Nutrition Indicator for Biodiversity

Food Composition

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Definition Biodiversity

Biodiversity exists at three levels
• The ecosystem
• The species in the ecosystem
• The varieties within species
Nutrition indicators for biodiversity - objectives

- To monitor biodiversity over time by measuring the composition and consumption of food and medicinal plant and animal genetic resources
- To encourage researchers to generate and compile more food consumption and compositional data for food biodiversity
- To enable more research on food biodiversity and nutrition and health
- To raise awareness of the population, researchers and governments on food biodiversity and their impact on dietary adequacy
- To understand the impact of food biodiversity on food security

Biodiversity & Nutrition Rationale

- Wild species and intraspecies biodiversity have key roles in global food security
- Different varieties have statistically different nutrient contents
- Nutrient content needs to be among criteria in cultivar promotion
- Knowledge on nutrient data on existing biodiversity needs to be a prerequisite for decision-making in GMO work
- Knowledge on nutrient data and intake data of varieties is essential in order to understand the impact of biodiversity on food security

➢ investigate and disseminate the nutrient and non-nutrient composition of wild foods and of foods at cultivar level
➢ include biodiversity questions and/or prompts in food consumption surveys
Links between biodiversity, food and nutrition recognized by

- Convention on Biological Diversity (CBD)
- Conference of the Parties of CBD: Decision VII/32
- Millennium Development Goals (MDG)
- Cross-cutting initiative on biodiversity for food and nutrition (IBFN)
- Intergovernmental Working Group on Plant Genetic Resources
- International Rice Commission

<table>
<thead>
<tr>
<th>Schema</th>
<th>Plant – example</th>
<th>Plant – example</th>
<th>Fish - example</th>
<th>Animal – example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>Rosaceae – Rose family</td>
<td>Poaceae – Grass family</td>
<td>Pleuronectidae</td>
<td>Bovidae Caprinae</td>
</tr>
<tr>
<td>Genus</td>
<td>Prunus L. – plum</td>
<td>Triticum L. – wheat</td>
<td>Platichthys</td>
<td>Ovis</td>
</tr>
<tr>
<td>Species</td>
<td>Prunus domestica L. – European plum</td>
<td>Triticum aestivum L. – common wheat</td>
<td>Platichthys flesus</td>
<td>Ovis aries – sheep</td>
</tr>
<tr>
<td>Subspecies</td>
<td>Prunus domestica L. subsp. domestica</td>
<td></td>
<td>(rarely used)</td>
<td></td>
</tr>
<tr>
<td>Variety</td>
<td>Prunus domestica L. var. domestica</td>
<td>Triticum aestivum ‘Pioneer 2163’</td>
<td>Platichthys flesus</td>
<td>Suffolk</td>
</tr>
<tr>
<td>Cultivar</td>
<td>Prunus domestica – European plum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breed</td>
<td>Prunus domestica ‘Cacak’s Beauty’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Food Biodiversity

<table>
<thead>
<tr>
<th>Resource</th>
<th>Nutrient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat, cultivated and wild</td>
<td>Protein, amino acids, B-vitamins, vitamin E, fatty acids</td>
</tr>
<tr>
<td>Triticum four species 106 varieties</td>
<td>Protein, amino acids, B-vitamins, vitamin E, fatty acids</td>
</tr>
<tr>
<td>Apricots</td>
<td>ß-carotene, lutein, lycopene, anthocyanins, vitamin C</td>
</tr>
<tr>
<td>Prunus armeniaca, more than 140 varieties</td>
<td>ß-carotene, lutein, lycopene, anthocyanins, vitamin C</td>
</tr>
<tr>
<td>Grapes</td>
<td>Vitamin C, organic acids, anthocyanins, resveratrol, many phytochemicals</td>
</tr>
<tr>
<td>Vitis two species (vinifera and sylvestris) hundreds of varieties</td>
<td>Vitamin C, organic acids, anthocyanins, resveratrol, many phytochemicals</td>
</tr>
</tbody>
</table>

## Differences in food composition

<table>
<thead>
<tr>
<th>Food</th>
<th>Protein g</th>
<th>Fibre g</th>
<th>Iron mg</th>
<th>Vitamin C mg</th>
<th>Beta-Carotenes mcg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>5.6 - 14.6</td>
<td>0.7 - 6.4</td>
<td>0.7 - 6.4</td>
<td>25 - 34</td>
<td>&lt;5 - 790</td>
</tr>
<tr>
<td>Cassava</td>
<td>0.7 - 6.4</td>
<td>0.9 - 1.5</td>
<td>0.9 - 2.5</td>
<td>25 - 34</td>
<td>&lt;5 - 790</td>
</tr>
<tr>
<td>Potato</td>
<td>1.4 - 2.9</td>
<td>1.2 - 2.3</td>
<td>0.3 - 2.7</td>
<td>6.4 - 36.9</td>
<td>1 - 7.7</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>1.3 - 2.1</td>
<td>0.7 - 3.9</td>
<td>0.6 - 14</td>
<td>2.4 - 35</td>
<td>100 - 23100</td>
</tr>
<tr>
<td>Taro</td>
<td>1.1 - 3</td>
<td>2.1 - 3.8</td>
<td>0.6 - 3.6</td>
<td>0 - 15</td>
<td>5 - 2040</td>
</tr>
<tr>
<td>Eggplant</td>
<td>9 - 19</td>
<td>9 - 19</td>
<td>50 - 129</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mango</td>
<td>0.3 - 1.0</td>
<td>1.3 - 3.8</td>
<td>0.4 - 2.8</td>
<td>22 - 110</td>
<td>20 - 4320</td>
</tr>
<tr>
<td>GAC</td>
<td></td>
<td></td>
<td></td>
<td>6180 - 13720</td>
<td></td>
</tr>
<tr>
<td>Apricot</td>
<td>0.8 - 1.4</td>
<td>1.7 - 2.5</td>
<td>0.3 - 0.9</td>
<td>3.5 - 16.5</td>
<td>200 - 6939 (beta carotene equivalent)</td>
</tr>
<tr>
<td>Banana</td>
<td>0.1 - 1.6</td>
<td>2.5 - 17.5</td>
<td></td>
<td></td>
<td>&lt;1 - 8500</td>
</tr>
</tbody>
</table>
Sweet potato varieties:
α - and β-carotene, mg/100g fresh wt

<table>
<thead>
<tr>
<th>Variety</th>
<th>%Moisture</th>
<th>β-carotene</th>
<th>α-carotene</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orange Flesh</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excel</td>
<td>77.8 (0.8)</td>
<td>12.8 (0.1)</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Kona B #</td>
<td>77.8 (0.6)</td>
<td>6.7 (0.2)</td>
<td>1.5 (0.2)</td>
</tr>
<tr>
<td>Regal</td>
<td>77.2 (2.1)</td>
<td>13.1 (0.7)</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>UH 71-5 #</td>
<td>70.3 (1.1)</td>
<td>8.0 (0.1)</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td><strong>Yellow/White Flesh</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoolhua Red #</td>
<td>70.4 (2.7)</td>
<td>0.2 (0.1)</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Satsuma #</td>
<td>68.3 (0.2)</td>
<td>0.6 (0.1)</td>
<td>&lt; 0.1</td>
</tr>
</tbody>
</table>

n=6, values in parentheses are standard errors. # Varieties are recommended by the University of Hawaii Extension Service for good yield and disease resistance. Source: A. S. Huang, L. Tanudjaja, D. Lum. Journal of Food Composition and Analysis, Vol. 12, No. 2, Jun 1999, pp. 147-151.
Nutrition indicator for biodiversity

1. Food composition

**Development**
- Expert consultation held in conjunction with the 7th International Food Data Conference
- 21 October 2007, São Paulo, Brazil
- 16 experts from 13 countries
- Tasks to define and develop indicator; identify data sources, gaps, reporting mechanism
- Consensus reached
- Report published, print and web, in three languages* and disseminated through FAO, Bioversity, INFOODS Regional/National Data Centres, international conferences and the Journal of Food Composition and Analysis.

**Status**
- Data are generally published in the international, peer-reviewed scientific literature
- Baseline data collected in late 2007/early 2008
- First year data collection and reporting in late 2008
- Second year data collection underway for reporting in late 2009
- Build up the database
- Ultimate goal: Conservation and sustainable use of food genetic resources

Nutrition indicators for biodiversity

1. Food composition (2007)

It counts the number of foods
- at variety/ cultivar/ breed level for common foods
- species level for wild/ indigenous/ underutilized foods
- with at least one value for component
- Several information sources identified
- Reporting mechanism: INFOODS Regional Data Centres
- Baseline collected in 2008 and for 2009
Distribution in reporting of variety/ cultivar/ breed of common foods vs. wild/ indigenous foods in food composition databases

Bangladesh - data acquisition flow for biodiversity
Foods counting for biodiversity in Africa from different literature sources

Increase of foods reported for the Nutrition Indicator for Biodiversity - food composition (2008 to 2009)
Comparision of Biodiversity Indicator on food composition 2008 vs. 2009

Coverage: over 50 countries and 300 publications

Increase of foods reported for the Nutrition Indicator for Biodiversity - food composition (2008 to 2009)
Nutrition indicator for biodiversity
2. Food consumption

Development
- Expert consultation held in conjunction with the 7th International Conference on Diet and Activity Methods
- 8-9 June 2009, Washington
- 12 experts from 8 countries
- Tasks to define and develop indicator; identify data sources, gaps, reporting mechanism
- Consensus reached
- Report will be published, print and web, in three languages* in late 2009.

Status
- Collect baseline data (2009)
- Collect first year data (2010)
- Submit first annual report (2010)
- Build up the database
- Develop guidelines to modify and field-test existing food consumption instruments
- Continue to report annually through a variety of fora

Nutrition indicator for biodiversity
2. Food consumption (2009)

Count:
- number of surveys with at least one reported food counting for biodiversity;
- total number of foods consumed counting for biodiversity (caution for double counting of foods). Definition of foods is similar as for food composition

Reported with additional information:
- Study (scope, date, number and description of subjects, geographical/ethnic coverage, instrument used; reference, total number of studies examined)
- Food (number of foods reported, food list)
Biodiversity & Nutrition – implications

For food composition database compilers:
- Sample and generate nutrient data for wild foods and individual cultivars, also by ecosystem
- Compile these data comprehensively, systematically and centrally, and disseminate widely

For food consumption surveys
- Include biodiversity questions and/or prompts in food consumption surveys
- Report food consumption also by ecosystem and/or ethnic group
- Communicate to food composition database compilers the need for compositional data for these specific foods

For nutrition education
- Investigate traditional foods and varieties
- Promote the most nutritious among them

For agriculture policies and programmes
- Nutrient content needs to be among criteria in promoting food biodiversity
Increase the evidence base

• Scientific data on composition
  – Compilation into food composition databases
  – Journal of Food Composition and Analysis
  – Strengthening laboratory capacity
• Consumption survey instruments
  – Modifying existing instruments
    • FFQ, 24h recall, diet history
    • Field testing, innovative
• Communication and reporting
  – Presentation at international conferences and fora
  – develop indicators on biodiversity and nutrition (food composition, food consumption) and report on it
  – publish scientific papers

Conclusions

Compositional data for food biodiversity…
• assist the agriculture sector to grow more nutritious varieties
• open new markets for these nutritious varieties
• contribute to sensible policy and programs for food aid and food fortification
• provide consumers with more information to obtain their nutrient requirements from food
• assist to conserve the biodiversity of our planet
  ➔ Contribute to nutrition, health and food security
  ➔ Contribute to preparedness to effects of climate change
More information …

• INFOODS webpage on biodiversity
  – Treaties and conventions
  – Expert consultation reports
  – Books
  – Documents
  – Posters
  – link to JFCA supplement Biodiversity and Nutrition: a common path

• Bioversity International webpage on biodiversity and nutrition
  http://www.bioversityinternational.org/Themes/Nutrition/index.asp