1. The food and nutrition security situation in SE Asia

Food Security
“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.”

----- (Food and Agriculture Organization, U.N.)

Scope

1. The food and nutrition security situation in SE Asia
2. Challenges and opportunities
3. Moving forward: What can be done to assure food security?
How food secure are Southeast Asian countries?

Index 1
DUPONT-Economist Intelligence Unit, Global Food Security Index. May 2015

<table>
<thead>
<tr>
<th>Country</th>
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<th>GFSI Score</th>
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</table>

2014

“Objective is to measure which countries are most and least vulnerable to food insecurity.”

Affordability
- Food consumption as % of household expenditure
- % population under poverty line
- GDP per capita @ PPP
- Agriculture import tariffs
- Food safety net programmes
- Access to financing for farmers

Availability
- Sufficiency of supply
- Public expenditure on agricultural R&D
- Agricultural infrastructure
- Volatility of agricultural production
- Political stability risk
- Corruption
- Urban absorption capacity
- Food loss

Quality & Safety
- Diet diversification
- Nutritional standards
- Micronutrient availability
- Protein quality
- Food safety

Index 2
Rice Bowl Index: “Food Security Robustness”

Composite Index

2014-15 Findings

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<tr>
<td>Thailand</td>
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</tbody>
</table>

Legend
- RBI Score
- Threshold

The last country above the threshold is Vietnam and the first to fall below is Indonesia

“Rice Bowl Index” -- Indicators

Environmental Factors
- Water stress
- Drought / Floods
- Soil / land degradation
- Loss of biodiversity, gene pool
- Climate variability, temperature rise, erratic weather patterns

Policy and Trade
- Political stability and conflict
- Protectionism and subsidies
- International trade policies
- Infrastructure including storage and transport
- Investment and innovation policies

Demand and Price
- Growing population
- Consumer income and dietary shifts
- Food reserve shortages
- Demand for biofuel
- Speculation and price volatility

Farm-level Factors
- Access to technology and innovation
- Farmer education / extension services
- Role of women on farm
- Access to market / price / information
- Levels of investment

Key enabling and disabling factors of food security
**ASEAN Agriculture**

<table>
<thead>
<tr>
<th>Country</th>
<th>Agriculture labour, % of total labour force, 2010</th>
<th>Agriculture, % of GDP 1990</th>
<th>Agriculture, % of GDP 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei</td>
<td>-</td>
<td>0.98</td>
<td>0.76</td>
</tr>
<tr>
<td>Cambodia</td>
<td>72.3</td>
<td>50.12</td>
<td>36.02</td>
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<td>38.3</td>
<td>17.55</td>
<td>15.34</td>
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<td>Lao PDR</td>
<td>72.2</td>
<td>45.06</td>
<td>29.72</td>
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<td>14.89</td>
<td>10.49</td>
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<td>-</td>
<td>57.26</td>
<td>36.36</td>
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<td>Philippines</td>
<td>33.2</td>
<td>19.14</td>
<td>12.31</td>
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<td>Singapore</td>
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<td>0.34</td>
<td>0.03</td>
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<td>Thailand</td>
<td>38.2</td>
<td>10.01</td>
<td>10.86</td>
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<td>Vietnam</td>
<td>49.5</td>
<td>38.74</td>
<td>20.58</td>
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</table>

Source: ADB Key Indicators 2013; UNCTAD Stat 2013

**Land-use Classification in Southeast Asia**

<table>
<thead>
<tr>
<th>Classification</th>
<th>2011</th>
<th>2012</th>
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<td>Land area</td>
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<td>434,070</td>
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<tr>
<td>Agricultural area</td>
<td>129,257</td>
<td>130,562</td>
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<tr>
<td>a. Arable land</td>
<td>68,412</td>
<td>69,504</td>
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<tr>
<td>b. Permanent crops</td>
<td>43,807</td>
<td>44,019</td>
</tr>
<tr>
<td>c. Permanent meadows and pastures</td>
<td>17,038</td>
<td>17,038</td>
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<tr>
<td>Forest area</td>
<td>212,978</td>
<td>211,892</td>
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<tr>
<td>Other land</td>
<td>91,835</td>
<td>91,617</td>
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</table>

**Arable land is about 16% of total land area in SE Asia**

Arable land per capita in Southeast Asia is about 0.12 ha.

Notes: Data expressed in 1000 Ha. Source: Faostat

**Major Crops in ASEAN by Production (2013)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Major Ag Commodities Produced</th>
<th>World Ranking (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei Darussalam</td>
<td>rice, vegetables, fruits; chickens, eggs</td>
<td>2 - pigeon peas, beans; 3 - mustard seed</td>
</tr>
<tr>
<td>Myanmar</td>
<td>rice, vegetables, beans, fruits, groundnuts, sugarcane</td>
<td>1 - palm oil, cloves, cinnamon, coconuts; 2 - rubber; nutmeg; 3 - rice, coffee, cassava</td>
</tr>
<tr>
<td>Indonesia</td>
<td>rice, cassava (tapioca), sugar cane, palm oil, maize, coconuts, bananas, fruits, rubber</td>
<td>1 - palm oil, cloves, cinnamon, coconuts; 2 - rubber; nutmeg; 3 - rice, coffee, cassava</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>rice, vegetables, sugar cane, maize, cassava, sweet potatoes</td>
<td>1 - palm oil, cloves, cinnamon, coconuts; 2 - rubber; nutmeg; 3 - rice, coffee, cassava</td>
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<tr>
<td>Malaysia</td>
<td>palm oil, rice, chicken meat, rubber, sugar cane, coconuts</td>
<td>2 - palm oil; 3 - rubber</td>
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<td>Philippines</td>
<td>sugarcane, rice, coconuts, bananas, maize, vegetables, fruits</td>
<td>2 - coconuts, pineapple; 3 - bananas</td>
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<td>Thailand</td>
<td>sugar cane, rice, cassava, maize, rubber, fruits</td>
<td>1 - rubber; pineapple; 2 - eggs; 3 - palm oil</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Rice, sugar cane, cassava vegetables, maize, pigmeat, fruits</td>
<td>1 - cashew pepper; 2 - coffee; 3 -</td>
</tr>
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</table>

Note: Data expressed in Tonnes. Source: FAOSTAT
### Imports of Four Key Food Commodities 2011/2012 Ty Into Asian Regions

<table>
<thead>
<tr>
<th>REGION</th>
<th>WHEAT</th>
<th>RICE</th>
<th>CORN</th>
<th>SOYBEAN</th>
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<tr>
<td></td>
<td>Million MT</td>
<td>%</td>
<td>Million MT</td>
<td>%</td>
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<td>E. Asia</td>
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<td>150,566</td>
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<td>36,396</td>
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* The ASEAN (Southeast Asia) region is also growing in its demand for animal feed

Source: USDA FAS

### Imports of Four Key Food Commodities 2013/2014 Ty Into AMCs

<table>
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<tr>
<th>ASEAN member</th>
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<th>RICE</th>
<th>CORN</th>
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<td>Million MT</td>
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<td>Million MT</td>
<td>%</td>
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<td>2,158</td>
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<td>300</td>
<td>6.3</td>
</tr>
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</table>

* Percent of ASEAN total

Source: USDA FAS

### Nutritional Security: The World’s Hungry

- **ASIA**: 512M
- **AFRICA**: 224M

1 out of 10 people go hungry every day in S.E. Asia

Source: The State of Food Insecurity in the World. FAO. 2015

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**Food Security: What it means for a Food-Importing Country**

*Producing enough food is only one part of the equation to achieve food security*

"Asia and the Pacific’s drive for food security has focused too narrowly on quantity, with a surge in obesity and still high levels of malnutrition in some countries highlighting the need for a new approach”

9.6% of people in S.E. Asia are under-nourished

Source: The State of Food Insecurity in the World. FAO. 2015

Link between nutritional insecurity and learning abilities

• 2008 Survey -- One-third of Filipino children stunted by lack of food and malnutrition due to poverty

Eva Goyena 2011. Food and Nutrition Institute, DOST, Philippines

Acute malnutrition stood at 25.6% in 2008 among school children in the Philippines, up from 22.8% in 2005

AFP Report – 4 Feb 2011

2. Challenges and opportunities

"Food Security is a complex situation"
.. F.A.O. SOFI. 2013

• Supply-side factors
  – Demographics: declining & ageing farmer population
  – Declining performance of agriculture
  – Environmental degradation (loss of land and water resources)
  – Climate change
  – Food/feed diversion to other uses

• Demand-side changes
  – Demographics: Population growth, urbanization, increased income
  – Diet changes (more diverse and high protein food)

These factors and changes interact with each other to affect food and nutrition security!

Many Challenges to Food Security

Acute, immediate threats

- Severe Weather disruptions
- Natural calamities
- Pest & Disease outbreaks
- Rising energy prices
- Competition from energy sector
- Sudden Policy changes e.g. trade
- Lower holdings of cereal stocks (Hoarding)
- Diversion from staple to cash crops
- Conflict/Terrorist activities
- Economic factors
- Price hikes
- Food safety/contamination
- Alternative Uses of Biomass
- Human health crises (e.g. SARS)

Chronic, longer-term threats

- Climate change
- Demographic changes
- Poverty
- Underinvestment in infrastructure/technology
- Degradation of land and water resources for agriculture
- Unfriendly policies towards farmers
- Declining no. of farmers

Local, National

National, Regional
By 2050, 70% of the world will be urban (mostly in developing countries)
Asia by 2050 will be >54% urban, as will ASEAN

Food and Diet changes from increasing household incomes

Food Demand Changes in Urbanizing Asia
- Most food is purchased
- Reduced per capita consumption of rice
- Increased consumption per capita of wheat and wheat-based products
- Increased diversity in the food groups consumed
- Rise in high proteins and energy dense diets
- Increased consumption of temperate zone products
- Rising popularity of convenience food and beverages; Westernization of diets
- More vulnerable to food price shocks

Source: Pingali, FAO 2004

Growth (> 60% since 2000) in ASEAN Middle Class fuels growth for more protein!


The Convergence towards animal-based diets, SOFI Report 2012, F.A.O.
The demand for protein food by the middle class living in cities is putting tremendous pressure on land and water resources.

In China, > 1300% increase in meat consumption since the 1960’s, and still rising!

### Estimated water requirements (litres) to produce protein foods, feed and staples

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<td>Potatoes</td>
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<td>105</td>
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<td>133</td>
</tr>
</tbody>
</table>

### Stress Factors on the natural resource base

**ASIA**
- c 60% of world’s population
- 34 per cent of the world’s arable land
- 36 per cent of the world’s water resources

**Environmental degradation**

**Soil**
- Declining arable land area (Degradation (Erosion, Salinization, etc.)

**Water**
- Declining fresh water resources (Pollution by industrial and agricultural effluents)

### With Climate Change by 2050

**Yield**
- Rice 14-26%
- Wheat 32-44%
- Maize 2-5%
- Soybean 18%

**Price**
- Rice 29-37%
- Wheat 81-102%
- Maize 58-97%
- Soybean 14-49%

Source: V. Anbumozhi, ADBI. 2012
“Countering Climate Extremes Key to Asia’s Food Future”

Asia and the Pacific faces a food ‘storm’ in the coming decades unless it takes decisive steps to respond to a host of pressures on its food supplies - including from climate change.

“This will require a combination of conserving and managing existing resources more effectively, tapping science to grow food from less land, and drawing in investment to meet growing food demand,” said Mahfuz Ahmed, Asian Development Bank (ADB) Technical Adviser for Rural Development and Food Security.

Asian Development Bank
5 Oct 2015

Global aggregate yield growth of grains and oilseeds:

1990-2007  1.1 % p.a.

• Yield growth of maize, rice and wheat in Asia has either modestly increased or been on the decline.

Trends challenge the ability of ASEAN to produce enough food (Quantity)

• Need to address effect of biotic and abiotic stresses on crop production and productivity
• Addressing farmers’ practices
• Addressing supply chain issues
• Addressing policy responses
Crop yield levels -- Concepts

RBI: Farm level yield is an important contributor to food security

Need to raise yield levels in both food surplus and food deficit countries

Yield Gaps can be as high as 50% of potential yield

Overall framework to describe rice agricultural systems

L: labor
W: water
F: (mineral) fertilizer
P: pesticides
V: varieties
T: technology level

Ya: attainable yield
IP: injury profile
YL: yield loss

A production situation (PS) is the combination of interconnected social, economical, and ecological attributes of the environment where agricultural systems’ performances take place..


Rice production situations (PS) and injury profiles (IP) in Asia’s lowlands characterized

- N = 1051 individual fields surveyed
- Standardized protocol (IN, PS) = 60 variables per field
- 14 sites
- period covered: 23 years (1987 – 2011)

Disturbances from stresses are the norm in rice systems

Rice loss due to Diseases and pests and others (tons/yr)

Data source: ASEAN Food Security Information System, as presented in Q2 2014

Rice diseases in Asia’s lowlands

• Despite the diversity of PS-IP, yield losses are broadly similar among PSs
• Recent evolution (1990-2010) indicates strong increases in inputs (fertilizers, pesticides) and technology shifts (hybrids)
• … and yet yields barely increased
• Which implies that over-intensification occurs
• New crop loss risks have emerged – False Smut, Bacterial Leaf Streak, Sheath Rot, Ragged Stunt
• Components of intensification (N, P, T = HYB) are misused (missed yield target; sustained crop losses; environmental impacts)
• System development should account for performances other than yield alone (WUE, NUE, yield quality, environmental impacts – and crop health)

Genetic improvement to address stresses

• Single biotic stress – single gene
• Single set of abiotic stresses – single gene
• Multiple biotic stresses – stacked genes
• Multiple stresses (biotic + abiotic)
• Epidemiological theories –
  – vertical (single gene resistance) versus horizontal resistance (polygenic, QTLs)

Biotechnology crop varieties

Country | Food status | Maize | Soybeans
---|---|---|---
U.S.A. | Exporter | 9.97 | 2.9
Canada | Exporter | 8.9 | 2.9
Argentina | Exporter | 6.6 | 2.5
China | Importer | 6.1 | 1.9

Sources: FAO Statistics; USDA FAS

Farmers’ Record Yields

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yields (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>22.3 (Rainfed) Chile</td>
</tr>
<tr>
<td>Soybean</td>
<td>10.8 (Irrigated) Chile</td>
</tr>
<tr>
<td>Wheat</td>
<td>15.5 (Irrigated) MO, US</td>
</tr>
<tr>
<td>Rice</td>
<td>18.0 (Irrigated) China</td>
</tr>
</tbody>
</table>

From: Fisher, Edmeades & Byerlee, 2013

Figure 9 – New Sub1 lines after 17 days submergence in field at IRRI.
Issues in Food Utilization

A. Nutrition (security)
   A. Linkage to poverty
   B. Food quality (enhancing crops)
   C. Malnutrition

B. Food Safety
   E.g. Reducing mycotoxins
   A. Food Loss and Waste

Global Hidden Hunger Index

The Hidden Hunger Index is the average, for preschool children, of three deficiency prevalence estimates:

- Stunting (as a proxy for zinc deficiency)
- Iron-deficiency anemia
- Vitamin A deficiency

Key message:
- Need to improve dietary quality, particularly for poorer population groups...

Action:
- Education (“rainbow diet”)
- Safety nets
- Home gardens
- Enhanced staples

To download the report: [http://www.fao.org/3/a-i4646e.pdf](http://www.fao.org/3/a-i4646e.pdf)
Food Safety Issues

- Raw food ingredients – quality and contaminant free
- Handling – quality and safety from contamination
- Processing techniques and technologies
- Packaging techniques and technologies
- Distribution and Retail (Shelf life)
- Considerations: Cost, Utility, Acceptance

Food Loss & Waste


Genetic improvement to address nutrition insecurity
- Quality traits, e.g. Vitamin A, Iron-enriched crop varieties
- Other quality traits

Genetic improvement to address food safety
- Reducing contaminants (e.g. mycotoxins)

Genetic improvement to address food loss
- Traits to delay senescence/ improve storability & handling
3. Moving forward: What can be done to assure food security?

- Emergent approaches and technologies to assure available, stable supplies of food
- Tackling food utilization issues (nutrition, safety, waste)

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The Food Supply Chain that guarantees food and nutrition security

<table>
<thead>
<tr>
<th>Input supplies</th>
<th>Farming &amp; Food Production</th>
<th>Processing &amp; Post Harvest</th>
<th>Marketing &amp; Sales</th>
<th>Distribution &amp; Wholesale &amp; Retail</th>
<th>Consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FARM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Concerns about sustainable food production (quantity)
Concerns about food quality (GAP)
Concerns about food safety

In SE Asia, “National food security depends on regional and global food security”

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Singapore: 4+1 “Food Taps”

2. Imports

Determined by food surplus in exporting countries

1. Self Production

Limited by production factors of land, water, labour

4. Contract Farming??

3. Reserves/Stockpiles

5. Food Aid

Producing enough food is only one part of the equation to achieve food security

---

How inter-connected are we?

Asia is a net food importer

Economist Online 28 May 2012

Source: Carilli
In summary: To assure food security

Food Availability
- Increase agricultural productivity using new technologies
- Reduce losses
- Encourage sustainable int’l trade
- Supportive agricultural policies

Physical Access To food
- Improve transport logistics and infrastructure
- Link farmers to markets
- Reduce loss
- Urban farming

Economic Access To food
- Keep food prices low and stable
- Social programs, safety nets
- Increase entrepreneurial skills of farmers
- Non-farm employment

Food Utilization
- Nutrition security
- Food safety: Improve infrastructure/hygiene
- Reduce waste
- Biofortification, dietary supplements, education

Need to address all four dimensions

SE Asia Regional Initiatives

- ASEAN Secretariat (Jakarta)
  - ASEAN Integrated Food Security Framework and Strategic Plan of Action
  - ASEAN Food Security Information System (AFSIS); ASEAN Plus Three Emergency Rice Reserve (APTEER)

- SEARCA (Southeast Asian Center for Research and Graduate Studies in Agriculture, Los Banos, Philippines)
  - Umbrella Program on Food Security
  - Leaders in ASEAN Agriculture and Development (6-10 June 2016)

- World Economic Forum/ GROWASIA:
  Inclusive Agri-business

Thank you -谢谢- Terima Kasih - धन्यवाद - ありがとう - Maraming selamat - Merci - Gracias - 너를 감사합니다 - Thank you

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