FOOD for Thought:
food security, food safety, food ethics?

Purwiyatno Hariyadi

- Southeast Asian Food and Agricultural Science and Technology (SEAFAST) Center, Bogor Agricultural University;
- Department of Food Science and Technology, Faculty of Agricultural Engineering and Technology, Bogor Agricultural University,

World Food Summit of 1996:

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.
Aspects of Food Security

Food availability
- Quantity
- Safety
- Quality

Accessibility
- Physical & economic accessibility
- Compliance to preferences
- Compliance to culture & religion

Consumption sufficiency
- Intake sufficiency
- Quality of household food processing
- Quality of sanitation & hygiene

Stability/sustainability of food availability, accessibility and consumption

Active & Healthy life of Individual

Your choice of actions/decisions potentially may influence food availability, thru the influence of:
- Quantity
- Safety/Quality

Consumption sufficiency
- Intake sufficiency
- Quality of household food processing
- Quality of sanitation & hygiene

Active & Healthy life of Individual

Aspects of Food Security .... First thing first

Food availability
- Compliance to culture & religion

Purwiyatno Hariyadi
hariyadi@seafast.org

ITP504 - Dept of Food Science & Technology
Bogor Agricultural University
Food Security - Food Quantity

Food availability

- Quantity

- Estimated 925 million hungry people in the world.
- The world population is expected to reach 9.1 billion by 2050.
- Food production will need to nearly double by 2050 in developing countries.
- About 40% world’s arable land is degraded to some degree and will be further affected by climate change.

Food Security - Food Quantity

The Challenge: How to Double Global Food Production and Reduce Environmental Damage?

- Food production will need to nearly double by 2050 in developing countries.
- About 40% world’s arable land is degraded to some degree and will be further affected by climate change.

Image: Kevin Van Aelst
(http://www.scientificamerican.com/article.cfm?id=can-we-feed-the-world)
Food Security - Food Quantity

.... Facts (2)

Global Food Losses and Food Wastes, FAO, Rome, 2011

- Roughly one-third of food produced for human consumption is lost or wasted globally → about 1.3 billion tons/year.

Food Security - Food Quantity

.... Facts (2)

Global Food Losses and Food Wastes, FAO, Rome, 2011

Per capita food losses and wastes (kg/year), at consumption and pre-consumptions stages, in different regions

- Europe
- North America & Oceania
- Industrialized Asia
- Subsahara Africa
- North Africa, West & Central Asia
- South & Southeast Asia
- Latin America

- Consumer
- Production to retailing
### Food Security - Food Quantity

#### Facts (2)

Global Food Losses and Food Wastes, FAO, Rome, 2011

<table>
<thead>
<tr>
<th>Total food losses/wastes</th>
<th>Characteristics of food losses/food wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Europe and North-America = 280-300 kg/year</td>
<td>• Industrialized countries: more than 40% of the food losses occur at retail &amp; consumer levels.</td>
</tr>
<tr>
<td>• Sub-Saharan Africa and South/Southeast Asia = 120-170 kg/year.</td>
<td>• Developing countries: more than 40% of the food losses occur at post harvest and processing levels</td>
</tr>
</tbody>
</table>

Food waste at consumer level in industrialized countries (222 million ton) is almost as high as the total food production in sub-Saharan Africa (230 million ton).

#### Opportunity (1a)

Increase food availability? (decreased food losses and food wastes)

- Industrialized countries: more than 40% of the food losses occur at retail & consumer levels.
- Developing countries: more than 40% of the food losses occur at post harvest and processing levels

**Any thought?**

*What we can do about this? (as food scientist/technologist)*
Food Security - Food Safety

.... Facts (3)

Food safety have become increasingly important globally

1. → protecting the health of the consumer.
2. → meeting requirements for international trade.
   → This is especially important for many developing countries that export foods to the major trading blocks of the developed world, or that have the potential to do so.

.... Facts          (3)

• Food borne diseases are caused by various microorganisms: parasites, bacteria, and viruses.

• The global incidence of foodborne disease (WHO, 2005) : 1.8 million people died from diarrhoeal diseases.
Food safety have become increasingly important globally

1. → protecting the health of the consumer

   • CDC (2011) estimates that each year roughly 1 in 6 Americans (or 48 million people) gets sick, 128,000 are hospitalized, and 3,000 die of food borne diseases.

• USA (1997), diseases caused by the major pathogens alone are estimated to cost up to US $35 billion annually in medical costs and lost productivity.

• The re-emergence of cholera in Peru in 1991 resulted in the loss of US $500 million in fish and fishery product exports that year.
Food Security - Food Safety

Food safety have become increasingly important globally

2. → meeting requirements for international trade.

- World trade of agricultural products (Brodesser, J, FAO)

- 91% (Other products)

- 9% (560 US$ Billions)

---

Food Security - Food Safety

2. → meeting requirements for international trade.

- Percentage increase per year of world trade & production by main product groups

- Already ~ 40% of all trade in food, agriculture, fisheries occurs between developing & developed countries.

- (World Integrated Trade Solution Database [http://wits.worldbank.org/wits/gptad.html])
Food Security - Food Safety

Meeting Standards, Winning Markets:
Trade Standards Compliance (2010)
• Norwegian Agency for Development Cooperation and
• United Nations Industrial Development Organization (UNIDO)

2. meeting requirements for international trade.

<table>
<thead>
<tr>
<th>Country</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Total</th>
<th>Annual Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>63</td>
<td>402</td>
<td>455</td>
<td>470</td>
<td>283</td>
<td>120</td>
<td>327</td>
<td>2,061</td>
<td>296.4</td>
</tr>
<tr>
<td>China</td>
<td>140</td>
<td>133</td>
<td>158</td>
<td>253</td>
<td>102</td>
<td>354</td>
<td>688</td>
<td>1,387</td>
<td>257.1</td>
</tr>
<tr>
<td>Turkey</td>
<td>141</td>
<td>200</td>
<td>150</td>
<td>198</td>
<td>250</td>
<td>284</td>
<td>302</td>
<td>1,265</td>
<td>223.6</td>
</tr>
<tr>
<td>India</td>
<td>60</td>
<td>109</td>
<td>110</td>
<td>137</td>
<td>86</td>
<td>111</td>
<td>157</td>
<td>780</td>
<td>111.4</td>
</tr>
<tr>
<td>United States</td>
<td>25</td>
<td>53</td>
<td>52</td>
<td>76</td>
<td>231</td>
<td>184</td>
<td>146</td>
<td>263</td>
<td>109.0</td>
</tr>
<tr>
<td>Thailand</td>
<td>143</td>
<td>85</td>
<td>45</td>
<td>117</td>
<td>85</td>
<td>57</td>
<td>105</td>
<td>670</td>
<td>95.7</td>
</tr>
<tr>
<td>Brazil</td>
<td>102</td>
<td>136</td>
<td>109</td>
<td>124</td>
<td>91</td>
<td>58</td>
<td>61</td>
<td>611</td>
<td>94.4</td>
</tr>
<tr>
<td>Vietnam</td>
<td>67</td>
<td>35</td>
<td>56</td>
<td>124</td>
<td>68</td>
<td>44</td>
<td>51</td>
<td>420</td>
<td>64.1</td>
</tr>
<tr>
<td>Argentina</td>
<td>11</td>
<td>42</td>
<td>66</td>
<td>57</td>
<td>75</td>
<td>42</td>
<td>58</td>
<td>330</td>
<td>48.0</td>
</tr>
<tr>
<td>Indonesia</td>
<td>38</td>
<td>36</td>
<td>70</td>
<td>58</td>
<td>43</td>
<td>26</td>
<td>16</td>
<td>235</td>
<td>60.7</td>
</tr>
<tr>
<td>Ghana</td>
<td>3</td>
<td>11</td>
<td>78</td>
<td>59</td>
<td>46</td>
<td>11</td>
<td>23</td>
<td>244</td>
<td>34.9</td>
</tr>
<tr>
<td>Egypt</td>
<td>9</td>
<td>46</td>
<td>33</td>
<td>24</td>
<td>39</td>
<td>35</td>
<td>48</td>
<td>210</td>
<td>31.3</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1</td>
<td>7</td>
<td>15</td>
<td>30</td>
<td>28</td>
<td>40</td>
<td>25</td>
<td>155</td>
<td>22.1</td>
</tr>
</tbody>
</table>

Table 3. Number of EU rejections of food and feed products from third countries, 2002-2008
Food Security - Food Safety

.... Facts (4)

2. → meeting requirements for international trade.

Table 4. Number of US rejections of food products, 2002-2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Year 2002</th>
<th>Year 2003</th>
<th>Year 2004</th>
<th>Year 2005</th>
<th>Year 2006</th>
<th>Year 2007</th>
<th>Year 2008</th>
<th>Total</th>
<th>Annual Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>1,464</td>
<td>1,502</td>
<td>1,578</td>
<td>1,795</td>
<td>1,477</td>
<td>1,279</td>
<td>1,066</td>
<td>1,024</td>
<td>1,101.7</td>
</tr>
<tr>
<td>India</td>
<td>745</td>
<td>775</td>
<td>871</td>
<td>1,026</td>
<td>1,132</td>
<td>1,233</td>
<td>707</td>
<td>1,232</td>
<td>901.9</td>
</tr>
<tr>
<td>China</td>
<td>541</td>
<td>647</td>
<td>616</td>
<td>672</td>
<td>644</td>
<td>680</td>
<td>429</td>
<td>5,055</td>
<td>625.6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>377</td>
<td>288</td>
<td>215</td>
<td>245</td>
<td>359</td>
<td>430</td>
<td>1,262</td>
<td>1,280</td>
<td>470.9</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>263</td>
<td>246</td>
<td>515</td>
<td>435</td>
<td>663</td>
<td>512</td>
<td>77</td>
<td>3,121</td>
<td>390.1</td>
</tr>
<tr>
<td>Canada</td>
<td>646</td>
<td>543</td>
<td>551</td>
<td>284</td>
<td>246</td>
<td>238</td>
<td>364</td>
<td>3,114</td>
<td>379.7</td>
</tr>
<tr>
<td>Vietnam</td>
<td>478</td>
<td>332</td>
<td>478</td>
<td>350</td>
<td>300</td>
<td>378</td>
<td>306</td>
<td>2,993</td>
<td>367.4</td>
</tr>
<tr>
<td>Japan</td>
<td>755</td>
<td>261</td>
<td>192</td>
<td>147</td>
<td>265</td>
<td>213</td>
<td>319</td>
<td>2,608</td>
<td>306</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1,388</td>
<td>269</td>
<td>531</td>
<td>214</td>
<td>313</td>
<td>374</td>
<td>250</td>
<td>2,359</td>
<td>269.9</td>
</tr>
<tr>
<td>Thailand</td>
<td>280</td>
<td>218</td>
<td>301</td>
<td>307</td>
<td>228</td>
<td>233</td>
<td>212</td>
<td>2,222</td>
<td>265.3</td>
</tr>
<tr>
<td>France</td>
<td>644</td>
<td>365</td>
<td>345</td>
<td>222</td>
<td>193</td>
<td>195</td>
<td>113</td>
<td>2,078</td>
<td>266.1</td>
</tr>
<tr>
<td>South Korea</td>
<td>397</td>
<td>344</td>
<td>315</td>
<td>215</td>
<td>122</td>
<td>166</td>
<td>297</td>
<td>1,931</td>
<td>242.3</td>
</tr>
<tr>
<td>Philippines</td>
<td>103</td>
<td>416</td>
<td>248</td>
<td>214</td>
<td>125</td>
<td>244</td>
<td>168</td>
<td>1,960</td>
<td>238.3</td>
</tr>
</tbody>
</table>

ITP504 - Dept of Food Science & Technology
Bogor Agricultural University
Purwiyanto Hariyadi
hariyadi@seafast.org
Food Security - Food Safety

2. meeting requirements for international trade.


Number of US rejections of food and feed exports from Indonesia, 2002-2008
Food Security - Food Safety

.... Facts (4)

2. → meeting requirements for international trade.

→ Economic losses for developing countries

<table>
<thead>
<tr>
<th>Country</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>0.9</td>
<td>0.4</td>
<td>1.9</td>
<td>0.8</td>
<td>8.1</td>
<td>12.0</td>
</tr>
<tr>
<td>Australia</td>
<td>0.0</td>
<td>0.7</td>
<td>10.7</td>
<td>0.3</td>
<td>0.0</td>
<td>11.7</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1.0</td>
<td>3.3</td>
<td>1.8</td>
<td>0.6</td>
<td>0.6</td>
<td>7.3</td>
</tr>
<tr>
<td>China</td>
<td>0.4</td>
<td>0.9</td>
<td>0.9</td>
<td>1.9</td>
<td>1.3</td>
<td>5.3</td>
</tr>
<tr>
<td>India</td>
<td>0.6</td>
<td>1.1</td>
<td>1.1</td>
<td>0.8</td>
<td>1.4</td>
<td>5.1</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>0.4</td>
<td>0.3</td>
<td>1.4</td>
<td>0.5</td>
<td>0.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Russia</td>
<td>2.0</td>
<td>0.8</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Greenland</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Other</td>
<td>4.9</td>
<td>4.1</td>
<td>4.9</td>
<td>6.2</td>
<td>2.3</td>
<td>22.5</td>
</tr>
<tr>
<td>Total</td>
<td>10.3</td>
<td>11.6</td>
<td>23.3</td>
<td>11.6</td>
<td>17.4</td>
<td>74.3</td>
</tr>
</tbody>
</table>

Value of EU rejections of fish and fishery products, 2004-2008 (US$ million)

Food Security - Food Safety

.... Facts (4)

2. → meeting requirements for international trade.

→ Economic losses for developing countries

<table>
<thead>
<tr>
<th>Country</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3.5</td>
<td>6.9</td>
<td>21.5</td>
<td>13.2</td>
<td>7.9</td>
<td>53.0</td>
</tr>
<tr>
<td>Vietnam</td>
<td>12.0</td>
<td>9.7</td>
<td>6.7</td>
<td>8.3</td>
<td>6.1</td>
<td>42.8</td>
</tr>
<tr>
<td>Indonesia</td>
<td>7.2</td>
<td>6.3</td>
<td>5.8</td>
<td>6.3</td>
<td>5.6</td>
<td>31.2</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>6.3</td>
<td>3.8</td>
<td>1.0</td>
<td>0.8</td>
<td>1.9</td>
<td>13.8</td>
</tr>
<tr>
<td>India</td>
<td>3.5</td>
<td>3.8</td>
<td>2.0</td>
<td>1.8</td>
<td>0.5</td>
<td>11.6</td>
</tr>
<tr>
<td>Thailand</td>
<td>2.3</td>
<td>2.6</td>
<td>1.7</td>
<td>2.5</td>
<td>1.6</td>
<td>10.7</td>
</tr>
<tr>
<td>Honduras</td>
<td>0.0</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.1</td>
<td>8.2</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1.9</td>
<td>1.3</td>
<td>0.9</td>
<td>1.6</td>
<td>2.0</td>
<td>7.7</td>
</tr>
<tr>
<td>Philippines</td>
<td>2.2</td>
<td>1.3</td>
<td>0.6</td>
<td>1.7</td>
<td>1.2</td>
<td>7.0</td>
</tr>
<tr>
<td>Mexico</td>
<td>1.7</td>
<td>1.2</td>
<td>1.0</td>
<td>0.6</td>
<td>0.7</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Value of US rejections of fish and fishery products, 2004-2008 (US$ million)
Increase food safety?
(decrease economic losses and increase welfare)

Any thought?
What we can do about this? (as food scientist/technologist)
Food Security - Food Safety

Any thought?
What we can do about this? (as food scientist/technologist)

ITP504 - Dept of Food Science & Technology
Bogor Agricultural University

Thank You