Food Balance Sheets

Palm Oil

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

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	-	-	-	-	-	-	-	-	-	-	-
Palm oil	-	-	-	-	-	-	-	-	-	-	-
Oil of palm kernels	-	-	-	-	-	-	-	-	-	-	-
Margarine and Shortening	-	-	-	-	-	-	-	-	-	-	-
Fatty acids	-	-	-	-	-	-	-	-	-	-	-
Oil boiled, dehydrated	-	-	-	-	-	-	-	-	-	-	-
Fat preparations nes	-	-	-	-	-	-	-	-	-	-	-
Hydrogenated oils	-	-	-	-	-	-	-	-	-	-	-

Production

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

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	**0**	-	-	-	-	-	-	-	-	-	-
Palm oil	**0**	-	-	-	-	-	-	-	-	-	-
Oil of palm kernels	**-**	-	-	-	-	-	-	-	-	-	-
Margarine and Shortening	**3,714,000**	-	-	-	-	-	-	-	-	-	-
Fatty acids	**-**	-	-	-	-	-	-	-	-	-	-
Oil boiled, dehydrated	**-**	-	-	-	-	-	-	-	-	-	-
Fat preparations nes	**194,100**	-	-	-	-	-	-	-	-	-	-
Hydrogenated oils	**-**	-	-	-	-	-	-	-	-	-	-

Trade

Please reference chapter 2 and the wheat example for a thorough description of the trade processing. For this example, we simply insert the available trade figures.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	**0**	**0**	-	-	-	-	-	-	-	-
Palm oil	0	**1,087,600**	**94,900**	-	-	-	-	-	-	-	-
Oil of palm kernels	-	**0**	**0**	-	-	-	-	-	-	-	-
Margarine and Shortening	3,714,000	**0**	**0**	-	-	-	-	-	-	-	-
Fatty acids	-	**0**	**0**	-	-	-	-	-	-	-	-
Oil boiled, dehydrated	-	**0**	**0**	-	-	-	-	-	-	-	-
Fat preparations nes	194,100	**0**	**0**	-	-	-	-	-	-	-	-
Hydrogenated oils	-	**0**	**0**	-	-	-	-	-	-	-	-

Stock Changes

Generally, stocks will be held for a select number of primary level products (such as wheat or rice). Similar to sugar, margarine is another exception to the rule: a processed product for which stocks are occassionally held.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	**0**	-	-	-	-	-	-	-
Palm oil	0	1,087,600	94,900	**0**	-	-	-	-	-	-	-
Oil of palm kernels	-	0	0	**0**	-	-	-	-	-	-	-
Margarine and Shortening	3,714,000	0	0	**3,900**	-	-	-	-	-	-	-
Fatty acids	-	0	0	**0**	-	-	-	-	-	-	-
Oil boiled, dehydrated	-	0	0	**0**	-	-	-	-	-	-	-
Fat preparations nes	194,100	0	0	**0**	-	-	-	-	-	-	-
Hydrogenated oils	-	0	0	**0**	-	-	-	-	-	-	-

Food

The module estimating food allocation uses food consumption estimates from the previous year and extrapolates these estimates forward using changes in GDP and product-related income elasticities. Recall that the "Food" variable is generally only reported at the primary level as the "Food Processing" variable is estimated by standardizing the "Food" quantities for all the processed commodities. However, in some cases (such as this example), there

may be no availability of the primary product and a large import value in a processed product. In this case, it makes sense to instead standardize food and food processing to this level, as this is likely where the processed product is being created.

For our example, suppose that our food module estimated a consumption of 3.7 million tons of margarine. We would then standardize this estimate back to the food processing element for oil of palm fruit for our balancing. However, margarine is a product that can be created from many different commodities, and thus we must standardize this food amount back into all the possible commodities that can be processed to create margarine. For example, suppose we have the following commodities that can be used to create margarine (and no other commodities in this country that could be processed into margarine):

Commodity	Availability	Equivalent Availability for Margarine	Share
Oil Palm Fruit	0	0	0%
Palm oil	993,000	1,122,100	30.1%
Soyabeans	3,874,100	788,000	21.1%
Sunflower Seed	3,930,500	1,821,000	48.8%

The equivalent availability for margarine is derived from the availability of the primary commodity by multiplying by the extraction rate(s) to convert the primary commodity into margarine. Then, the share is computed by comparing availability: 30.1% of the total availability of margarine comes from palm oil, so we assume that 30.1% of the margarine is produced from palm oil. This is, of course, just an approximation, and in the absence of country specific information it is a reasonable assumption. Thus, the 3.7 million tonne requirement of margarine production must have 30.1% satisfied by palm oil, or 1.1 million tonnes. This translates into 980 thousand tonnes of palm oil (dividing by extraction rates). Suppose there is also some small consumption reported for fat preparations, and so the final food processing estimate for oil palm fruit is about 1.2 million tonnes.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	**0**	**-**	-	-	-	-	-
Palm oil	0	1,087,600	94,900	0	**0**	**1,159,700**	-	-	-	-	-
Oil of palm kernels	-	0	0	0	-	-	-	-	-	-	-
Margarine and Shortening	3,714,000	0	0	3,900	-	-	-	-	-	-	-
Fatty acids	-	0	0	0	-	-	-	-	-	-	-
Oil boiled, dehydrated	-	0	0	0	-	-	-	-	-	-	-
Fat preparations nes	194,100	0	0	0	-	-	-	-	-	-	-
Hydrogenated oils	-	0	0	0	-	-	-	-	-	-	-

To avoid later confusion, we also adjust the production value of margarine and shortening (as only 37.5% of this production will be covered by oil palm fruit).

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	-	-	-	-	-	-
Palm oil	0	1,087,600	94,900	0	0	1,159,700	-	-	-	-	-
Oil of palm kernels	-	0	0	0	-	-	-	-	-	-	-
Margarine and Shortening	**1,117,000**	0	0	3,900	-	-	-	-	-	-	-
Fatty acids	-	0	0	0	-	-	-	-	-	-	-
Oil boiled, dehydrated	-	0	0	0	-	-	-	-	-	-	-
Fat preparations nes	194,100	0	0	0	-	-	-	-	-	-	-
Hydrogenated oils	-	0	0	0	-	-	-	-	-	-	-

Losses

Losses are estimated using the methodology described in chapter 2, unless losses quantities are measured by the country.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	-	-	-	-	-	**0**
Palm oil	0	1,087,600	94,900	0	0	1,159,700	-	-	-	-	**0**
Oil of palm kernels	-	0	0	0	-	-	-	-	-	-	**0**
Margarine and Shortening	1,117,000	0	0	3,900	-	-	-	-	-	-	**0**
Fatty acids	-	0	0	0	-	-	-	-	-	-	**0**
Oil boiled, dehydrated	-	0	0	0	-	-	-	-	-	-	**0**
Fat preparations nes	194,100	0	0	0	-	-	-	-	-	-	**0**
Hydrogenated oils	-	0	0	0	-	-	-	-	-	-	**0**

Seed

As the country of interest has no production of palm oil fruit, no amount will be allocated to seed. Thus, we can fill the table in with zeros.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	-	-	**0**	-	-	0
Palm oil	0	1,087,600	94,900	0	0	1,159,700	-	**0**	-	-	0
Oil of palm kernels	-	0	0	0	-	-	-	**0**	-	-	0
Margarine and Shortening	1,117,000	0	0	3,900	-	-	-	**0**	-	-	0
Fatty acids	-	0	0	0	-	-	-	**0**	-	-	0
Oil boiled, dehydrated	-	0	0	0	-	-	-	**0**	-	-	0

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Fat preparations nes	194,100	0	0	0	-	-	-	**0**	-	-	0
Hydrogenated oils	-	0	0	0	-	-	-	**0**	-	-	0

Industrial Utilization

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	-	-	0	-	**0**	0
Palm oil	0	1,087,600	94,900	0	0	1,159,700	-	0	-	**-**	0
Oil of palm kernels	-	0	0	0	-	-	-	0	-	**-**	0
Margarine and Shortening	1,117,000	0	0	3,900	-	-	-	0	-	**-**	0
Fatty acids	-	0	0	0	-	-	-	0	-	**-**	0
Oil boiled, dehydrated	-	0	0	0	-	-	-	0	-	**-**	0
Fat preparations nes	194,100	0	0	0	-	-	-	0	-	**-**	0
Hydrogenated oils	-	0	0	0	-	-	-	0	-	**-**	0

Tourist Consumption

For this particular example, suppose we have a small number of tourists leaving or coming to this country, and so the allocation of the commodity to the tourist element is roughly zero.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	-	-	0	**0**	0	0
Palm oil	0	1,087,600	94,900	0	0	1,159,700	-	0	**0**	-	0
Oil of palm kernels	-	0	0	0	-	-	-	0	**0**	-	0
Margarine and Shortening	1,117,000	0	0	3,900	-	-	-	0	**0**	-	0
Fatty acids	-	0	0	0	-	-	-	0	**0**	-	0
Oil boiled, dehydrated	-	0	0	0	-	-	-	0	**0**	-	0
Fat preparations nes	194,100	0	0	0	-	-	-	0	**0**	-	0
Hydrogenated oils	-	0	0	0	-	-	-	0	**0**	-	0

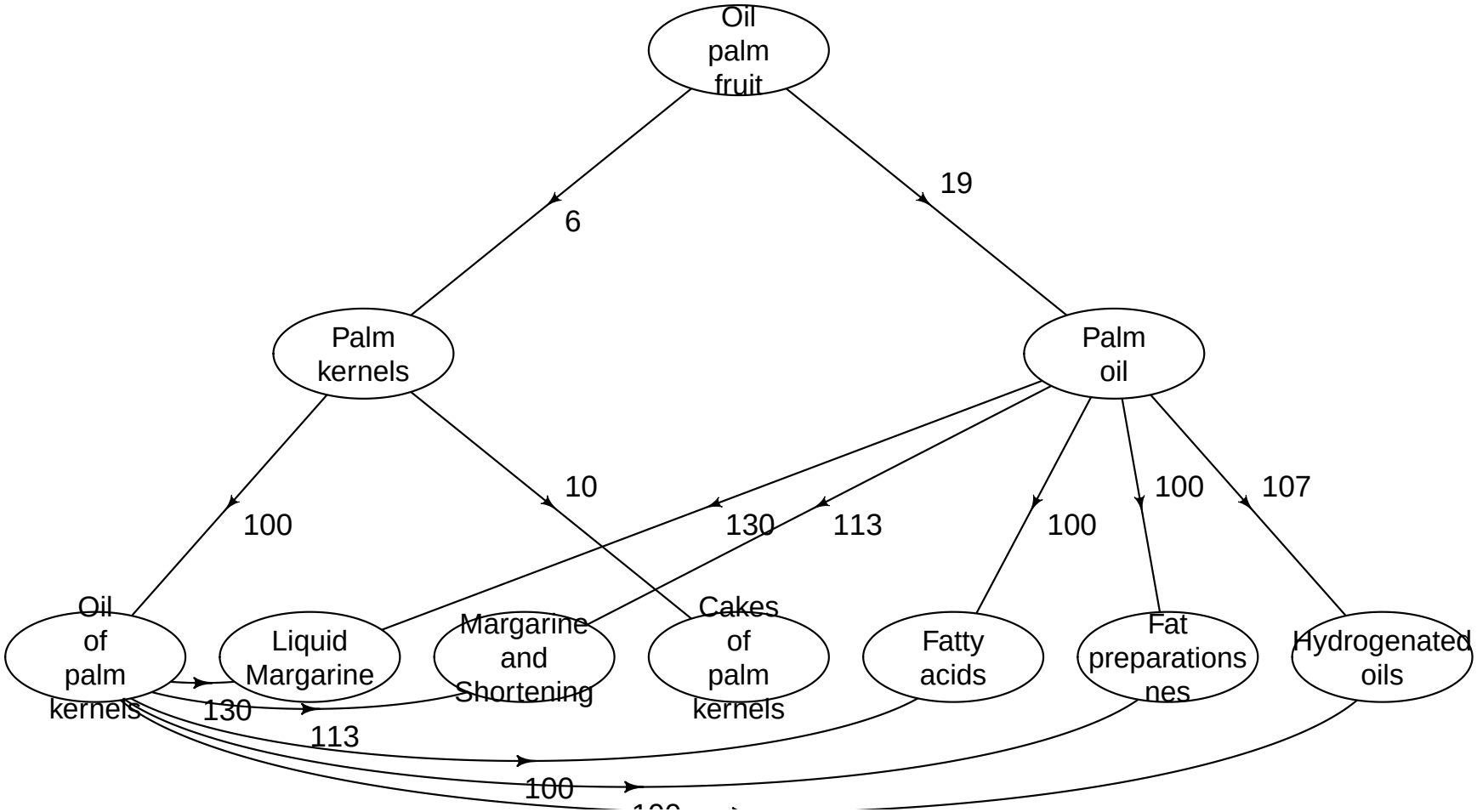
Feed

For the palm oil commodity tree, only one element is allocated to feed (cakes of palm kernels). This commodity is a byproduct in the processing of palm kernels into oil of palm kernels. However, for the example we are considering, no palm kernels are available. Thus, neither "oil of palm kernels" nor "cake of palm kernels" are produced. Also, palm oil itself is never fed directly to animals, and thus we have no commodity to allocate any feed to. Thus, all feed is assumed to be 0.

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	-	**0**	0	0	0	0
Palm oil	0	1,087,600	94,900	0	0	1,159,700	**0**	0	0	-	0
Oil of palm kernels	-	0	0	0	-	-	**0**	0	0	-	0
Margarine and Shortening	1,117,000	0	0	3,900	-	-	**0**	0	0	-	0
Fatty acids	-	0	0	0	-	-	**0**	0	0	-	0
Oil boiled, dehydrated	-	0	0	0	-	-	**0**	0	0	-	0
Fat preparations nes	194,100	0	0	0	-	-	**0**	0	0	-	0
Hydrogenated oils	-	0	0	0	-	-	**0**	0	0	-	0

Standardization and Balancing

Now, suppose we have the following commodity tree:



Here is our initial table:

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	-	0	0	0	0	0
Palm oil	0	1,087,600	94,900	0	0	1,159,700	0	0	0	-	0
Oil of palm kernels	-	0	0	0	-	-	0	0	0	-	0
Margarine and Shortening	1,117,000	0	0	3,900	-	-	0	0	0	-	0
Fatty acids	-	0	0	0	-	-	0	0	0	-	0

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil boiled, dehydrated	-	0	0	0	-	-	0	0	0	-	0
Fat preparations nes	194,100	0	0	0	-	-	0	0	0	-	0
Hydrogenated oils	-	0	0	0	-	-	0	0	0	-	0

The next step in this process is to balance the processed commodities by creating production quantities. However, in our case, we have official production figures for the two main uses of oil palm fruit within this country: margarine and fat preparations. Since these figures are official and compose the majority of the end uses of oil palm fruit, we should update the food processing estimate based on these official figures:

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	0	0	0	0	0	0
Palm oil	0	1,087,600	94,900	0	0	**1,182,600**	0	0	0	-	0
Oil of palm kernels	-	0	0	0	-	0	0	0	0	-	0
Margarine and Shortening	1,117,000	0	0	3,900	-	0	0	0	0	-	0
Fatty acids	-	0	0	0	-	0	0	0	0	-	0
Oil boiled, dehydrated	-	0	0	0	-	0	0	0	0	-	0
Fat preparations nes	194,100	0	0	0	-	0	0	0	0	-	0
Hydrogenated oils	-	0	0	0	-	0	0	0	0	-	0

Some of the SUA lines are not balanced, and this is because we have not allocated utilizations in the case of excess supply. For these commodities, we should allocate the excess trade amount according to the variable which makes the most sense for that particular commodity (or, multiple variables if we know the split at which a commodity is utilized).

Name	Production	Imports	Exports	StockChange	Food	Food Processing	Feed	Seed	Tourist	Industrial	Loss
Oil palm fruit	0	0	0	0	0	0	0	0	0	0	0
Palm oil	0	1,087,600	94,900	0	0	1,182,600	0	0	0	0	0
Oil of palm kernels	-	0	0	0	0	0	0	0	0	0	0
Margarine and Shortening	1,117,000	0	0	3,900	**1,113,100**	0	0	0	0	0	0
Fatty acids	-	0	0	0	0	0	0	0	0	0	0
Oil boiled, dehydrated	-	0	0	0	0	0	0	0	0	0	0
Fat preparations nes	194,100	0	0	0	**194,100**	0	0	0	0	0	0
Hydrogenated oils	-	0	0	0	0	0	0	0	0	0	0

The next step is to aggregate this full table back into the primary commodity equivalent (in this case palm oil). We follow the same aggrega-

tion/standardization process as outlined in the wheat example.

Name	Production	Imports	Exports	StockChange	Food	Feed	Seed	Tourist	Industrial	Loss
Palm oil	0	1,087,600	94,900	3,400	1,179,200	0	0	0	0	0

Now, we must balance to satisfy the FBS equation of supply equals utilization. To do this, we need to extract the computed standard deviations of each variable. These standard deviations are determined by the data source (i.e. for official data, a standard deviation of 0 is applied. For semi-official data, a higher standard deviation is used; and for estimated quantities an even larger standard deviation is used). In this case, production and trade quantities are official while all other quantities are estimated.

Variable	Production	Imports	Exports	StockChange	Food	Feed	Seed	Tourist	Industrial	Loss
Mean	0	1,087,600	94,900	3,400	1,179,200	0	0	0	0	0
Standard Dev.	0	0	0	1,400	59,000	0	0	0	0	0

After balancing the above tables, we have with the following quantities. Note that the "Food" variable is the variable that receives most of the adjustment because it has a substantially higher variability.

Variable	Production	Imports	Exports	StockChange	Food	Feed	Seed	Tourist	Industrial	Loss
Mean	0	1,087,600	94,900	3,300	989,400	0	0	0	0	0
Standard Dev.	0	0	0	1,400	59,000	0	0	0	0	0

After balancing, some quantities are updated (and some remain unchanged, if they have a standard deviation of zero). As with the wheat example, the aggregated table can be placed directly into the food balance sheet. Note that if we also had any data on oil of palm kernels, we would need to also perform a standardization and balance for that commodity and include that as a separate FBS line.

As with the other two examples, we now calculate the calorie, fat, and protein content usi9ng the food consumption values at the SUA level. We do this by applying the calorie/fat/protein content nutritive factors to all SUA items with a non-zero food quantity. Also, note that our food quantity for the standardized commodity was adjusted down. In order to ensure consistency, we must adjust all our SUA food quantities by the same percentage. As with the wheat example, note that a GJ is a measure of energy equal to a billion joules, or roughly 239,000 Calories; also, a Mg is one million grams.

Name	Quantity	kJ Energy/kg	g Protein/kg	g Fat/kg	Energy (GJ/day)	Protein (Mg/day)	Fat (Mg/day)
Palm oil	0	37,000	0.00	1000.00	0	0	0
Margarine and Shortening	933,900	31,800	1.68	856.79	81,300	5	2,200
Fat preparations nes	162,900	NA	NA	NA	NA	NA	NA

Standardization of nutrients is now a simple last step: all the variables here (i.e. calories, fats, and proteins) are purely additive, so the standardized calories/fats/proteins are simply the sum of the total calories/fats/proteins for each commodity:

Commodity	Energy (GJ/day)	Protein (Mg/day)	Fat (Mg/day)
Sugar	81,300	5	2,200

To convert these figures into something more meaningful, we may divide by the population of the country. If we assume this country has 600 million inhabitants, we have:

Commodity	Calories/person/day	g Protein/person/day	g Fat/person/day
Sugar	32	0	4