ASIA AND PACIFIC COMMISSION ON AGRICULTURAL STATISTICS

<table>
<thead>
<tr>
<th>TWENTY-SEVENTH SESSION</th>
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<tbody>
<tr>
<td>Nadi, Fiji, 19 – 23 March 2018</td>
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<td>Agenda Item 7.3a</td>
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New Methodological Framework for Compilation of country-led Food Balance Sheet

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Presentation Outline

1. Concept of Food Security and its Dimensions
2. SUA/FBS: Potential uses including SDG Monitoring
3. Basic SUA/FBS: identity and approach
4. Definitions of SUA/FBS components
5. New Changes including Balancing mechanisms
6. Requisite Steps for SUA/FBS compilation at country level
Definition and Dimensions of Food Security

• “Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life

• There are four dimensions of Food Security
  • Availability
  • Access
  • Utilization and
  • Stability

• Food Balance Sheet is closely related with the Availability Dimension of food security
History of Food Balance Sheet

• World War I: first attempts at preparing FBS

• 1936: preparation of a systematic international comparison of food consumption

• 1942-43: 1st intensive use of FBS to analyze the food security situation after the World War II

• 1949: printing of the *Handbook for the Preparation of Food Balance Sheets*
  
  o FBS were published for 41 countries and since then it’s regularly prepared and published

• 1977: food balance sheets for 162 countries
  
  o table of per caput food supplies showed [cal., prot., fat] the supply by food groups of selected minerals and vitamins
History; new methodological changes

- ≈ 2015: intensive focus of finalizing the revised FBS methodology.
  
  Same overall framework, but important innovations.

  Main changes:

a) Updating the overall approach solve the balance (more refined)

b) Updating/refining the imputation methods of the FBS components – harness links between the various FBS variables/elements and information from outside the FBS

  e.g. the new feed use imputation method (animal number, type of breeding…), seed use, stock

c) More accuracy with the various variables

  e.g. other utilization → tourist food, other utilizations

d) Less discretion of the compiler

e) International classifications adopted (FCL replaced by CPC and HS)
The **FBS** is a national accounting/statistical framework, presenting a comprehensive picture of the pattern of a country's food supply during a specified reference period.

**SUPPLY = UTILIZATION**

\[ P + I - dSt = X + Fo + Fe + Se + T + IU + Lo + ROU + \text{food processing} \]

**Where:**

- **P** = production
- **I** = imports
- \( dSt = \Delta \) stocks
- **Fo** = food
- **Fe** = feed
- **Se** = seed
- **T** = tourist food
- **IU** = industrial Use
- **Lo** = Loss
- **Rou** = Residual or other uses
Definition/Process of SUA and FBS

Population

Food component

Food conversion factors

Per capita:
- Quantity
- Calories
- Proteins
- Fats

Dietary Energy Supply (DES)
Potential Uses

• Basis for policy analysis aimed at ensuring food security:
  o Estimate the food shortages/surpluses
  o Estimate the amount of food aid
  o Estimate a country’s overall DES and macronutrient availability (proxy of food consumption)
  o Determine the availability of a certain class of food
  o Analyze livestock policies (e.g. the degree to which primary food resources are used to produce animal feed)

• Calculation of derived indicators:
  o Prevalence of Undernourishment (PoU)
  o Self-sufficiency ratio (SSR)
  o Import dependency ratio (IDR)
Potential Uses

• **Statistical proposes:**
  - Framework for data reconciliation, Harmonization of data collection efforts and Data validation
  - Improve National Account estimates,
  - Means of comparing food availability (from FBS) and food consumption (from HH surveys)
  - Benchmarking (compare food availability across countries, over time)
  - Track changes in dietary composition & growth of consumption in new products
  - Determine how prices affect food availability
  - Link to two SDG indicators (2.1.1 & 12.3.1)
The contribution of the FBS to the SDGs

Achieving the 2030 Agenda for SD

17 Goals
169 Targets
231 Indicators
• 21 Indicators under FAO’s mandate
The contribution of the FBS to the SDGs

Achieving the 2030 Agenda for SDG

17 Goals
169 Targets
231 Indicators

- 21 Indicators under FAO’s mandate
  - 2.1.1
  - 12.3.1
The contribution of the FBS to the SDGs

**DES (Dietary Energy Supply)**

**INDICATOR 2.1.1**
Prevalence of Undernourishment (PoU)

**SDG 2 TARGET 1**
"By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round"

**Post-harvest losses**

**INDICATOR 12.3.1**
Global Food Loss Index

**SDG 12 TARGET 3**
“By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.”
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

### a) Domestic supply = Domestic utilization

### b) Total supply = Total utilization

<table>
<thead>
<tr>
<th>Supply (t)</th>
<th>Utilization (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Food (+for processing)</td>
</tr>
<tr>
<td>Imports</td>
<td>Feed</td>
</tr>
<tr>
<td>– Exports</td>
<td>Seed</td>
</tr>
<tr>
<td>ΔStocks</td>
<td>Tourist</td>
</tr>
<tr>
<td></td>
<td>Industrial use</td>
</tr>
<tr>
<td></td>
<td>Loss</td>
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<tr>
<td></td>
<td>Residual</td>
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<tr>
<td>Domestic supply</td>
<td>Domestic utilization</td>
</tr>
</tbody>
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<tr>
<td></td>
<td>Industrial use</td>
</tr>
<tr>
<td></td>
<td>Loss</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
</tr>
<tr>
<td>Total supply</td>
<td>Total utilization</td>
</tr>
</tbody>
</table>


Additional variables

In order to compile 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”.

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

- **Activity and productivity variables:** Area shown/harvested, Carcass weight, Off take rate etc

- **Extraction rates:** loss in weight in the *conversion (or processing) of one product into another*.

- **Processing shares:** Percentages of the amount of a given commodity sent to processing
Supply Utilization Accounts (SUAs) and FBS

Exemple of SUA table for paddy rice

<table>
<thead>
<tr>
<th>Product</th>
<th>Production</th>
<th>Imports</th>
<th>Exports</th>
<th>Stock change</th>
<th>Food</th>
<th>Food processing</th>
<th>Feed</th>
<th>Seed</th>
<th>Net Tourist Food</th>
<th>Industrial Use</th>
<th>Loss</th>
<th>ROU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy rice</td>
<td></td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Husked rice</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Milled paddy rice</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rice bran</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Broken rice</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rice flour</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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.
Commodity Trees

Commodity Trees are designed to be exhaustive. They start with a primary product and branch out into successive levels of processed products, with each level linked by extraction rates. For example, starting with Wheat 0015, we can see:

- 1st Level:
  - Wheat flour 0016
  - Wheat bran 0017
  - Wheat germ 0019
  - Malt ex 0049
  - Bulgur, wholemeal 0021
  - Breakfast cereals ex 0041
  - Cereal preparations ex 0113
  - Bev. Dist. Alcohol. ex 0634
  - Dregs ex 0654
  - Non-food alcoh. ex 0632
  - Dregs ex 0654

- 2nd Level:
  - Cereal prep. ex 0113
  - Macaroni ex 0018
  - Bread 0020
  - Pastry 0022
  - Starch 0023
  - Gluten 0024
  - Wafers 0110
  - Wheat ferm. bev. 0026
  - Dregs ex 0654
  - Breakfast cereals ex 0041

To be expressed on dry basis.
### New Changes

- **Flags**

<table>
<thead>
<tr>
<th>Source</th>
<th>Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official</td>
<td></td>
</tr>
<tr>
<td>Semi-official</td>
<td>T</td>
</tr>
<tr>
<td>Imputed</td>
<td>I</td>
</tr>
<tr>
<td>Expert estimation</td>
<td>E</td>
</tr>
</tbody>
</table>

- **Tolerance Limit (Confidence Interval)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Confidence</th>
<th>Tolerance interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>1.0</td>
<td>± 0%</td>
</tr>
<tr>
<td>Trade</td>
<td>1.0</td>
<td>± 0%</td>
</tr>
<tr>
<td>Stocks</td>
<td>0.75</td>
<td>± 25%</td>
</tr>
<tr>
<td>Food</td>
<td>0.90</td>
<td>± 10%</td>
</tr>
<tr>
<td>Food processing</td>
<td>1.0</td>
<td>± 0%</td>
</tr>
<tr>
<td>Feed</td>
<td>0.75</td>
<td>± 25%</td>
</tr>
<tr>
<td>Seed</td>
<td>0.90</td>
<td>± 10%</td>
</tr>
<tr>
<td>Tourist Food</td>
<td>0.75</td>
<td>± 25%</td>
</tr>
<tr>
<td>Industrial Use</td>
<td>0.75</td>
<td>± 25%</td>
</tr>
<tr>
<td>Loss</td>
<td>0.75</td>
<td>± 25%</td>
</tr>
</tbody>
</table>
New Changes

• Area/Yield Imputation using time series data

• Stock Estimation

\[
\Delta Stocks_t = f (\Delta ProdNT_t) + \varepsilon_t
\]

Where:
\(\Delta Stocks_t\) is equivalent to \(Closing Stocks_t - Closing Stocks_{t-1}\),
\(\Delta ProdNT_t\) is equivalent to
\([Production + Imports - Exports]_t - [Production + Imports - Exports]_{t-1}\), and
\(\varepsilon_t\) is an error term.
New Changes

- Estimation of Food

\[
Food_t = \frac{\text{Population}_t}{\text{Population}_{t-1}} \times Food_{t-1} \\
\times \left[ 1 + \epsilon \log \left( \frac{\text{Household consumption expenditure}_t}{\text{Household consumption expenditure}_{t-1}} \right) + \phi \right]
\]

- Feed

\[
FD = \sum_i N_i \times e_i \text{(energy requirement)}
\]

- Seed

\[
Sown \ area_{t+1} = (\text{RatioSH}) \times \text{Harvested area}_{t+1}
\]

\[
\text{Seed use (MT)}_t = \text{Seeding rate } \left( \frac{\text{MT}}{\text{HA}} \right) \times \text{Sown area (HA)}_{t+1}
\]
New Changes

• **Tourist Food**

| NetTF = [#Incoming visitor days * Daily food availability for visitors] – [#Outgoing traveler days * Daily food availability for residents] |

<table>
<thead>
<tr>
<th><strong>Loss</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity of Loss</strong> = Quantity of Production * Estimated % Loss</td>
</tr>
</tbody>
</table>
The revised FBS balancing:

calculate the imbalance from the supply = utilization identity

\[
Imb = P + I - dSt - X - Fo - Fe - Se - T - IU - Lo - ROU
\]

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
The recommended approach

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

<table>
<thead>
<tr>
<th>Line</th>
<th>Product</th>
<th>Production (1)</th>
<th>Imports (2)</th>
<th>Exports (3)</th>
<th>Feed (4)</th>
<th>Seed (5)</th>
<th>Loss (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Sorghum</td>
<td>892</td>
<td>307</td>
<td>48</td>
<td>1061</td>
<td>3</td>
<td>44</td>
</tr>
<tr>
<td>B</td>
<td>Imbalance for A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>43</td>
</tr>
<tr>
<td>C</td>
<td>Measurement error (in %)</td>
<td>15.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>40.0%</td>
<td>15.0%</td>
<td>15.0%</td>
</tr>
</tbody>
</table>

- Line A: point estimates
- Line B: imbalance (imb = P + Im - Ex –Fe – Se – Lo)
- Line C: measurement errors


Steps for Compilation of Supply Utilization Account (SUA)/Food Balance Sheet (FBS)

**STEP1: Formation of a National Technical Working Group (NTWG)**

- A National Technical Working Group will be responsible for:
  - The indicative membership of the NTWG shall be:
  - **Coordinator:** Director, Agriculture Division, National Statistics Office or Ministry/Department of Agriculture (whoever is responsible),
  - **Members:** National Statistics Office,
    - Population section, National account section, Agriculture section, Livestock section, Trade section, Fisheries section etc.
  - Ministry or Department of Agriculture, Department of Livestock, Department of Fisheries, Department of Food, Department of Health and Nutrition, Department of commerce and trade, Academia and university representatives
Steps for Compilation of Supply Utilization Account (SUA)/Food Balance Sheet (FBS)

Step 2: Conducting of 5-day National Training Workshop (NTW) on SUA/FBS

The workshop will involve lectures and hands-on exercises on software to be provided by FAO under the guidance of FAO resource persons. It is expected that the Coordinator makes sure the availability of following data to be used in the workshop:

- Supply Side Variables
- Utilization Variables
- Other Variables

STEP 3: Follow-up work by participants on data entry and validation (about 3 months)

Remote support will be provided by FAO

Step 4: Holding of National FBS validation workshop (3days)

Step 5: Writing of Report on Nation Food Security and Dissemination (optional based upon country request)
Thank you