Generation and Use of Consumption Data of Thailand

PANPILAD SAIKAEW
NATIONAL BUREAU OF AGRICULTURAL COMMODITY AND FOOD STANDARDS (ACFS), THAILAND

Strengthening Capacity of Data Collection and Generation for Food Safety Risk Analysis, 10 – 13 June 2013, Tokyo, Japan
Outline

- How to generate Consumption data of Thailand
  - national food consumption data survey
  - development of electronic database

- Use of consumption data: case study-Pesticide residue limit
National Consumption Data of Thailand

National Consumption Survey (2004-2005)
Institute of Nutrition, Mahidol University

530 Food items

National consumption data

Published by ACFS
National Food Consumption Survey

- 4-years project started in 2002, responding to food safety purpose

Planning, Preparation & Pilot survey – 2002-2003

1\textsuperscript{st} Survey – Dec 03-Mar 04

2\textsuperscript{nd} Survey – Sep 04-Dec 04

Data analysis - Jan 05-Mar 06

Publishing of Food Consumption Data – Dec 06
Aims of the survey

- To obtain a comprehensive food consumption database for exposure assessment of food chemicals and others
- To be used as a key information in establishing food and agricultural standards
- To be used as a key information in establishing health promotion strategies related to food and nutrition of the population
Scope/Method of the Survey

Target population
19,046 respondents randomly selected from representative provinces of each region

Sampling technique
Stratified 3-stage random sampling
Scope/Method of the Survey

- Study of individual consumer
- All 4 regions (N, NE, C & S) and Bangkok also both urban and rural areas included
  → represent national consumption
Data collection sites
# People in The Survey

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>1184</td>
<td>1179</td>
<td>2363</td>
<td>12.6</td>
</tr>
<tr>
<td>3-6</td>
<td>1106</td>
<td>1121</td>
<td>2227</td>
<td>11.9</td>
</tr>
<tr>
<td>6-9</td>
<td>1165</td>
<td>1170</td>
<td>2335</td>
<td>12.5</td>
</tr>
<tr>
<td>9-16</td>
<td>1224</td>
<td>1240</td>
<td>2464</td>
<td>13.1</td>
</tr>
<tr>
<td>16-19</td>
<td>1132</td>
<td>1154</td>
<td>2286</td>
<td>12.2</td>
</tr>
<tr>
<td>19-35</td>
<td>1229</td>
<td>1215</td>
<td>2444</td>
<td>13.0</td>
</tr>
<tr>
<td>35-65</td>
<td>1245</td>
<td>1321</td>
<td>2566</td>
<td>13.7</td>
</tr>
<tr>
<td>&gt;65</td>
<td>1031</td>
<td>1030</td>
<td>2061</td>
<td>11.0</td>
</tr>
<tr>
<td>&gt;3</td>
<td>8132</td>
<td>8251</td>
<td>16383</td>
<td>87.4</td>
</tr>
<tr>
<td>Total</td>
<td>9316</td>
<td>9430</td>
<td>18746</td>
<td>100</td>
</tr>
</tbody>
</table>
Food items for the survey

- Age group 0-3 year → 146 items from 9 food groups
- 7 Age groups > 3 year → 384 items from 18 food groups
# 530 Food Items

Food groups divided for national food consumption survey

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cereal and its products</td>
</tr>
<tr>
<td>2.</td>
<td>Root and its products</td>
</tr>
<tr>
<td>3.</td>
<td>Bean, seed and products</td>
</tr>
<tr>
<td>4.</td>
<td>Vegetable</td>
</tr>
<tr>
<td>5.</td>
<td>Fruit</td>
</tr>
<tr>
<td>6.</td>
<td>Meat and its products</td>
</tr>
<tr>
<td>7.</td>
<td>Marine aquatic animals</td>
</tr>
<tr>
<td>8.</td>
<td>Egg</td>
</tr>
<tr>
<td>9.</td>
<td>Milk and its products</td>
</tr>
<tr>
<td>10.</td>
<td>Lipid (fat and oil)</td>
</tr>
<tr>
<td>11.</td>
<td>Sugar</td>
</tr>
<tr>
<td>12.</td>
<td>Herb and spice</td>
</tr>
<tr>
<td>13.</td>
<td>Alcoholic/Liquor</td>
</tr>
<tr>
<td>14.</td>
<td>Beverage</td>
</tr>
<tr>
<td>15.</td>
<td>Snack</td>
</tr>
<tr>
<td>16.</td>
<td>Dessert</td>
</tr>
<tr>
<td>17.</td>
<td>Food supplement</td>
</tr>
<tr>
<td>18.</td>
<td>Water</td>
</tr>
</tbody>
</table>
Data collection tools

- **Questionnaires**
  - Household and individual questionnaire on eating pattern
  - Quantitative food frequency questionnaire (individual)
  - 24-hour dietary recall

- **Record form**
  - Body weight and height
Portion size measurement tools
Consumption Data Reporting

- 8 Age groups
- Baby & Young children (0-3 y) vs. General population (>3 y)
- Male, Female & All sex
- Consumption per capita/day vs. Eater only/eating day
- Average (mean) vs. High percentile (97.5 Perc.)
  - Consumption data from survey reported as “edible portion as consumed”
Per Capita

- The consumption of a food item by population calculated per person per day
- Reported as g food/person/day
- Normally used for chronic exposure assessment (e.g. food additives, contaminants, pesticides) and evaluate of nutrient intake (under or over intake)
• The consumption of a food item by eater of that food in a single meal or day (WHO use a single day for acute exposure assessment)

• Reported as g food/person(eater)/day or g food/kgbw/day

• Normally used for acute exposure assessment (e.g. some pesticides, pathogens) and evaluate of consumption pattern of a single meal or day
ข้อมูลการบริโภคอาหารของประเทศไทย

FOOD CONSUMPTION DATA OF THAILAND

สำนักงานมาตรฐานสินค้าและระบบคุณภาพ
สำนักงานมาตรฐานสินค้าเกษตรและอาหารแห่งชาติ
กระทรวงเกษตรและสหกรณ์
ISBN 974-403-423-8
Limitation of Current Consumption Data

- Data reported as "edible portion as consumed" (form of each food also reported)
- Cannot be served the needs of all / various users
- The published data only provided for manually use
- Published only in Thai
How to break down a “hotdog” into ingredients

1st Ingredient
- Bread
- Sausage
- Onion (chopped)
- Ketsup

2nd Ingredient
- Wheat four
- Pork meat (grounded)
- Onion (whole)

Raw Commodity
- Wheat
- Pork Meat
- Tomato

* What stage of food the data users need data?
Development of Database

- Develop all Factors / Recipes
- Develop Database structure / Software
- Translating into English Develop bi-lingual database
- Develop user menu / instruction
- Trial period
- Revise / Approve database
Review of current data
Determine factors needed for each food item
Conduct studies to obtain all factors
Publish factors / Revise consumption data
Develop electronic consumption database (Th/Eng)
Development of Electronic Database

The structure of database from food items to raw material

<table>
<thead>
<tr>
<th>Food</th>
<th>Ingredient</th>
<th>RM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thai noodle</td>
<td>Rice flour</td>
<td>Rice grain</td>
</tr>
</tbody>
</table>

Food ingredient factor

food item to raw material process
The National Bureau of Agricultural Commodity and Food Standards (ACFS) is a governmental agency under the Ministry of Agriculture and Cooperatives. At ACFS, we recognize that food trade has played an important role in world food security. Therefore it is important to ensure that food trade is not disrupted and does not jeopardize the food security of the world. Since the WTO and its Member Countries have agreed to reduce tariffs so that trade can be accelerated, the non-tariff barriers such as food safety have become trade requirements. ACFS is therefore making every effort to ensure the safety of food and agricultural commodities produced in Thailand so that both local and international consumers can always trust and enjoy them.

We work in partnership with Government Departments, local authorities, national, regional and international organizations to achieve our goals. Below are our core functions:

1. Standard setting for agricultural systems, commodity and food items, and food safety;
2. Accreditation of certification bodies;
3. Dialogue and negotiation with international trade partners on disputes concerning SPS/TBT issues;
4. Food standard control;
5. Promotion of standard compliance for terms and food establishments.

In addition, the Bureau is the national information center for agricultural and food standards and also acts as the focal point for WTO-SPS/TBT, Codex and the International Plant Protection Convention (IPPC).

The Bureau is located at 50 Phaholyothin Road, Chatuchak district, Bangkok, sharing the same compound as Kasetsart University and several Departments under the Ministry of Agriculture and Cooperatives.
Use of Data in MRL Establishment

Process of MRLs Establishment

- Set pesticide priority for MRLs establishment
- Data collecting & analysis
- Propose draft MRLs
- **Risk assessment based on proposed MRLs**
- Adopt MRLs
Thai MRL Establishment

- TAS 9002-2004: 12 pesticides 214 MRLs
- TAS 9002-2006: replaced TAS 9002-2004
  - Total 36 pesticides 652 MRLs
- TAS 9002-2008: replaced TAS 9002-2006
  - Total 40 pesticides 690 MRLs
- TAS 9003-2004: Extraneous Maximum Residue Limit (EMRL) 5 pesticides 79 EMRLs
Risk Assessment of the Proposed MRLs

- All proposed MRLs must ensure safety to consumer by applying appropriate risk assessment using Codex technique.
- Intake calculation is conducted, assuming that all food consumed contain residue at MRL (worst case).
- Consumption data was used in the intake calculation.
- Both chronic and acute intake were included in the calculation.
- All MRLs/EMRLs have to pass the assessment that provide sufficient safety to consumer before they can be submitted for adoption as national MRLs.
Risk Assessment

- Hazard identification
- Hazard characterization
- Exposure assessment
- Risk characterization
Dietary Exposure to a Hazard

Consumption of a Food containing the Hazard

Hazard Level in the Food
Residue Intake Calculation

- Chronic intake calculation for each pesticide residue ➔ Compared with Acceptable Daily Intake (ADI)
- Acute intake calculation for each MRL of each pesticide residue ➔ Compared with Acute Reference Dose (ARfD)
Chronic Exposure Assessment

Chronic Intake Calculation

National Theoretical Maximum Daily Intake (NTMDI) =

\[ \sum \frac{\text{Chemical Level (MRL) x Food consumption (mean)}}{\text{Body weight}} \]

Compare intake to ADI

\[ \text{NTMDI} \leq 100\% \text{ ADI} = \text{acceptable risk} \]
Acute Exposure Assessment

= intake from one food in one meal or day

Calculate “National Estimated Short-Term Intake (NESTI)

3 cases of intake calculation depended on food commodity unit weight

Case 1: food commodity unit weight ≤ 25 g
Case 2: food commodity unit weight > 25 g
Case 3: processed Commodity is bulked or blended; including milk
Acute Exposure Assessment

**Case 1** - food commodity unit weight \( \leq 25 \text{ g} \)
- also applies to meat, edible offal, eggs

\[
\text{NESTI} = \frac{\text{LP} \times \text{HR}}{\text{bw}}
\]

- \text{LP} = \text{Large portion consumption (97.5th percentile of eater)}
- \text{HR} = \text{Highest residue found from supervised trial data}
Case 2: food commodity unit weight > 25 g

Case 2a unit weight edible portion (U) < LP

\[
\text{NESTI} = \frac{(U \times HR \times v)}{bw} + \frac{[(LP-U) \times HR]}{bw}
\]

v = Variability factor
(JMPR use a default v = 3)
Acute Exposure Assessment

Case 2b  \( U \geq LP \)

\[ \text{NESTI} = LP \times HR \times V \times \frac{bw}{bw} \]
Acute Exposure Assessment

Case 3  Processed Commodity is bulked or blended; including milk

NESTI = LP x STMR-P

\[ \frac{\text{bw}}{\text{bw}} \]

STMR-P = supervised trials median residue in processed commodity

NESTI for each MRL < 100 % ARfD = acceptable risk
Consumption Data

- For chronic intake: mean per capita consumption (g/person/day)
- For acute intake: 97.5 percentile eater only consumption (g/person/day or g/kgbw/day) = Large Portion (LP)
- General population (> 3 year) and children (3-6 year)
**Raw material query**

**Intake:** Per Capita, **Reported as:** Mean, **Age:** >3

**Question 2:** Raw material consumption from all food codes (g/person/day)

<table>
<thead>
<tr>
<th>Raw material code</th>
<th>(e.g. CG 010006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF 060339</td>
<td>Query</td>
</tr>
</tbody>
</table>

**Raw Material Code:** VF 060339  
**Raw Material Name:** Tomato

<table>
<thead>
<tr>
<th>Food Code</th>
<th>Food Name</th>
<th>Food consumption (g/person/day)</th>
<th>Raw material consumption (g/person/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0133</td>
<td>Pizza</td>
<td>1.0600</td>
<td>0.2656</td>
</tr>
<tr>
<td>0421</td>
<td>Tomato</td>
<td>5.3800</td>
<td>5.3800</td>
</tr>
<tr>
<td>0642</td>
<td>Pork, roasted (Satay, sliced pork on skewer, grilled)</td>
<td>5.9000</td>
<td>1.8272</td>
</tr>
<tr>
<td>0772</td>
<td>Sardines, canned in tomato sauce</td>
<td>5.3100</td>
<td>2.5136</td>
</tr>
<tr>
<td>0773</td>
<td>Dried curry fish in can</td>
<td>1.8200</td>
<td>0.0586</td>
</tr>
<tr>
<td>1208</td>
<td>Tomato ketchup</td>
<td>1.0700</td>
<td>2.7576</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>20.5400</td>
<td><strong>12.8026</strong></td>
</tr>
</tbody>
</table>

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National Bureau of Agricultural Commodity and Food Standards, Ministry of Agriculture and Cooperative, 50 Phaholyothin Road, Ladyard Chatuchak Bangkok 10900. Thailand. Tel. (662) 561 - 2277
**Raw material query**

Intake: Eaters only  Reported as: 97.5th percentile  Age: >3

Question 2: Raw material consumption from all food codes (g/person/day)

<table>
<thead>
<tr>
<th>Raw material code</th>
<th>Raw Material Code</th>
<th>Raw Material Name</th>
<th>Food consumption (g/person/day)</th>
<th>Raw material consumption (g/person/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF 060339</td>
<td>VF 060339</td>
<td>Tomato</td>
<td>178.0000</td>
<td>44.6017</td>
</tr>
<tr>
<td>0133</td>
<td>Pizza</td>
<td>178.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0421</td>
<td>Tomato</td>
<td>96.0000</td>
<td></td>
<td>96.0000</td>
</tr>
<tr>
<td>0642</td>
<td>Pork, roasted (Satay, sliced pork on skewer, grilled)</td>
<td>120.0000</td>
<td>37.1628</td>
<td></td>
</tr>
<tr>
<td>0772</td>
<td>Sardines, canned in tomato sauce</td>
<td>117.0000</td>
<td>55.3844</td>
<td></td>
</tr>
<tr>
<td>0773</td>
<td>Dried curry fish in can</td>
<td>90.0000</td>
<td>2.8994</td>
<td></td>
</tr>
<tr>
<td>1208</td>
<td>Tomato ketchup</td>
<td>34.0000</td>
<td></td>
<td>87.6248</td>
</tr>
</tbody>
</table>
Refine of Intake Calculation

- Tier approach

1\textsuperscript{st} Calculation: Primary estimation, MRL is used as a maximum residue concentration

- If intake \( \leq \frac{\text{ADI}}{\text{ARfD}} \) → pass

- If intake \( > \frac{\text{ADI}}{\text{ARfD}} \) → 2\textsuperscript{nd} refine intake calculation
Refine of Intake Calculation

- Replace MRL (maximum level) with median residue level (where applicable and available)
- Residue in edible portion, processing/cooking factors
  - Quantitative: direct residue studies
  - Qualitative: estimate from other related data
- Estimation of residue level/proportion
  - Monitoring data
## Example of refinement

**Carbendazim**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>MRL</th>
<th>Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>2</td>
<td>54 % ADI</td>
</tr>
<tr>
<td>Mango</td>
<td>5</td>
<td>24 % ADI</td>
</tr>
</tbody>
</table>

Sum of all commodities Intake 107 % ADI

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Median</th>
<th>Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>0.05</td>
<td>1.3 % ADI</td>
</tr>
<tr>
<td>Mango</td>
<td>0.4</td>
<td>1.9 % ADI</td>
</tr>
</tbody>
</table>

Sum of all commodities Intake 32 % ADI
Thank you for your attention