Food Balance Sheets

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	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	**26210000**	0	0	0	0	0	0	0	0	0	0
Sugar Cane	**26510000**	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	**2075000**	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	26210000	**194500**	**300**	0	0	0	0	0	0	0	0

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar Cane	26510000	**9700**	**860**	0	0	0	0	0	0	0	0
Sugar and Syrups nes	-	**265400**	**96200**	0	0	0	0	0	0	0	0
Beet sugar	4561000	**10**	**194800**	0	0	0	0	0	0	0	0
Refined sugar	-	**1275200**	**111200**	0	0	0	0	0	0	0	0
Molasses	2075000	**464200**	**236500**	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	26210000	194500	300	**-**	0	0	0	0	0	0	0
Sugar Cane	26510000	9700	860	**-**	0	0	0	0	0	0	0
Sugar and Syrups nes	-	265400	96200	**-**	0	0	0	0	0	0	0
Beet sugar	4561000	10	194800	**-**	0	0	0	0	0	0	0
Refined sugar	-	1275200	111200	**79500**	0	0	0	0	0	0	0
Molasses	2075000	464200	236500	**-**	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	26210000	194500	300	-	-	0	0	0	0	0	0
Sugar Cane	26510000	9700	860	-	-	0	0	0	0	0	0
Sugar and Syrups nes	-	265400	96200	-	**23000**	0	0	0	0	0	0
Beet sugar	4561000	10	194800	-	-	0	0	0	0	0	0
Refined sugar	-	1275200	111200	79500	**8800000**	0	0	0	0	0	0
Molasses	2075000	464200	236500	-	-	0	0	0	0	0	0

Feed

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar Beet	26210000	194500	300	-	-	0	**-**	0	0	0	0
Sugar Cane	26510000	9700	860	-	-	0	**-**	0	0	0	0
Sugar and Syrups nes	-	265400	96200	-	23000	0	**-**	0	0	0	0
Beet sugar	4561000	10	194800	-	-	0	**-**	0	0	0	0
Refined sugar	-	1275200	111200	79500	8800000	0	**-**	0	0	0	0
Molasses	2075000	464200	236500	-	-	0	**9023600**	0	0	0	0

Losses

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar Beet	26210000	194500	300	-	-	0	-	**205500**	0	0	0
Sugar Cane	26510000	9700	860	-	-	0	-	**213300**	0	0	0
Sugar and Syrups nes	-	265400	96200	-	23000	0	-	**-**	0	0	0
Beet sugar	4561000	10	194800	-	-	0	-	**-**	0	0	0
Refined sugar	-	1275200	111200	79500	8800000	0	-	**-**	0	0	0
Molasses	2075000	464200	236500	-	-	0	9023600	**-**	0	0	0

Seed

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar Beet	26210000	194500	300	-	-	0	-	205500	**-**	0	0
Sugar Cane	26510000	9700	860	-	-	0	-	213300	**1572200**	0	0
Sugar and Syrups nes	-	265400	96200	-	23000	0	-	-	**-**	0	0
Beet sugar	4561000	10	194800	-	-	0	-	-	**-**	0	0
Refined sugar	-	1275200	111200	79500	8800000	0	-	-	**-**	0	0
Molasses	2075000	464200	236500	-	-	0	9023600	-	**-**	0	0

Industrial Utilization

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar Beet	26210000	194500	300	-	-	0	-	205500	-	**-**	0
Sugar Cane	26510000	9700	860	-	-	0	-	213300	1572200	**-**	0
Sugar and Syrups nes	-	265400	96200	-	23000	0	-	-	-	**-**	0
Beet sugar	4561000	10	194800	-	-	0	-	-	-	**-**	0
Refined sugar	-	1275200	111200	79500	8800000	0	-	-	-	**-**	0
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	**-**	0

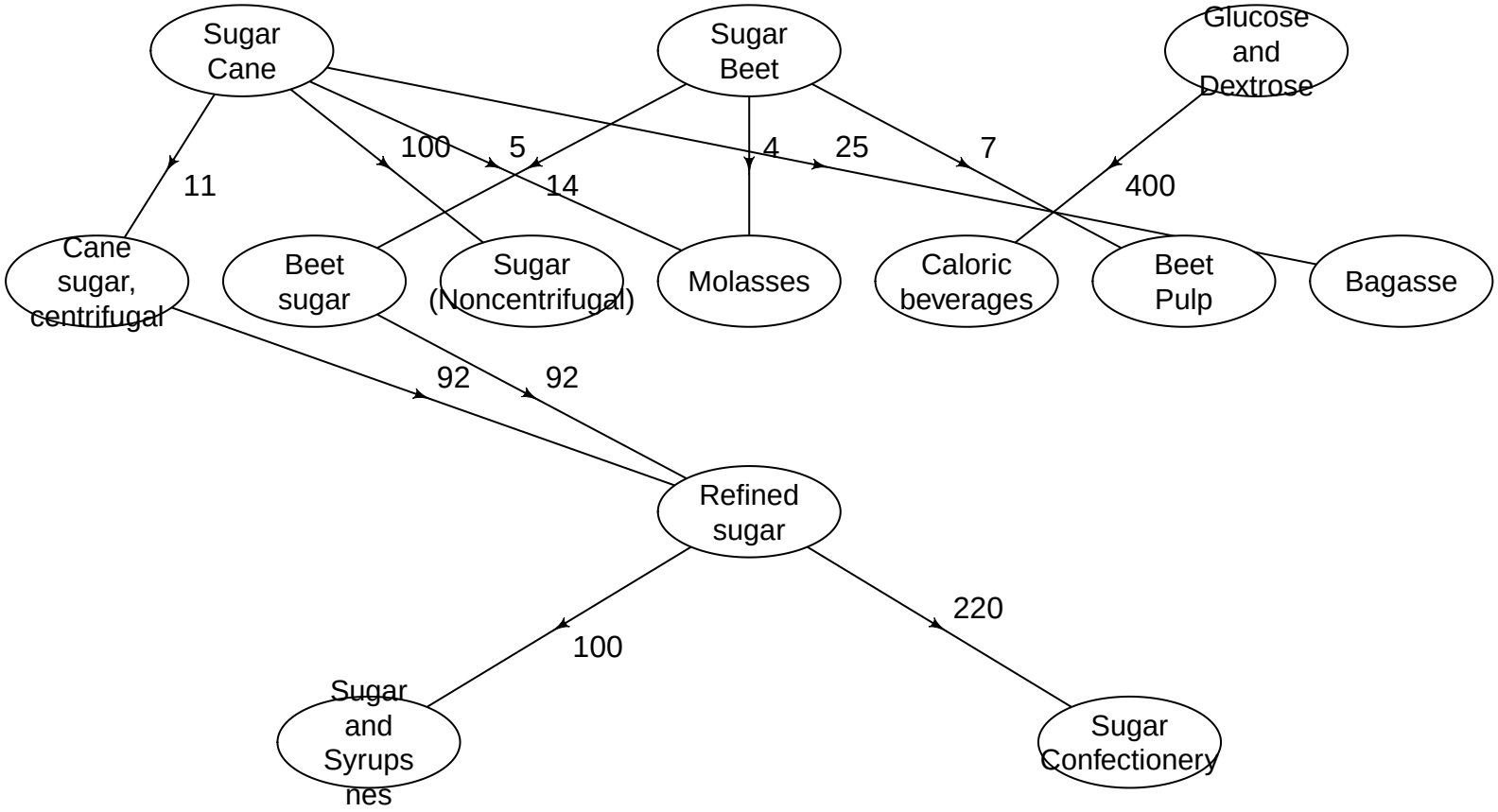
Tourist Consumption

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	26210000	194500	300	-	-	0	-	205500	-	-	**0**
Sugar Cane	26510000	9700	860	-	-	0	-	213300	1572200	-	**70**
Sugar and Syrups nes	-	265400	96200	-	23000	0	-	-	-	-	**-**
Beet sugar	4561000	10	194800	-	-	0	-	-	-	-	**-**
Refined sugar	-	1275200	111200	79500	8800000	0	-	-	-	-	**-3000**
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	**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	26210000	194500	300	-	-	0	-	205500	-	-	0
Sugar Cane	26510000	9700	860	-	-	0	-	213300	1572200	-	70
Sugar and Syrups nes	-	265400	96200	-	23000	0	-	-	-	-	-
Beet sugar	4561000	10	194800	-	-	0	-	-	-	-	-
Refined sugar	-	1275200	111200	79500	8800000	0	-	-	-	-	-3000
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	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	-	265400	96200	-	23000	0	-	-	-	-	-
Cane sugar, centrifugal	**2720800**	-	-	-	-	-	-	-	-	-	-
Beet sugar	4561000	10	194800	-	-	0	-	-	-	-	-
Refined sugar	-	1275200	111200	79500	8800000	0	-	-	-	-	-3000
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	0
Beet Pulp	**1834200**	-	-	-	-	-	-	-	-	-	-
Bagasse	**6183700**	-	-	-	-	-	-	-	-	-	-

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". However, the supply for "Sugar and Syrups nes" exceeds the utilization, and we have no data for "Sugar Confectionary", so we don't need to introduce any required production in this step.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar and Syrups nes	**0**	265400	96200	-	23000	0	-	-	-	-	-
Cane sugar, centrifugal	2720800	-	-	-	-	-	-	-	-	-	-
Beet sugar	4561000	10	194800	-	-	0	-	-	-	-	-
Refined sugar	-	1275200	111200	79500	8800000	**0**	-	-	-	-	-3000
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	0
Beet Pulp	1834200	-	-	-	-	-	-	-	-	-	-
Bagasse	6183700	-	-	-	-	-	-	-	-	-	-

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. Note that the food processing quantities from beet sugar and cane sugar must be multiplied by their corresponding extraction rates to compute the production value of refined sugar. Moreover, if the extraction rates from these two parents are different, then we must compute availabilities weighted by these extraction rates. In this case, we could ignore this because the extraction rates are identical.

Name	Availability	Percent
Beet sugar	4366203	61.6%
Cane sugar, centrifugal	2720837	40.8%

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	0	265400	96200	-	23000	0	-	-	-	-	-
Cane sugar, centrifugal	2720800	-	-	-	-	**3328100**	-	-	-	-	-
Beet sugar	4561000	10	194800	-	-	**5055000**	-	-	-	-	-
Refined sugar	**7712500**	1275200	111200	79500	8800000	0	-	-	-	-	-3000
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	0
Beet Pulp	1834200	-	-	-	-	-	-	-	-	-	-
Bagasse	6183700	-	-	-	-	-	-	-	-	-	-

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	10	194800	0	0	5164700	0	0	0	0	0
Standard Dev.	0	0	0	NA	NA	957551	NA	NA	NA	NA	NA

Variable	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Mean	2720800	0	0	0	0	3218400	0	0	0	0	0
Standard Dev.	17453	NA	NA	NA	NA	957551	NA	NA	NA	NA	NA

After balancing the above tables, we're left with the following values. Note that food processing is the element that receives most of the adjustment because it has a substantially higher variability.

Variable	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Mean	4561000	10	194800	0	0	4366200	0	0	0	0	0
Standard Dev.	0	0	0	0	0	957551	0	0	0	0	0

Variable	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Mean	2721000	0	0	0	0	2721000	0	0	0	0	0
Standard Dev.	17453	0	0	0	0	957551	0	0	0	0	0

We can now adjust our SUA table with the updated/balanced values:

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar and Syrups nes	0	265400	96200	-	23000	0	-	-	-	-	-
Cane sugar, centrifugal	**2721000**	-	-	-	-	**2721000**	-	-	-	-	-
Beet sugar	4561000	10	194800	0	0	**4366200**	0	0	0	0	0
Refined sugar	7712500	1275200	111200	79500	8800000	0	-	-	-	-	-3000
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	0
Beet Pulp	1834200	-	-	-	-	-	-	-	-	-	-
Bagasse	6183700	-	-	-	-	-	-	-	-	-	-

We must now process the changes in the current elements down the tree into the other elements.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar and Syrups nes	0	265400	96200	-	23000	0	-	-	-	-	-
Cane sugar, centrifugal	2721000	-	-	-	-	2721000	-	-	-	-	-
Beet sugar	4561000	10	194800	0	0	4366200	0	0	0	0	0
Refined sugar	**6520200**	1275200	111200	**78000**	**7609200**	0	0	0	0	0	-3000
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	0
Beet Pulp	1834200	-	-	-	-	-	-	-	-	-	-
Bagasse	6183700	-	-	-	-	-	-	-	-	-	-

Lastly, some elements have not yet been updated in this process. To ensure a full balance of the SUA, we should go through and balance those rows as well.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Sugar and Syrups nes	0	265400	96200	-	**169200**	0	-	-	-	-	-
Cane sugar, centrifugal	2721000	-	-	-	-	2721000	-	-	-	-	-
Beet sugar	4561000	10	194800	0	0	4366200	0	0	0	0	0
Refined sugar	6520200	1275200	111200	78000	7609200	0	0	0	0	0	-3000
Molasses	2075000	464200	236500	-	-	0	9023600	-	-	-	0
Beet Pulp	1834200	-	-	-	-	-	-	-	-	-	-
Bagasse	6183700	-	-	-	-	-	-	-	-	-	-

Now, we standardize all these commodities into their primary equivalents: in this case, cane sugar and beet sugar. Commodities with multiple parents must be processed back into all the parents according to shares determined in the processing step (for example, refined sugar back to cane and beet in the proportion given earlier).

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Waste	Seed	Industrial	Tourist
Cane sugar, centrifugal	2721000	854000	153900	34600	3558400	2721000	0	0	0	0	-1300
Beet sugar	4561000	1142300	373800	52200	5278800	4366200	0	0	0	0	-2000

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	169162.4	NA	NA	NA
Beet sugar	0.0	1699.49	0	0.0
Refined sugar	7609240.9	1699.49	0	0.0
Molasses	NA	1274.11	0	0.1

Standardization of calories is simpler since we don't need to divide by extraction rates: the standardized calories/fats/proteins are the sum of the total calories/fats/proteins for each element. However, this is more complicated than simply adding up calories/fats/proteins because we have to standardize children commodities into multiple parents. For example, as with the quantity standardization, we should standardize refined sugar back into cane sugar and beet sugar according to the proportion from processing:

Standardized_Equivalent	Energy (millions)	Protein (millions)	Fat (millions)
Beet Sugar	7966.007	0	0
Cane Sugar	5276.187	0	0