Food and Agriculture Organization
of the United Nations

Food Balance Sheets

Methodological principles for the construction of country-level FBS

2017

Learning objectives

At the end of this session, the audience will:

a) Know all the relevant concepts involved in compiling FBS

b) Be able to understand the difference between supply utilization accounts (SUA) and Food Balance Sheets (FBS)

c) Understand how commodity trees link SUA back to the primary commodity equivalent-level FBS

d) Know the recommended balancing mechanism and their alternatives

Outline

1. Basic identity and approach
2. Definitions of FBS components
3. Additional variables
4. Supply Utilization Accounts (SUAs) and link with FBS
5. Balancing mechanisms

1. The basic identity and approach

1. The basic identities

- Basic premise of FBS :
  - within a given country in a given year, the sum of all aspects in the supply of a given product = the sum of utilizations for that product

- This concept is expressed in two basic identities of FBS:
  1) Domestic supply = Domestic utilization
  2) Total supply = Total utilization

1. The basic identities

a) Domestic supply = Domestic utilization

Opening Stocks + Production + Imports – Exports = Food + Feed + Seed + Tourist Food + Industrial Use + Loss + Residual Use + Closing Stocks

b) Total supply = Total utilization

Opening Stocks + Production + Imports = Exports + Food + Feed + Seed + Tourist Food + Industrial Use + Loss + Residual Use + Closing Stocks

→ **Food processing could be included in the utilization part of the equation but this variable is dropped in the final stages of FBS compilation**

1. The basic identities

a) Domestic supply = Domestic utilization

Supply (t)	Utilization (t)
opening stocks production imports - exports	feed seed loss processing food industrial use other utilization closing stocks tourist food
Domestic supply	Domestic utilization

b) Total supply = Total utilization

Supply (t)	Utilization (t)
opening stocks production imports	exports feed seed loss processing food industrial use other utilization closing stocks tourist food
Total supply	Total utilization

1. The basic identities

As many countries do not collect data on stock levels for the majority of products, absolute opening and closing stock levels are replaced by **estimate of the change in stock levels** during the reference period.

a) Domestic supply = Domestic utilization

Production + Imports – ΔStocks **=** Food + Feed + Seed + Tourist Food + Industrial Use + Loss + Residual Use

b) Total supply = Total utilization

Production + Imports – ΔStocks **=** Exports + Food + Feed + Seed + Tourist Food + Industrial Use + Loss + Residual Use

1. The basic identities

a) Domestic supply = Domestic utilization

Supply (t)	Utilization (t)
production imports – exports **ΔStocks**	feed seed loss processing food industrial use other utilization tourist food
Domestic supply	Domestic utilization

b) Total supply = Total utilization

Supply (t)	Utilization (t)
opening stocks production Imports **ΔStocks**	exports feed seed loss processing food industrial use other utilization tourist food
Total supply	Total utilization

1. The basic identities

The basic identity can also be specified with an additional utilization variable: **food processing.**

Production + Imports – ΔStocks **=** Exports + Food + Food Processing + Feed + Seed + Tourist Food + Industrial Use + Loss + Residual Use

Food processing is not always included in expressions of the basic underlying identity, because this variable is dropped in the final stages of FBS compilation in order to avoid double-counting.

However, food processing should be included as a utilization variable in the specification of the preliminary individual commodity balances (SUA).

2. The SUA/FBS variables

2.1. Supply and use variables

The basic supply and utilization variables cover all of the aspects of the basic identity.

Supply variables	Use variables
a) Production b) Imports and Exports c) Stocks	d) Food e) Food Processing f) Feed g) Seed h) Tourist food i) Industrial use j) Loss k) Residual and other uses

N.B.: The following variables are defined more in-depth in session 3.

2.2. Additional variables

In order to compose the complete FBS (including estimates of per capita nutrient availability) several additional variables are required:

- **Population (UNPD)**

  - UNPD definition : "*de facto* population in a country, area or region as of 1 July of the year indicated".

  The term *de facto* indicates that not only citizens, but all residents should be counted in the population (including refugees or resident migrant workers).

  - Estimates of population are needed to convert aggregate national nutrient supplies into per capita nutrient supplies

2.2. Additional variables

- **Nutrient Estimates**

  - Nutrient estimates allow to derive **estimates of the amount of calories, fat, and protein available** for consumption by a country's population.

These estimates are **derived from the final "food" estimates** in the balance sheet for each product **by applying certain conversion factors** to those quantities.

Nutrient-related variables derived:

- Food: total calorie equivalent
- Calories per capita per day
- Food: total protein equivalent
- Proteins per capita per day
- Food: total fat equivalent
- Fats per capita per day

Nutrient conversion table:
http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Food_security/Excel_sheets/Nutritive_Factors.xls

2.2. Additional variables

- **Activity and productivity variables**

➢ Other relevant variables that could be necessary for:

1. The imputation of missing values (activity and productivity variables)

Activity variables	Productivity variables
• Crops: area sown, area harvested • Livestock: number of animals	• Crops: Yield in MT/HA • Livestock: carcass weight and take-off

2. Validation of main production variables

   e.g. to check the production estimate, compilers can (i) analyse the area and yield, (ii) compare yields to historic trends or agronomic potential.

   e.g. to validate the quantity of meat produced from a given number of animals, compilers can use the carcass weight.

2.2. Additional variables

- **Extraction rates**

  - They are parameters that reflect the loss in weight in the **conversion (or processing) of one product into another**.

  - Extraction rates are expressed as a percentage, and are calculated as the amount (by weight) of derived product that is produced using a given amount of input product:

$$\boxed{Extraction\ rate = \frac{Quantity\ of\ output}{Quantity\ of\ input}}$$

e.g. to produce 80 MT of maize flour, 100 MT of maize are needed: the extraction rate is 80%.

$$Extraction\ rate = \frac{80\ MT\ maize\ flour}{100\ MT\ maize}$$

2.2. Additional variables

- Extraction rates are key components of the FBS, both when calculating the production of processed products from primary ones, and when converting derived product quantities back up to primary product equivalent.

N.B.: In cases where several output products are produced from a single transformation process of one input good → check that the cumulative extraction rate is less than 100%.

Carrying forward ward the example of maize flour, the same transformation process that produces flour also produces both maize bran and maize germ.

The only exception is in cases where water, vinegar, or other products have been added during the transformation process.

2.2. Additional variables

- **Processing shares**

    - Percentages of the amount of a given commodity sent to processing
    - Necessary for FBS because:
        - goods can be processed into an array of derived products, and
        - the input used for the production of these derived goods is seldom known with certainty

    → Shares can be applied to the amount of a good sent to processing to calculate the amount of input into a given transformation process, and then an extraction rate can be applied to those inputted quantities to derive a production estimate.

→ Processing shares + extraction rates estimate of the production of derived goods when very little information exists.

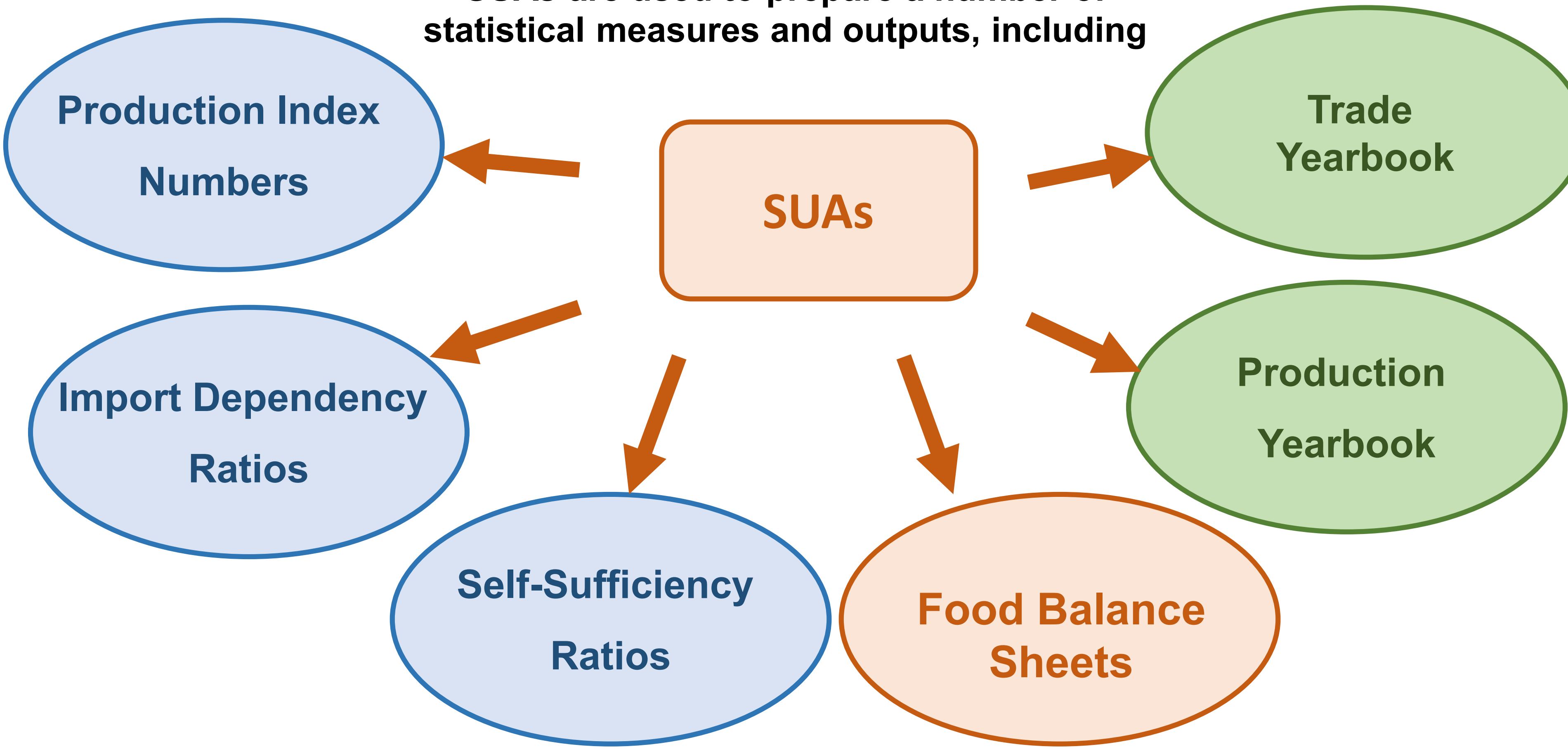
3. Supply Utilization Accounts (SUAs) and link with FBS through standardization using commodity trees

3.1. Supply Utilization Accounts (SUAs) and FBS

FBS	SUA
▪ Published at the primary commodity equivalent level (in order to facilitate interpretation and policy formation) ▪ Doesn't provide a holistic picture on how the commodity is being consumed, traded, or otherwise used after being processed into various derived products	▪ Are the accounting balances for individual products ▪ Supply and demand occurring for each products, both primary and derived

3.1. Supply Utilization Accounts (SUAs)

SUAs are used to prepare a number of statistical measures and outputs, including



3.1. Supply Utilization Accounts (SUAs) and FBS

Exemple of SUA table for paddy rice

Product	Production	Imports	Exports	Stock change	Food	Food processing	Feed	Seed	Net Tourist Food	Industrial Use	Loss	ROU
1 Paddy rice	-	-	-	-	-	-	-	-	-	-	-	-
Husked rice 2	-	-	-	-	-	-	-	-	-	-	-	-
Milled paddy rice 2	-	-	-	-	-	-	-	-	-	-	-	-
Rice bran	-	-	-	-	-	-	-	-	-	-	-	-
Broken rice	-	-	-	-	-	-	-	-	-	-	-	-
Rice flour 3	-	-	-	-	-	-	-	-	-	-	-	-

For each primary commodity family, compilers should elaborate SUAs for both the primary commodity in question and all of its derived sub-products, which can include several different levels of processing.

Each of these subsequent processing levels is linked back to the previous level through an extraction rate.

3.1. Supply Utilization Accounts (SUAs) and FBS

Example of a sample blank SUA table for soybeans:

Product	Production	Imports	Exports	Stock change	Food	Food processing	Feed	Seed	Net Tourist Cons.	Industrial Use	Loss
Soybeans	-	-	-	-	-	-	-	-	-	-	-
Oil of soybeans	-	-	-	-	-	-	-	-	-	-	-
Cake of soybeans	-	-	-	-	-	-	-	-	-	-	-
Soy sauce	-	-	-	-	-	-	-	-	-	-	-
Margarine & shortening	-	-	-	-	-	-	-	-	-	-	-
Hydrogenated oils and fats	-	-	-	-	-	-	-	-	-	-	-

3.1. Supply Utilization Accounts (SUAs) and FBS

SUAs can include several different levels of processing

Example:

- Soybean (1) is processed into soybean oil and cake (2a), or processed into soy sauce (2b)
- Soybean oil (2a) is processed into margarine/shortening (3a) or hydrogenated oils and fats (3b)

REMEMBER THAT: each of these subsequent processing levels is linked back to the previous level through an extraction rate.

*Quantity of output = Quantity of input * Extraction rate*

Example: Quantity of soybean oil = 9,750 MT soybean * 0.18 = 1,755 MT

→ 100 MT of soybean will only yield around 18 MT of soybean oil after processing.

3.1. Supply Utilization Accounts (SUAs) and FBS

This non-equivalence between 100 MT of soybean oil and 100 MT of soybean can also be seen by working backward from the amount of oil.

In order to produce 100 MT of soybean oil, about 555 MT of fresh soybean would be needed as input.

$$\boxed{\textit{Quantity of input} = \frac{\textit{Quantity of output}}{\textit{Extraction rate}}}$$

<u>REMEMBER THAT</u>:

- It is incorrect to simply add the quantities of primary and derived products together.
- Derived products must first be converted back to their "primary commodity equivalent" and then all of the primary commodity equivalents can be added together to arrive at one overall balance.
- Derived products can be converted back to their primary commodity equivalents simply by dividing by the extraction rate.

3.1. Supply Utilization Accounts (SUAs) and FBS

Equation used in the standardization process:

$$\boxed{Primary\ commodity\ equivalent = \frac{Quantity\ of\ derived\ product}{Extraction\ rate}}$$

This linking of primary to derived commodities using extraction rates is fundamental to the FBS compilation process.

<u>REMEMBER THAT</u>: most food manufacturing commodities produce multiple outputs, and it is even possible for those outputs to undergo further transformation into second-tier derived goods.

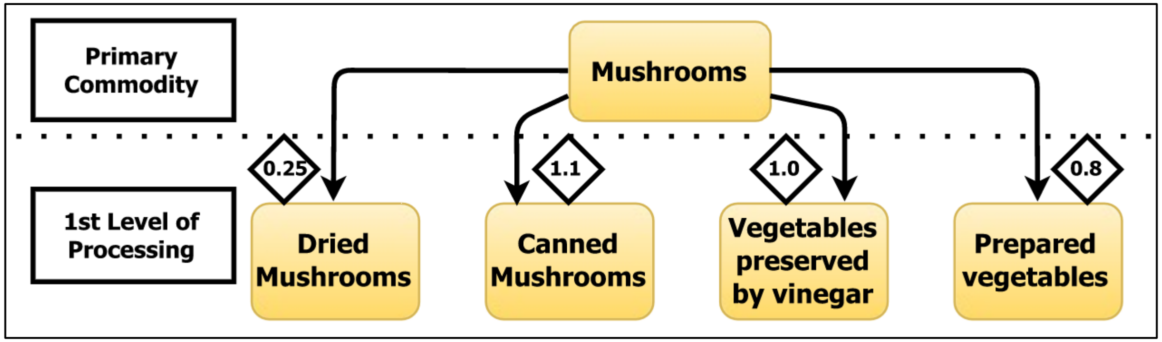
In order to better conceptualize these primary/derived product relationships, commodities and their derived products are organized into “commodity trees.”

3.2. Commodity Trees

Commodity trees "stem" from **one primary product** and then branch out into one or successive levels of **processed products**, with each level **linked by extraction rates**.

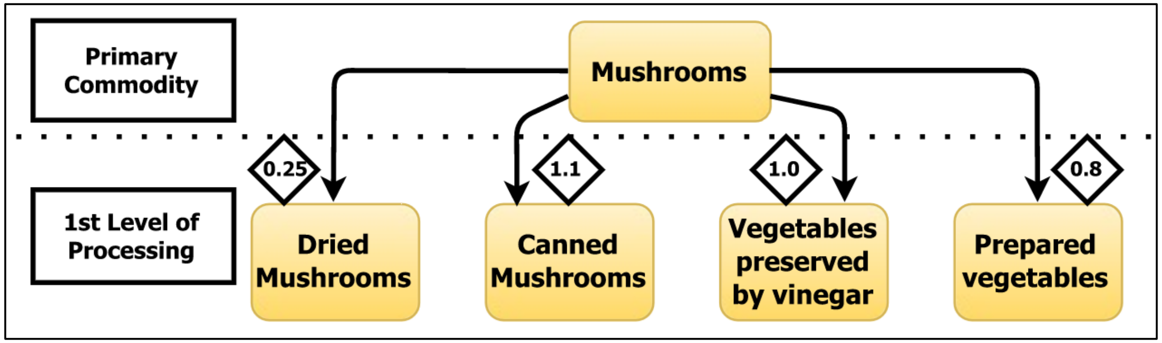
- They are designed to be exhaustive.

Example 1: Mushroom Commodity Tree



- the primary commodity "mushrooms" can be processed into 4 different derived products
- the extraction rate for each of these conversion processes is noted in the diamond above each derived product.

3.2. Commodity Trees



Dried mushrooms: extraction rate = 0.25 → for every 100 MT of mushrooms that enter the process to become dried mushrooms, 25 MT of dried mushrooms will be produced.

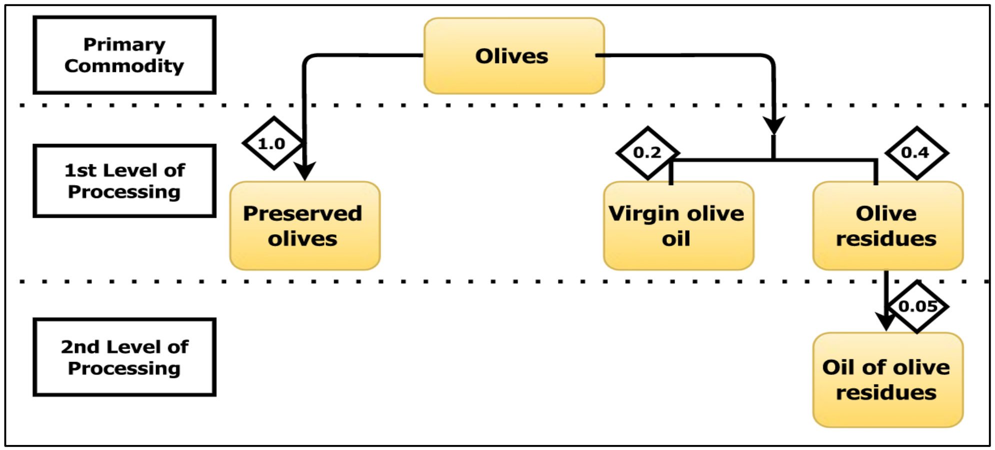
Extraction rates for most processes are less than 1.

Exceptions: water or brine are added in the processing.

Example - canned mushroom: extraction rate = 1.1 → for every 100 MT of mushrooms entering the canning process, 110 MT of canned mushrooms results (due to the fact that brine is added in the process of canning).

3.2. Commodity Trees

Example 2: Olive Commodity Tree



The transformation process has two outputs:

- virgin olive oil
- olive residues

Virgin olive oil: extraction rate = 0.2 → for every 100 MT of olives milled, 20 MT of olive oil are produced.
But **this same process** also creates 40 MT of olive residues.

Multiple products that are produced from a single transformation process are called **co-products.**

NOTE THAT: only one commodity from each transformation process is standardized and aggregated - in order to avoid double-counting.

- the product that is standardized will typically be the one that makes the largest contribution to food.

3.2. Commodity Trees

Countries are encouraged to :

1) review the commodity trees, and

2) update them, using country-specific extraction rates

NIGERIA			
CROPS AND DERIVED PRODUCTS			
	Seeding rates	Extraction rates	Waste of supply
	KG/HA	%	%
CEREALS			
Wheat	50		2
Flour of Wheat		72	2
Bran of Wheat		25	
Rice, Paddy	50		7.3
Rice, Husked		70	3

→ In the absence of extraction rate estimates from the country, extraction rates of neighboring countries can certainly be adopted as a next-best option (particularly if the neighboring country utilizes similar technologies)

Technical Conversion Factors for Agricultural Commodities:

http://www.fao.org/fileadmin/templates/ess/documents/methodology/tcf.pdf

3.3. Processing Shares

Processing share is the percentage of the amount of a given commodity sent to processing that is thought to be dedicated to a specific transformation process.

- These shares are used to calculate the amount of input used for a given transformation process.

*Q input for B = of A sent to processing * B's processing shares*

The quantity of input required for any processed *Good B* is equivalent to the quantity of its source Good A that is sent to processing, multiplied by the a priori processing share.

<u>NOTE THAT:</u>

1. for co-products, their processing shares will be identical.
2. the processing shares must sum to 100 (given that all of the higher-level good sent to processing is transformed into some other good).

3.3. Processing Shares (Example)

FBS compilers in Country A know that olives are processed domestically into both preserved olives and virgin olive oil.

The FBS compilers know that the amount of olives sent to processing = 150,000 MT.

By consulting with market experts, the compilers learn that around 10% percent of olives are processed into preserved olives, indicating that 90% of olives are milled for olive oil.

<u>Note that:</u>

1) co-products from the same transformation process will have identical processing shares as they are two goods derived from a single input (the processing shares for virgin olive oil and olive residues will both be 90%);

2) the processing shares for the different transformation processes must sum to 100 → FBS compilers must ensure that all transformation processes are accounted for.

→ For this example, although there are three output goods, there are only two transformation proces

		Olives	Preserved olives	Virgin olive oil	Olive residues
A	Amount Processed	150,000			
B	Processing Share		10%	90%	90%

3.3. Processing Shares (Example)

FBS compilers in Country A know that olives are processed domestically into both preserved olives and virgin olive oil.

1. **Calculate the amount of input for each good** (line C)

		Olives	Preserved olives	Virgin olive oil	Olive residues
A	Amount Processed	150,000			
B	Processing Share		10%	90%	90%
C	**Amount of Input**		**15,000**	**135,000**	**135,000**

2. Add the product-specific extraction rate to **calculate production of the derived good** by multiplying the amount of input (line C) by the product-specific extraction rates (line D).

		Olives	Preserved olives	Virgin olive oil	Olive residues
A	Amount Processed	150,000			
B	Processing Share		10%	90%	90%
C	Amount of Input		15,000	135,000	135,000
D	**Extraction Rate**		**100%**	**20%**	**40%**
E	**Production**		**15,000**	**27,000**	**54,000**

4. The recommended balancing mechanism

4.1. The balancing mechanism: Introduction

Main objective of balancing: supply = utilization

→ balancing the equation in practice is not so straightforward:

Reason 1: usually not all the supply and demand variables are measured by countries

- Most of the time, supply-side variables are measured, while more of the demand-side variables are imputed or estimated
- If all of the demand side variables were to be estimated in order to balance out the supply side, then all of the measurement error of the supply-side variables would accumulate in the demand-side variables, affecting the accuracy of demand-side estimates.

4.1. The balancing mechanism: Introduction

Reason 2: in the rare cases where all supply and demand variables are measured independently, it is not likely that the point estimates alone would lead to a precisely-balanced supply and demand equation.

Discrepancies in:

- data sources
- data collection and compilation methods
- reference periods and measurement errors occurring at any if these stages

4.1. The balancing mechanism: Introduction

<u>**Previous approach**</u>: assign one element of the equation as the balancing item.

- Variable used for balancing vary but feed or food are commonly used.
- Most appropriate method when all of the variables are measured *except* for the balancing item.

→ This "one balancer" approach has been popular for decades (main advantage: being convenience)

- Drawbacks:

(i) in most countries, few of the utilization variables are measured, such that the supply = utilization equation will actually have <u>more than one unknown;</u>

(ii) estimates for the balancing item could <u>fluctuate wildly</u> from year to year;

(iii) if the errors are biased, those annual <u>errors accumulate</u>, and it may become difficult to distinguish from the error itself;

(iv) the <u>choice of variable to use as the balancer</u> can be problematic.

4.1. The balancing mechanism: Introduction

Preferred approach:

- not only acknowledges measurement error
- but also seeks to use these errors of individual variables to help balancing the overall identity

→ Need to specify each of the variables as a range of possible values, or confidence interval, according to their measurement errors

$$\boxed{P^* + I^* - dSt^* = X^* + Fo^* + Fe^* + Se^* + T^* + IU^* + Lo^* + ROU^*}$$

where: $variable^*$ = variable + *e (variable)*

e = measurement error

4.1. The balancing mechanism: Introduction

3 steps to distribute the equation's imbalance:

Step 1: calculate the imbalance from the supply = utilization identity

$$\boxed{Imb = P + I - dSt - X - Fo - Fe - Se - T - IU - Lo - ROU}$$

where: *Imb* is the imbalance for a given commodity in a given country

Note that:

- in this step, the imbalance is calculated from the variable point estimates
- No accounting has yet been made for the measurement error…that follows in Step 2

4.1. The balancing mechanism: Introduction

Step 2: distribute the imbalance throughout the supply = utilization identity.

- Can be more or less complicated or computationally demanding, and it is here that the methodological approaches of countries may differ

- The optimal approach will consider all of the information contained within the underlying variable estimates

- The direction of adjustments in the point estimates will depend upon the sign on the imbalance calculated in Step 1 :

  - if the calculated imbalance is **positive** → supply > utilization → adjustments in the supply variables (production and imports) should be downward;
  - if the calculated imbalance is **negative** → supply < utilization → adjustments in the utilization variables must be positive.

4.1. The balancing mechanism: Introduction

Step 3: check that all balanced quantities are within any set bounded values, and rebalance if necessary.

- If the balancing process will produce results where certain balanced quantities are estimated outside of bounded (or likely) values, this problem is resolved by:

    1) setting the value in question at the boundary level and assigning that value a zero standard deviation (so, a fixed, “balanced” value)

    2) repeating Steps 1 and 2 in order to redistribute the imbalance

4.2. The recommended approach to distribute the imbalance at FBS level

Different methods can be used to distribute the imbalances.

Recommended approach : **Distribute imbalance proportionally based on aggregated error**

> Rationale: the variables with the highest measurement errors (considered the least reliable) are adjusted proportionally more than variables with a lower assigned measurement error.

Step 1: Use measurement error percentages and point estimates to quantify the error of each variable.

Step 2: Sum up the individual errors of each variable to calculate an aggregated error for the equation.

Step 3: Calculate the proportion of the aggregated error for each of the elements.

Step 4: Distribute the imbalance proportionally.

Step 5: Ensure that any constraints are met, and recalculate if necessary.

4.2. The recommended balancing mechanism (Example)

The recommended approach

Example: FBS compilers in Country Z have produced the following unbalanced SUA table for sorghum in their country.

Line	Product	Production (1)	Imports (2)	Exports (3)	Feed (4)	Seed (5)	Loss (6)	
A	Sorghum	892	307	48	1061	3	44	
B	Imbalance for A							43
C	Measurement error (in %)	15.0%	0.0%	0.0%	40.0%	15.0%	15.0%	

- Line A: point estimates

- Line B: imbalance (imb = P + Im - Ex –Fe – Se – Lo)

- Line C: measurement errors

4.2. The recommended balancing mechanism (Example)

Step 1: Quantify the error into units instead of percentages.

Unbalanced sorghum table with quantified error

Line	Product	Production (1)	Imports (2)	Exports (3)	Feed (4)	Seed (5)	Loss (6)	
A	Sorghum	892	307	48	1061	3	44	
B	Imbalance for A [A=A1+A2-A3-A4-A5-A6]							43
C	Measurement error (in %)	15.0%	0.0%	0.0%	40.0%	15.0%	15.0%	
D	**Error [D=A*C]**	**133.8**	**0**	**0**	**424.4**	**0.5**	**6.6**	

4.2. The recommended balancing mechanism (Example)

Step 2: Sum individual variable errors to calculate aggregated error

Line	Product	Production (1)	Imports (2)	Exports (3)	Feed (4)	Seed (5)	Loss (6)	
A	Sorghum	892	307	48	1061	3	44	
B	Imbalance for A [A=A1+A2-A3-A4-A5-A6]							43
C	Measurement error (in %)	15.0%	0.0%	0.0%	40.0%	15.0%	15.0%	
D	Error [D=A*C]	133.8	0	0	424.4	0.5	6.6	
E	**Aggregated error [E=D1+D2+D3+D4+D5+D6]**							**565.3**

The individual error estimates for each of the variables is added up to arrive at an estimate of the equation's aggregated error

4.2. The recommended balancing mechanism (Example)

Step 3: Calculate proportion of aggregated error for each individual variable

Line	Product	Production (1)	Imports (2)	Exports (3)	Feed (4)	Seed (5)	Loss (6)	
A	Sorghum	892	307	48	1061	3	44	
B	Imbalance for A [A=A1+A2-A3-A4-A5-A6]							43
C	Measurement error (in %)	15.0%	0.0%	0.0%	40.0%	15.0%	15.0%	
D	Error [D=A*C]	133.8	0	0	424.4	0.5	6.6	
E	Aggregated error [E=D1+D2+D3+D4+D5+D6]							565.3
F	**Proportion of aggregated error [F=D/E]**	**23.7%**	**0.0%**	**0.0%**	**75.1%**	**0.1%**	**1.2%**	

- **Line F:** the proportion of the aggregated error that belongs to each one of the individual variables is calculated (by dividing the error of each individual variable, line D, by the aggregated error estimate, line E.

4.2. The recommended balancing mechanism (Example)

Step 4: Distribute the imbalance proportionally, based upon these percentages

Line	Product	Production (1)	Imports (2)	Exports (3)	Feed (4)	Seed (5)	Loss (6)	
A	Sorghum	892	307	48	1061	3	44	
B	Imbalance for A [A=A1+A2-A3-A4-A5-A6]							43
C	Measurement error (in %)	15.0%	0.0%	0.0%	40.0%	15.0%	15.0%	
D	Error [D=A*C]	133.8	0	0	424.4	0.5	6.6	
E	Aggregated error [E=D1+D2+D3+D4+D5+D6]							565.3
F	Proportion of aggregated error [F=D/E]	23.7%	0.0%	0.0%	75.1%	0.1%	1.2%	
G	**Adjustment [G=B*F]**	**10.2**	**0.0**	**0.0**	**32.3**	**0.0**	**0.5**	
H	**Sorghum adjusted values [for (1) and (2), H=A-G, for remaining, H=A+G]**	**881.8**	**307.0**	**48.0**	**1093.3**	**3.0**	**44.5**	
I	**Imbalance for H [I=H1+H2-H3-H4-H5-H6]**							**0**

4.2. The recommended balancing mechanism (Example)

Step 5: ensure that any constraints are met and recalculate if necessary

In this particular example, no values violate any constraints, so no rebalancing is necessary and the account can be considered to be balanced.

Pros of this approach:

- it is not computationally demanding and can easily be replicated.
- it takes into account the imprecision of the point estimates by calculating the adjustments based on measurement error, using all available information.

Cons of this approach:

- the balanced equation produced will vary slightly depending upon the *a priori* assigned measurement errors.
- this method may not be feasible for countries who wish to publish detailed accounts for derived products

4.3. Other balancing mechanisms

a) Assigning small, positive imbalances to a “residual use” category

- This approach could be utilized in cases where a positive imbalance is below an *a priori* threshold (< 5% of total supply or total demand).
- It should not be used for imbalances greater than this level.
- In this way the error does not accumulate in any of the other variables, and it is dealt with in a transparent way.

b) Single balancer approach

- One utilization variable is calculated as the remainder after all other utilizations are accounted for.
- Note that not all variables are appropriate as balancers in the single balancer approach, and
- the degree of appropriateness may even differ from product to product.

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4.4. Constraints on the balancing process

Step 3 of the recommend balancing approach alludes to the idea that the balancing process should take into account certain constraints on the values.

A) ROW CONSTRAINTS

1) For each commodity supply must be equal to utilization

SUPPLY = UTILIZATION

2) As an extension of this row constraint, a country's exports of a given commodity cannot exceed their supply of that commodity

Production + Imports – Δstock > Exports

- useful way of either identifying errors in trade data or alerting country-level FBS analysts that production of a new commodity is taking place

4.4. Constraints on the balancing process

B) COLUMN CONSTRAINTS

1) Single-year column constraints

examples:

- changes in food availability and derived DES estimates: barring catastrophe, DES estimates are unlikely to vary greatly on an annual basis → aggregate changes of 100 calories per capita is the absolute upper bound.
- stocks: subtraction from stocks in a given year cannot be greater than the overall level of stocks.

2) Multiple-year column constraints

examples:

- stocks: it is considered highly unlikely that a country would either add to stocks or take away from stocks for many years in a row → impose a bound on the stocks changes in the balancing process

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4.4. Constraints on the balancing process

C) *"VERTICAL STANDARDIZATION"* CONSTRAINT

In cases where production, trade, and other utilizations of derived products come from official data:

→ ensure that there is a sufficient quantity of primary product sent to processing to ensure that each of the derived product accounts do not have any negative discrepancies ("row constraint").

D) IMBALANCE EXCEEDS AGGREGATE MEASUREMENT ERROR

- These instances can result from much larger error in one of the point estimates than is indicated by the assigned measurement error
- It does indicate that the confidence intervals are set too conserve

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Conclusions

1. Food balance sheets:
   - based on an overall supply = utilization identity
   - accounts of primary and derived products are organized into commodity trees and linked by extraction rates
2. Individual supply utilization accounts of derived products are filled and balanced, then aggregated up to the primary commodity equivalent level
3. Accounts at the primary commodity equivalent level are then balanced
4. The recommended approach

References

- Global Strategy to improve agricultural and rural statistics, 2017. *Handbook of Food Balance Sheet*, Rome, Italy, Chapter 2

- FAO, 2016. *Technical Conversion Factors for Agricultural Commodities,* Rome, Italy

Thank You