements for wheat:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Mean | 54418808 | 1999076 | 32789894 | -230630 | 0 | 26277929 | 4898000 | 560306 | 1904246 | 0 | 67 |
| Standard Dev. | 544188 | 0 | 0 | 89854 | NA | 1749 | 244900 | 56031 | 1129 | NA | 7 |

Note that in this case, the standard deviation for food for processing is very small because the flour production is an official figure (and this is the main use of wheat). Thus, the "food for processing" element is not adjusted much.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Mean | 62922689 | 1999076 | 32789894 | -542940 | 0 | 26277821 | 4586899 | 450006 | 1904206 | 0 | 67 |
| Standard Dev. | 544188 | 0 | 0 | 89854 | NA | 1749 | 244900 | 56031 | 1129 | NA | 7 |

Now, when balancing, we find that food for processing is adjusted down slightly. This adjustment to food of wheat implies that the production of children commodities must also be updated (and hence their food values as well).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Production (processed) | SD(Production) | Wheat Equivalent | SD(Wheat Equivalent) | Adjustment |
| Wheat flour | 18652048 | 0 | 25905622 | 0 | 0 |
| Bulgur | 345670 | 884 | 363863 | 931 | 0 |
| Breakfast cereals | 8247 | 1481 | 8247 | 1481 | 0 |
| Wheat bran | 5440277 | 167776 | 24728531 | 762619 | -108 |

We can now update the production numbers for each of the first level primary elements. Note that in the process of creating flour, we also create bran and germ. The amount of bran and germ created, in this case, is determined by the amount of flour we need to create (as that was our most stringent requirement). Thus, we have:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 62922689 | 1999076 | 32789894 | -542940 | 0 | 26277821 | 4586899 | 450006 | 1904206 | 0 | 67 |
| Wheat flour | 18652048 | 341529 | 572794 | - | 18539484 | 0 | - | - | - | - | -29201 |
| Wheat germ | **-** | - | - | - | - | - | - | - | - | - | - |
| Bulgur | **345699** | 182485 | 524471 | 0 | **3713** | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakfast cereals | **8325** | 307172 | 217289 | 0 | **98208** | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat starch | 0 | 624947 | 224528 | - | - | 0 | - | - | - | - | - |
| Wheat bran | **5699282** | 258937 | 2343712 | 0 | 0 | 0 | **3614507** | 0 | 0 | 0 | 0 |

Our food balance sheet is nearly completed, except that some commodities haven't been handled yet. In particular, wheat starch had imports exceeding exports and so we have not balanced that commodity yet; also, wheat flour has official production and so we haven't modified that commodity either. These unbalanced elements must be updated, and since the production is already fixed (either because it's an official figure or because it's 0) the balancing is very straight-forward: the uncertainty will be entirely allocated to food (or, in general, to either food or feed).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 62922689 | 1999076 | 32789894 | -542940 | -544188 | 26277821 | 4586899 | 450006 | 1904206 | 0 | 67 |
| Wheat flour | 18652048 | 341529 | 572794 | - | **18449984** | 0 | - | - | - | - | -29201 |
| Wheat germ | - | - | - | - | - | - | - | - | - | - | - |
| Bulgur | 345699 | 182485 | 524471 | 0 | 3713 | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakfast cereals | 8325 | 307172 | 217289 | 0 | 98208 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat starch | 0 | 624947 | 224528 | - | **-** | 0 | - | - | - | - | - |
| Wheat bran | 5699282 | 258937 | 2343712 | 0 | 0 | 0 | 3614507 | 0 | 0 | 0 | 0 |

Now, the final step is aggregating this full table back into primary equivalent. For most elements, this is trivial: for example, the final stock change for wheat will simply be the current stock change because there is no stock change for processed products. However, there are three elements that must be handled differently: imports, exports, and food. Note that the final value for wheat equivalent production is simply the current value for wheat production: this is because ``production'' of flour (or any other processed product) isn't really production in the sense that the flour is acquired from a different commodity (whereas production of wheat is truly a production as it is not derived from anything else). Also, food processing will not be standardized as it is more of an accounting variable that specifies how much of a commodity at one level should be processed into a different commodity.

To standardize trade and food, we can simply aggregate the trade and food of the children commodities up into their primary equivalent by dividing by the extraction rate. We add these primary equivalents to the current value of trade/food of wheat, and we have our final, primary equivalent trade/food of wheat. Also, feed is not standardized back into wheat equivalent as it is accounted for **???**.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Wheat | 62922689 | 3993871 | 34721681 | -542940 | 25183111 | 26277821 | 4586899 | 450006 | 1904206 | 0 | -40490 |

We can also compute calories, fats, and proteins at this point. First, we apply a calorie/fat/protein content factor to each individual element:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Quantity | Energy | Protein | Fat |
| Wheat | -544188.080 | 1420.937 | 12.3400 | 1.86500 |
| Wheat flour | 18449983.700 | 1472.172 | 11.0475 | 1.33875 |
| Bulgur | 3712.819 | NA | NA | NA |
| Breakfast cereals | 98208.358 | NA | NA | NA |
| Wheat starch | NA | NA | NA | NA |
| Wheat bran | 0.000 | NA | NA | NA |

Standardization is trivial: all the commodities here are purely additive, so the standardized calories/fats/proteins are simply the sum of the total calories/fats/proteins for each element:

|  |  |  |
| --- | --- | --- |
| Energy (millions) | Protein (millions) | Fat (millions) |
| 26388.3 | 197.11 | 23.69 |

## Sugar

Now, let's consider the full process for creating a food balance sheet for sugar. We start off with an empty table:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar Cane | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar and Syrups nes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Beet sugar | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Refined sugar | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Molasses (from beet, cane and maize) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Production

For production data, we first fill in the table with any available official figures. In this case, the production value is known for all the primary products and thus no imputation is done. We also have production data for some of the processed commodities:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | **26214040** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar Cane | **26511598** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar and Syrups nes | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Beet sugar | **4561000** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Refined sugar | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Molasses (from beet, cane and maize) | **2075000** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Trade

For the next example, we'll show how the imputation, mirroring and balancing works. In this case, we just take the country totals and insert into this table.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | **194543** | **304** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar Cane | 26511598 | **9725** | **861** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar and Syrups nes | - | **387899** | **2766095** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Beet sugar | 4561000 | **9** | **194806** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Refined sugar | - | **1275232** | **111184** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Molasses (from beet, cane and maize) | 2075000 | **464181** | **236516** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | - | **965161** | **867423** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | - | **-** | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | - | **1314304** | **1075983** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Stock Changes

We now estimate the stock changes. Note that for most products, we assume that countries do not hold stocks. Generally, stocks will only be held for primary level products, and not even all of these products. The numbers below represent the estimated stock changes (by the stock imputation methodology described previously) for the example country we're considering.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar Cane | 26511598 | 9725 | 861 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar and Syrups nes | - | 387899 | 2766095 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Beet sugar | 4561000 | 9 | 194806 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Refined sugar | - | 1275232 | 111184 | **79498** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | **193313** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | - | - | - | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | **-** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Food

The allocation to food, on the other hand, can potentially be considered at any processing level, although some commodities (such as wheat) are assumed to not be eaten as such. We impute food consumption numbers for the example country and update the FBS table below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar Cane | 26511598 | 9725 | 861 | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | **22953** | 0 | 0 | 0 | 0 | 0 | 0 |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| Refined sugar | - | 1275232 | 111184 | 79498 | **8800000** | 0 | 0 | 0 | 0 | 0 | 0 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | **2014156** | 0 | 0 | 0 | 0 | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | **238505** | 0 | 0 | 0 | 0 | 0 | 0 |

### Feed

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | - | - | 0 | **-** | 0 | 0 | 0 | 0 |
| Sugar Cane | 26511598 | 9725 | 861 | - | - | 0 | **-** | 0 | 0 | 0 | 0 |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | 22953 | 0 | **-** | 0 | 0 | 0 | 0 |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | **-** | 0 | 0 | 0 | 0 |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | 0 | **-** | 0 | 0 | 0 | 0 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | **9023616** | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | **-** | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | **-** | 0 | 0 | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | **-** | 0 | 0 | 0 | 0 |

### Losses

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | - | - | 0 | - | **205504** | 0 | 0 | 0 |
| Sugar Cane | 26511598 | 9725 | 861 | - | - | 0 | - | **213257** | 0 | 0 | 0 |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | 22953 | 0 | - | **-** | 0 | 0 | 0 |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | - | **-** | 0 | 0 | 0 |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | 0 | - | **-** | 0 | 0 | 0 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | **-** | 0 | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | **-** | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | **-** | 0 | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | **-** | 0 | 0 | 0 |

### Seed

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | - | - | 0 | - | 205504 | **-** | 0 | 0 |
| Sugar Cane | 26511598 | 9725 | 861 | - | - | 0 | - | 213257 | **1572250** | 0 | 0 |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | 22953 | 0 | - | - | **-** | 0 | 0 |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | - | - | **-** | 0 | 0 |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | 0 | - | - | **-** | 0 | 0 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | **-** | 0 | 0 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | **-** | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | **-** | 0 | 0 |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | - | **-** | 0 | 0 |

### Industrial Utilization

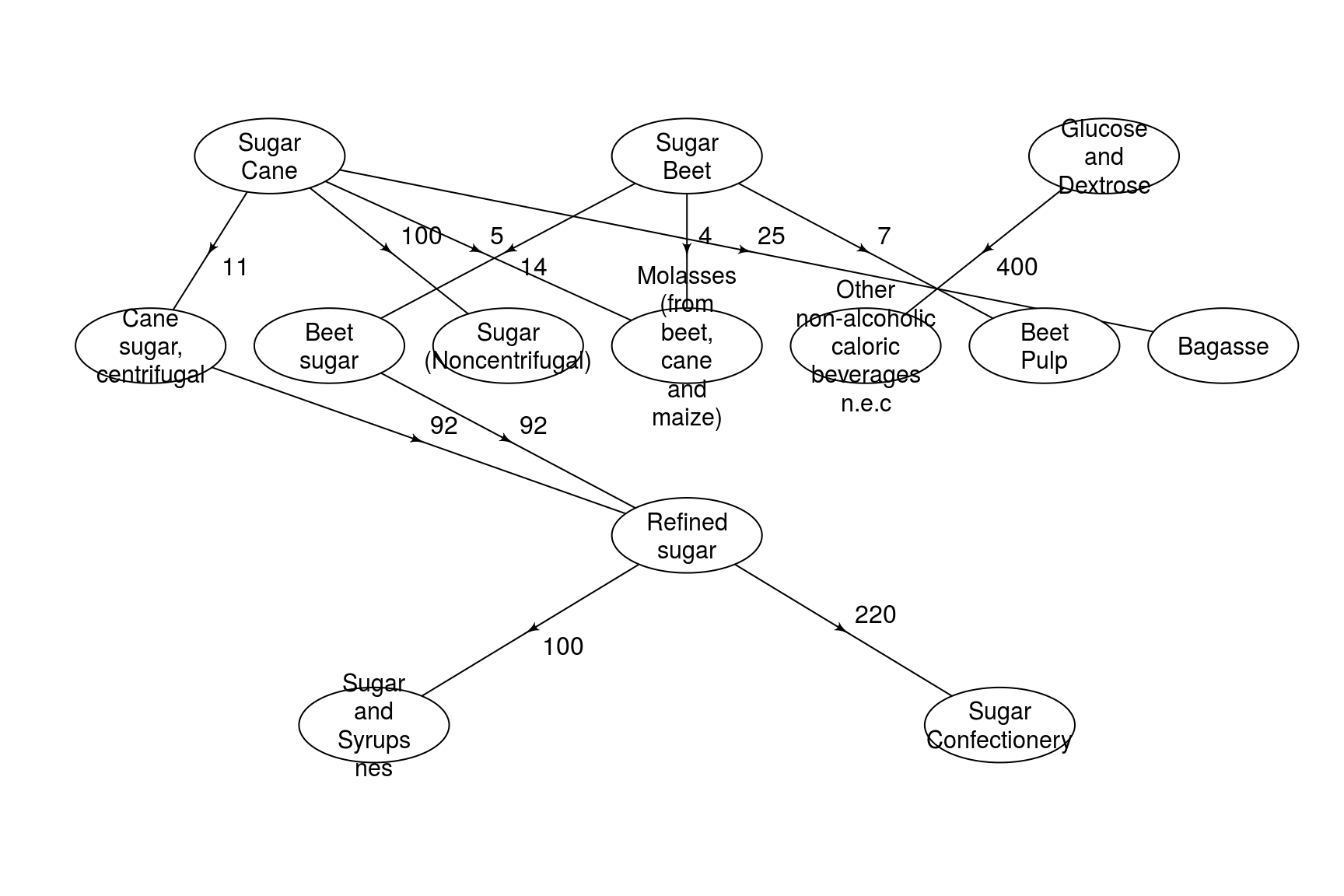
|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | - | - | 0 | - | 205504 | - | **-** | 0 |
| Sugar Cane | 26511598 | 9725 | 861 | - | - | 0 | - | 213257 | 1572250 | **-** | 0 |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | 22953 | 0 | - | - | - | **-** | 0 |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | - | - | - | **-** | 0 |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | 0 | - | - | - | **-** | 0 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | **-** | 0 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | **-** | 0 |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | - | **-** | 0 |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | **-** | 0 |

### Tourist Consumption

The tourist consumption estimation approach uses tourist data from the WTO as well as last year's consumption patterns to estimate the impact of tourism on local consumption. Note that tourist consumption can be negative; as an extreme example consider a case where many nationals travel abroad but no tourists enter. In this case, the country will have a negative ``tourist consumption'' because more calories will be assumed abroad than locally.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | - | - | 0 | - | 205504 | - | - | **2** |
| Sugar Cane | 26511598 | 9725 | 861 | - | - | 0 | - | 213257 | 1572250 | - | **71** |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | 22953 | 0 | - | - | - | - | **-** |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | - | - | - | - | **-** |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | 0 | - | - | - | - | **-2986** |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | - | **1** |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | - | **-** |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | - | - | **-** |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | - | **-** |
| ### Standardization and Balancing |  |  |  |  |  |  |  |  |  |  |  |

Now, suppose we have the following commodity tree:



We first start with the pre-standardized table:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar Beet | 26214040 | 194543 | 304 | - | - | 0 | - | 205504 | - | - | 2 |
| Sugar Cane | 26511598 | 9725 | 861 | - | - | 0 | - | 213257 | 1572250 | - | 71 |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | 22953 | 0 | - | - | - | - | - |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | - | - | - | - | - |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | 0 | - | - | - | - | -2986 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | - | 1 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | - | - |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | - | - | - |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | - | - |

The processing for sugar works slightly differently than most commodities. Sugar cane and sugar beet are, in almost every case, converted into cane sugar or beet sugar (i.e. they are not eaten as such nor are they processed into other products). Thus, in this case, rather than standardizing values back to sugar cane and sugar beet, we instead assume all sugar cane and sugar beet is first converted into the corresponding sugar and we perform the balances at this level.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar and Syrups nes | - | 387899 | 2766095 | - | 22953 | 0 | - | - | - | - | - |
| Cane sugar, centrifugal | 2720837 | - | - | - | - | - | - | - | - | - | - |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | - | - | - | - | - |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | 0 | - | - | - | - | -2986 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | - | 1 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | - | - |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | - | - | - |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | - | - |
| Beet Pulp | 1834194 | - | - | - | - | - | - | - | - | - | - |
| Bagasse | 6183721 | - | - | - | - | - | - | - | - | - | - |

The next step in this process is to balance the processed commodities by creating production values. These production values will require an amount of food processing from the parent commodities. We must start this process at the bottom of the tree, in this case considering "Sugar and Syrups nes" and "Sugar Confectionary" and going up to "Refined Sugar".

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar and Syrups nes | **2401148** | 387899 | 2766095 | - | 22953 | 0 | - | - | - | - | - |
| Cane sugar, centrifugal | 2720837 | - | - | - | - | - | - | - | - | - | - |
| Beet sugar | 4561000 | 9 | 194806 | - | - | 0 | - | - | - | - | - |
| Refined sugar | - | 1275232 | 111184 | 79498 | 8800000 | **2401148** | - | - | - | - | -2986 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | - | 1 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | - | - |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | - | - | - |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | - | - |
| Beet Pulp | 1834194 | - | - | - | - | - | - | - | - | - | - |
| Bagasse | 6183721 | - | - | - | - | - | - | - | - | - | - |

Next, we move up the tree to the balancing of refined sugar and the food processing required in the beet and cane sugar elements. We require refined sugar production in order to balance refined sugar, and thus we must create this production from the parent(s) of refined sugar. Looking at the commodity tree, we see that refined sugar can be created from both beet and cane sugar. We will allocate production of refined sugar from these parent commodities according to their availabilities.

|  |  |  |
| --- | --- | --- |
| Name | Availability | Percent |
| Beet sugar | 4393397 | 60.3% |
| Cane sugar, centrifugal | 2893793 | 39.7% |

Thus, we allocate according to the parent availabilities:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar and Syrups nes | 2401148 | 387899 | 2766095 | - | 22953 | 0 | - | - | - | - | - |
| Cane sugar, centrifugal | 2720837 | - | - | - | - | **4364243** | - | - | - | - | - |
| Beet sugar | 4561000 | 9 | 194806 | - | - | **6628813** | - | - | - | - | - |
| Refined sugar | **10113612** | 1275232 | 111184 | 79498 | 8800000 | 2401148 | - | - | - | - | -2986 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | - | 1 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | - | - |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | - | - | - |
| Other non-alcoholic caloric beverages n.e.c | - | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | - | - |
| Beet Pulp | 1834194 | - | - | - | - | - | - | - | - | - | - |
| Bagasse | 6183721 | - | - | - | - | - | - | - | - | - | - |

Now, we must balance the primary products in this table (i.e. sugar cane and sugar beet). To do this, we need to extract the computed standard deviations of each element. The table below shows the expected value and estimated standard deviation for sugar beet (top) and sugar cane (bottom):

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Mean | 4561000 | 9 | 194806 | 0 | 0 | 6772632 | 0 | 0 | 0 | 0 | 0 |
| Standard Dev. | 0 | 0 | 0 | NA | NA | 44387 | NA | NA | NA | NA | NA |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Mean | 2720837 | 0 | 0 | 0 | 0 | 4220424 | 0 | 0 | 0 | 0 | 0 |
| Standard Dev. | 17453 | NA | NA | NA | NA | 44387 | NA | NA | NA | NA | NA |

After balancing the above tables, we're left with the following values. Note that only waste and food processing are adjusted, and food processing takes the majority of the change because it has a substantially higher variability.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Mean | 2921735 | 0 | 0 | 0 | 0 | 2921739 | 0 | 0 | 0 | 0 | 0 |
| Standard Dev. | 17453 | 0 | 0 | 0 | 0 | 44387 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar and Syrups nes | 2401148 | 387899 | 2766095 | - | 22953 | 0 | - | - | - | - | - |
| Glucose and Dextrose | - | - | - | - | - | 46 | - | - | - | - | - |
| Cane sugar, centrifugal | 2921735 | - | - | - | - | 2921739 | - | - | - | - | - |
| Beet sugar | 4561000 | 9 | 194806 | 0 | 0 | 4366203 | 0 | 0 | 0 | 0 | 0 |
| Refined sugar | 6704906 | 1275232 | 111184 | 2697445 | 8800000 | 3181324 | 0 | 0 | 0 | 0 | 7600 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | - | 1 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | - | - |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 2014156 | 0 | - | - | - | - | - |
| Other non-alcoholic caloric beverages n.e.c | 184 | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | - | - |
| Beet Pulp | 1834194 | - | - | - | - | - | - | - | - | - | - |
| Bagasse | 6183721 | - | - | - | - | - | - | - | - | - | - |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Sugar and Syrups nes | 2401148 | 387899 | 2766095 | - | 22953 | 0 | - | - | - | - | - |
| Glucose and Dextrose | - | - | - | - | - | 46 | - | - | - | - | - |
| Cane sugar, centrifugal | 2921735 | - | - | - | - | 2921739 | - | - | - | - | - |
| Beet sugar | 4561000 | 9 | 194806 | 0 | 0 | 4366203 | 0 | 0 | 0 | 0 | 0 |
| Refined sugar | 6704906 | 1275232 | 111184 | 2697445 | 1982586 | 3181324 | 0 | 0 | 0 | 0 | 7600 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | - | - | 0 | 9023616 | - | - | - | 1 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | - | 0 | - | - | - | - | - |
| Undenatured ethyl alcohol (<=80%) | - | - | - | - | 0 | 0 | - | - | - | - | - |
| Other non-alcoholic caloric beverages n.e.c | 184 | 1314304 | 1075983 | - | 238505 | 0 | - | - | - | - | - |
| Beet Pulp | 1834194 | - | - | - | - | - | - | - | - | - | - |
| Bagasse | 6183721 | - | - | - | - | - | - | - | - | - | - |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Production | Imports | Exports | StockChange | Food | Food Processing | Feed | Waste | Seed | Industrial | Tourist |
| Glucose and Dextrose | - | - | - | - | - | 46 | - | - | - | - | - |
| Cane sugar, centrifugal | 2921735 | - | - | - | - | 2921739 | - | - | - | - | - |
| Beet sugar | 4561000 | 1807760 | 3322283 | 2932005 | 2179933 | 4366203 | 0 | 0 | 0 | 0 | 8261 |
| Molasses (from beet, cane and maize) | 2075000 | 464181 | 236516 | 0 | 0 | 0 | 9023616 | 0 | 0 | 0 | 1 |
| Undenatured ethyl alcohol (>80%) | - | 965161 | 867423 | 193313 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undenatured ethyl alcohol (<=80%) | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Beet Pulp | 1834194 | - | - | - | - | - | - | - | - | - | - |
| Bagasse | 6183721 | - | - | - | - | - | - | - | - | - | - |

We can also compute calories, fats, and proteins at this point. First, we apply a calorie/fat/protein content factor to each individual element:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Quantity | Energy | Protein | Fat |
| Sugar and Syrups nes | 22952.71 | NA | NA | NA |
| Beet sugar | 0.00 | 1699.49 | 0 | 0.0 |
| Refined sugar | 1982586.01 | 1699.49 | 0 | 0.0 |
| Molasses (from beet, cane and maize) | NA | 1274.11 | 0 | 0.1 |
| Undenatured ethyl alcohol (>80%) | NA | NA | NA | NA |
| Undenatured ethyl alcohol (<=80%) | 0.00 | NA | NA | NA |
| Other non-alcoholic caloric beverages n.e.c | 238504.82 | NA | NA | NA |

Standardization is trivial: all the commodities here are purely additive, so the standardized calories/fats/proteins are simply the sum of the total calories/fats/proteins for each element:

|  |  |  |
| --- | --- | --- |
| Energy (millions) | Protein (millions) | Fat (millions) |
| 3369.39 | 0 | 0 |