



# Food Balance Sheets

FBS Component: Stocks and Stock  
Changes

# Learning Objectives

At the end of this presentation, the audience will know:

- a) Different data sources for stocks and stocks changes
- b) Recommended approach for estimating stocks changes

# Outline

1. Definitions
2. Data sources
3. Imputation and Estimation

# 1. Definition of Stock in FBS

- Stocks
- Stocks are defined as the aggregate total of product allocated to storage for use at some future point in time
- Stocks can be held by a variety of actors at any level of the supply chain - from production to retail.

## Who holds commodity Stocks?

- governments,
- manufacturers,
- importers,
- exporters,
- resale or wholesale merchants,
- farmers

# 1. Definition of Stock in FBS

- Change in stocks
- In principle, changes in stocks comprises changes in stocks occurring during the reference period at all levels from production to retail level, i.e. it comprises changes in:
  - Government stocks,
  - Stocks with manufactures,
  - Importers,
  - Exporters
  - Other whole sale and retail merchants
  - Transport and storages enterprises
  - Stocks in farms

# 1. Definition of Stock in FBS

- Why are stocks kept?

Stocks are kept:

- To smooth consumption levels between harvests
- To ensure against food shortages
- To increase market power

# 1.1 How to take stocks into account in FBS?

Stocks can be accounted for in **two ways**:

## 1. First way

First of all, stock levels at both the **beginning** and **end** of the period can be noted

Domestic supply = domestic utilization:

- *Opening Stocks* + *Production* + *Imports* – *Exports* = *Food* + *Feed* + *Seed* + *Tourist Food* + *Industrial Use* + *Loss* + *Residual Use* + *Closing Stocks*
- Total supply = Total utilization:
- *Opening Stocks* + *Production* + *Imports* = *Exports* + *Food* + *Feed* + *Seed* + *Tourist Food* + *Industrial Use* + *Loss* + *Residual Use* + *Closing Stocks*

# 1.1 How to take stocks into account in FBS?

## 2. Second way

Alternatively, the FBS framework can be elaborated by estimating the change in stocks from one time period to the next as a component of supply

Domestic supply = domestic utilization:

$$- \textit{Production} + \textit{Imports} - \textit{Exports} - \Delta\textit{Stocks} = \textit{Food} + \textit{Feed} + \textit{Seed} + \textit{Tourist Food} + \textit{Industrial Use} + \textit{Loss} + \textit{Residual Use}$$

Total supply = total utilization:

$$- \textit{Production} + \textit{Imports} - \Delta\textit{Stocks} = \textit{Exports} + \textit{Food} + \textit{Feed} + \textit{Seed} + \textit{Tourist Food} + \textit{Industrial Use} + \textit{Loss} + \textit{Residual Use}$$

- where  $\Delta\textit{Stocks} = \textit{Closing Stocks} - \textit{Opening Stocks}$ .



## 2. Data sources

### Official data sources

**Official government agricultural surveys** are the preferred mechanism through which to collect data on stock levels.

- Farm surveys can produce estimates of on-farm stocks,
- Surveys of processors, manufacturers, exporters, or distributors can target stockholding elsewhere in the supply chain.
- Governments themselves may also be large stockholders of certain food commodities

## 2. Data sources

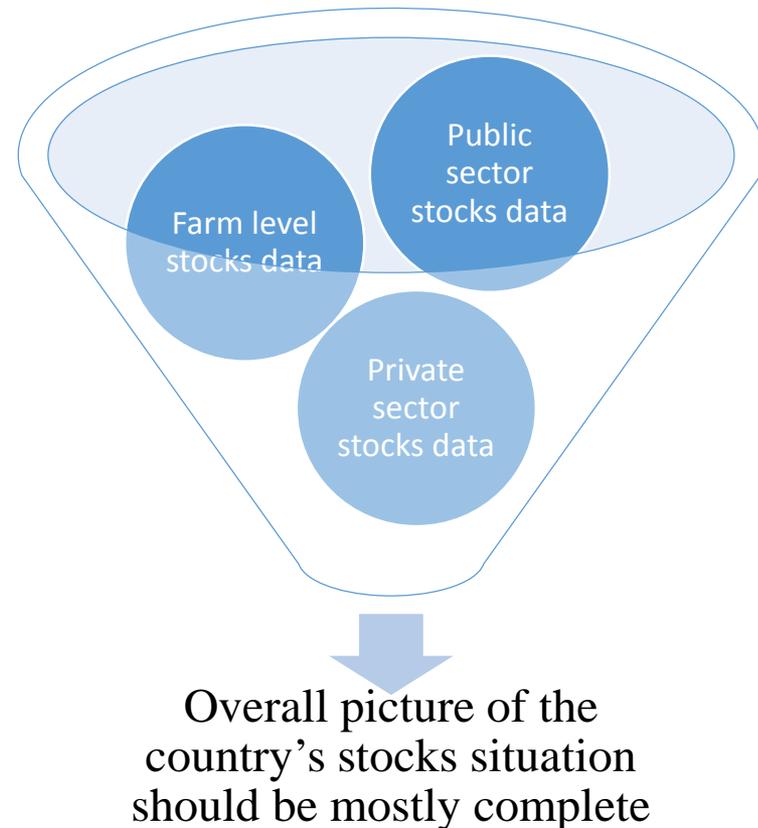
### Official data sources

#### AMIS recommendation:

Make explicit efforts to measure stock levels of major commodities rather than rely on an imputation or estimation approach

The first of these recommendations is the adding of a stocks module to periodic agricultural production surveys

The second action is the reporting of government-held stock levels



## 2. Data sources

### Official data sources

Additionally, the Global Strategy has included this variable in the minimum set of core data that should be measured and disseminated annually (FAO et al., 2012).

## 2. Data sources

### Alternative data sources

- Outside of official sources, data on stocks are often limited to only one aspect of the marketing chain (processors, for example)
- For this reason, countries are encouraged to develop strategies to survey overall stock levels in an official capacity rather than rely on incomplete estimations from one segment of the supply chain
- However, for some supply chains reports of **stock levels from processors or industry** could account for the majority of stockholdings, and thus be invaluable to estimating total stock levels.

## 2. Data sources

### Alternative data sources

- Consult the AMIS database, which estimates **closing stock levels** for **maize, wheat, rice, and soybeans** for more than 20 of the world's largest producers and consumers of those commodities
  - <http://statistics.amis-outlook.org/data/index.html#HOME>.
- Similarly, estimates on global **sugar stocks** can be accessed from F.O. Licht
  - <https://www.agra-net.com/agra/international-sugar-and-sweetener-report/>.

# 3. Imputation and estimation

- A few different approaches can be used to impute or estimate stock changes, subject to some cumulative constraint on stock levels.
- The approaches may vary depending upon the commodity in question.

# 3. Imputation and estimation

## Recommended approaches

The recommended approach is a purely mathematical point of view based on the supply=utilization identity.

## What motivates the choice of this approach?

- stocks represent the mismatch between supply and utilization in a given year.
- most domestic utilizations tend to change little from year to year,
- Therefore, changes in stock positions tend to be correlated with changes in domestic supply (that is, production plus imports, minus exports).
- As such, changes in stocks can be modeled as a function of changes in internal supply.

# 3. Imputation and estimation

## Recommended approaches

The function is written as follow:

- $\Delta \mathbf{Stocks}_t = f(\Delta \mathbf{Supply}_t) + \varepsilon_t$
- Where:
- $\Delta \mathbf{Stocks}_t$  is equivalent to  $\mathbf{Stocks}_t - \mathbf{Stocks}_{t-1}$ ,
- $\Delta \mathbf{Supply}_t$  is equivalent to  $[\mathbf{Production} + \mathbf{Imports} - \mathbf{Exports}]_t - [\mathbf{Production} + \mathbf{Imports} - \mathbf{Exports}]_{t-1}$ , and
- $\varepsilon_t$  is an error term.

# 3. Imputation and estimation

## Recommended approaches

- FBS compilers can estimate this relationship using regression analysis and choose the **functional form most appropriate** for their situations.
- Compilers may wish to add additional variables in their regressions, but the basic approach should remain the same

# 3. Imputation and estimation

## Recommended approaches

- The imputation of stock changes through this recommended approach relies on countries having historically measured stock levels for the commodity in question
- Estimates of stock changes derived from regressions must be checked against a constraint for cumulative stock levels. That is, **a negative stock change in any given year may not exceed the previous level of stocks**
- The last concept to keep in mind when modelling stock changes is that over several successive years, cumulative stock changes should sum to approximately zero

# 3. Imputation and estimation

## Alternative approach

- If historical data on stock levels for **grains, pulses, sugar, and oilseeds**, are not available, compilers can preliminarily use stocks to “balance” the supply and demand equation.
- But this approach should only be utilized in instances where there is some measured data used to derive the food estimate.
- Otherwise, compilers are dealing with an equation with **two unknowns**, and error cannot properly be accounted for.
- Even in this case, compilers must check cumulative changes against a running estimate of stock levels to ensure that estimated changes are feasible.

# 3. Imputation and estimation

## Alternative approach

- For **some perishable products**, stock changes can be used to smooth supply fluctuations from year-to-year.
- In these cases, compilers should be aware that stocks accumulated in one year should in most cases be entirely or nearly entirely used in the following year.
- Compilers should also consider adjusting losses to account for any stocks not allocated to consumption in the following year.
- However, before this approach is followed, compilers should have a solid understanding of the supply chain for the respective product.

# References

- Global Strategy to improve agricultural and rural statistics, 2017. *Handbook of Food Balance Sheet*, Rome, Italy, chapter 3.5, section 3.5.3
- Agricultural Market Information System, *Expert Meeting on Stocks Measurement*, 21 November 2014, International Grains Council, London



Thank You