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A Graduate School of Nanyang Technological University

# Impact of Climate Change on ASEAN Food Security
# 6-7 June 2013, Manila, Philippines

**Framing the issues: Linking climate change effects to the food security ecosystem in the ASEAN region and beyond**

**Expert Group Meeting**

Centre For Non-Traditional Security Studies

# Context

- At the 21th ASEAN Summit held in Phnom Penh, Cambodia, in 2012, ASEAN leaders declared that "*food security remains a major challenge for ASEAN and the world as a whole, at a time of high commodity prices and economic uncertainty*".

- Food security is fundamental to human security and sustainable development.

# Context

Question: How are different important area-sources of key food items for ASEAN affected by anticipated climate change scenarios (downscaled to specific climate factors)?

**Downscaled CC scenarios for Asia:**

- Average ambient temperature increase of 2 deg C
- Increased precipitation
- Decreased precipitation
- Sea temperature rise
- Sea level rise of 0.5 m

# Objectives of Expert Group Meeting

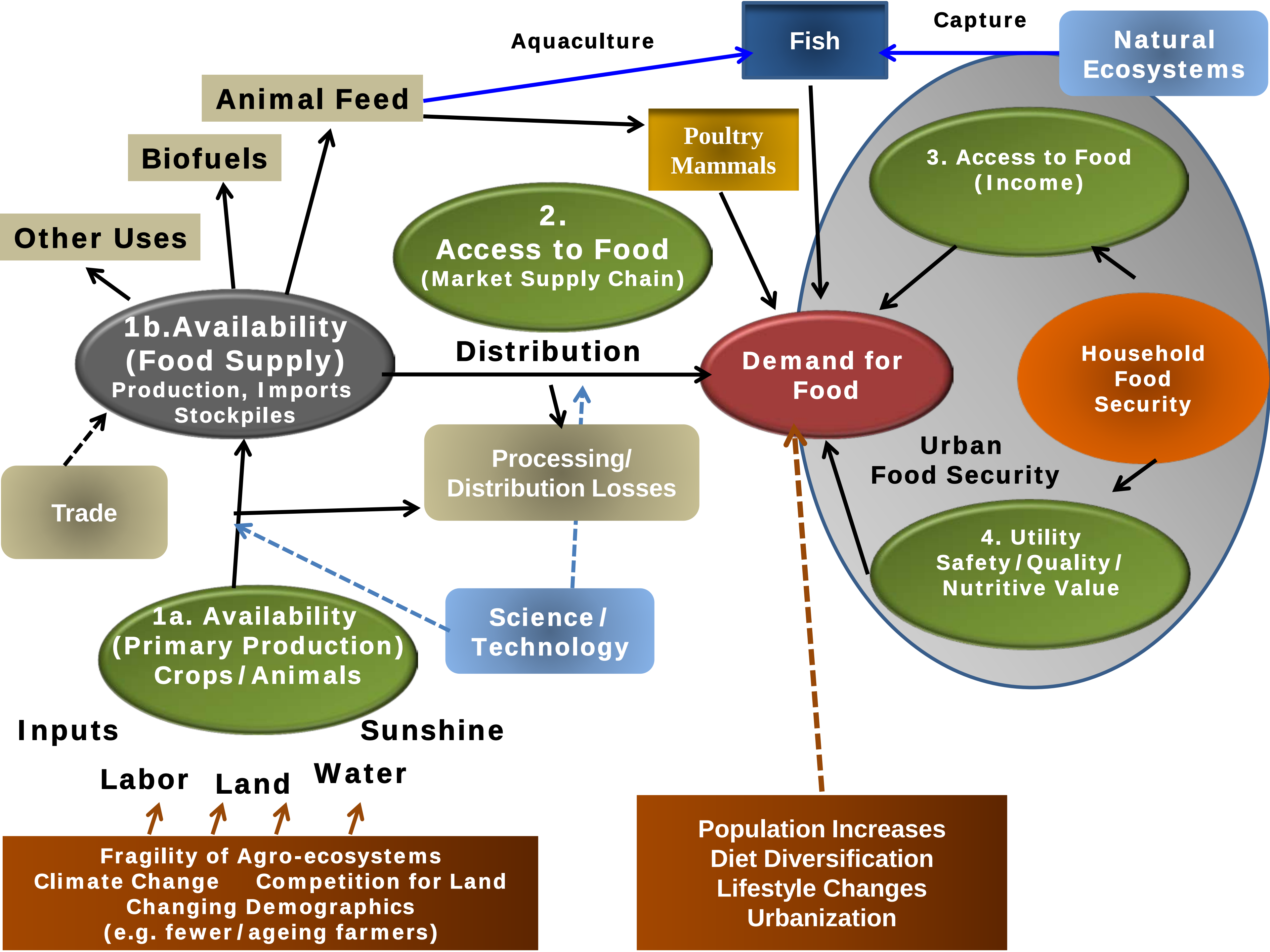
- Determine which climate change scenarios are most likely to impact on the food security ecosystem in ASEAN, recognizing the inter-connectedness between geographic regions for food trade, for e.g. the impact of sea level rises, an increase/decrease in rainfall, etc, on shipping lanes and infrastructure; and
- Identify possible strategies that would facilitate a mapping of the drivers that affect food security, and a detailed assessment of the impact of climate change on food security ecosystem components, according to geographic locations.

*Underpinning: What are policy recommendations?*

# 1. The Food Security Ecosystem

The food security ecosystem is considered to include:

- food availability (agricultural production, imports via trade, reserves or stockpiles),
- physical access to food (supply chains and their associated logistics),
- economic access (food pricing and safety nets) and
- food utilization (nutrition and safety).



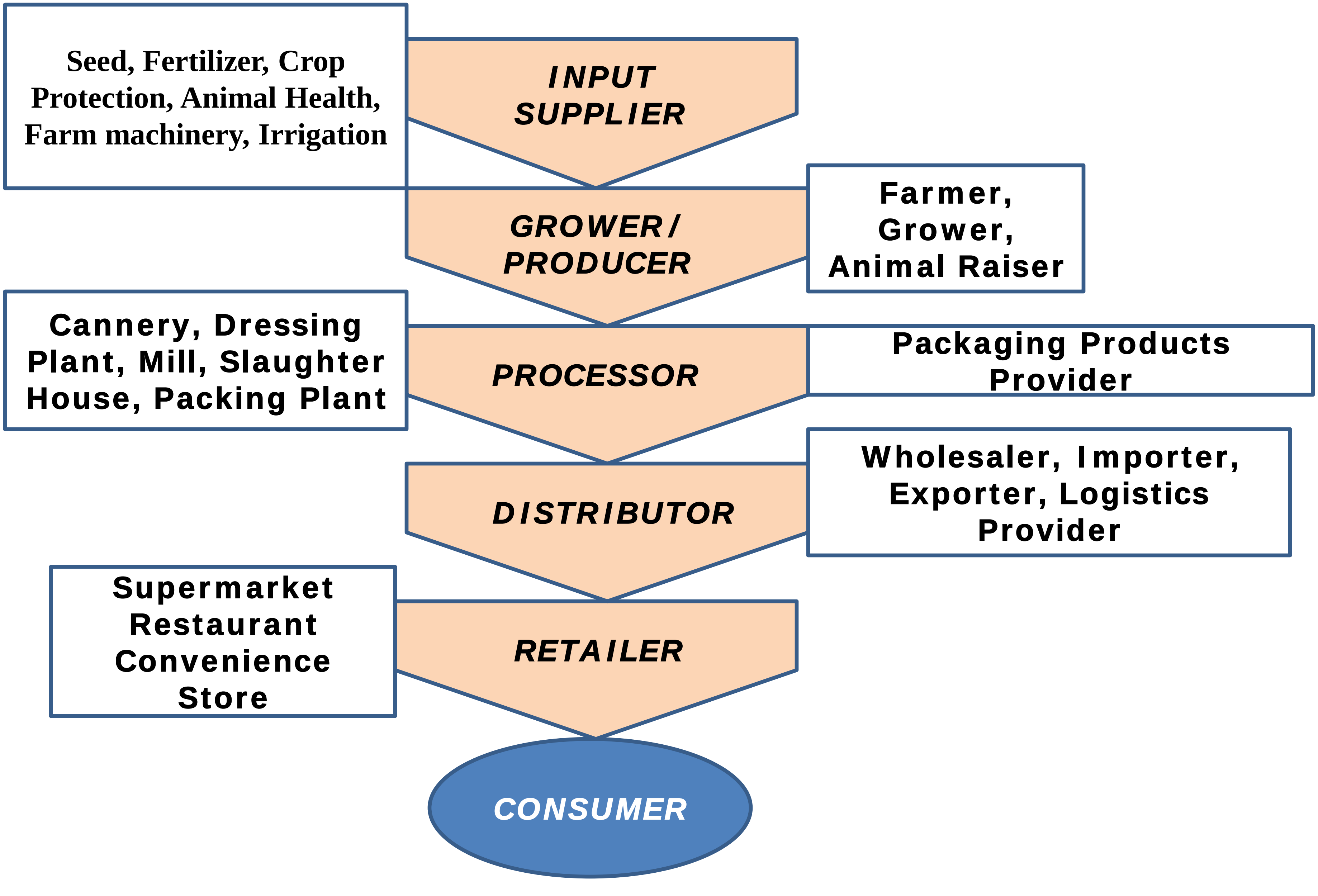
Fish
Capture
Natural Ecosystems
Aquaculture
Animal Feed
Biofuels
Other Uses
Poultry Mammals
3. Access to Food (Income)
2. Access to Food (Market Supply Chain)
1b.Availability (Food Supply) Production, Imports Stockpiles
Distribution
Demand for Food
Household Food Security
Urban Food Security
Trade
Processing/ Distribution Losses
4. Utility Safety / Quality / Nutritive Value
1a. Availability (Primary Production) Crops / Animals
Science / Technology
Inputs
Sunshine
Labor
Land
Water
Fragility of Agro-ecosystems
Climate Change
Competition for Land
Changing Demographics
(e.g. fewer / ageing farmers)
Population Increases
Diet Diversification
Lifestyle Changes
Urbanization

***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."*

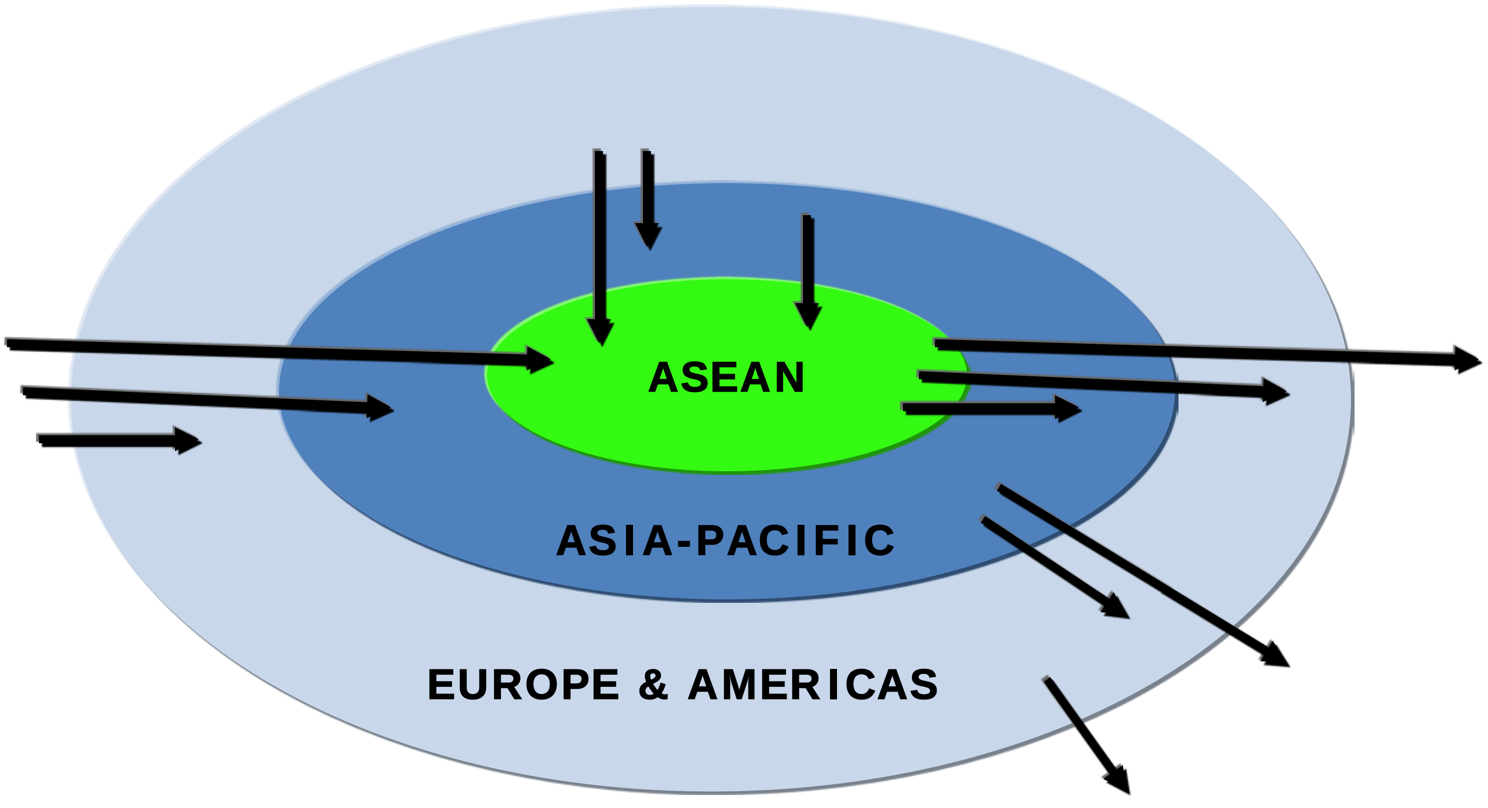
*(Food and Agriculture Organization, U.N.)*

*Underpinning ---*
*Stability in availability, access and utility*




**COMPONENTS IN THE FOOD SUPPLY CHAIN**

## Inter-relationships between Food Supply and Demand at regional and global levels




Global Food Supply Chain

| Country | Major Ag Commodities Produced | World Ranking (2011) |
| --- | --- | --- |
| Brunei | rice, vegetables, fruits; chickens, eggs | |
| Burma | rice, vegetables, beans, fruits, groundnuts, sugarcane | 2- pigeon peas, beans; 3- mustard seed |
| Cambodia | rice, cassava, maize, vegetables, sugar cane | |
| Indonesia | rice, cassava (tapioca), sugar cane, palm oil, maize, coconuts, bananas, fruits, rubber | 1- palm oil, cloves, cinnamon, coconuts;<br>2 – rubber, nutmeg; 3 – rice, coffee, cassava |
| Laos | rice, vegetables, sugar cane, maize, cassava, sweet potatoes | |
| Malaysia | palm oil, rice, chicken meat, rubber, sugar cane, coconuts | 2 – palm oil;<br>3 - rubber |
| Philippines | sugarcane, rice, coconuts, bananas, maize, vegetables, fruits | 2 – coconuts, pineapple; 3 - bananas |
| Singapore | eggs, vegetables | |
| Thailand | sugar cane, rice, cassava, maize, rubber, fruits | 1 –rubber, pineapple; 2- eggs; 3 – palm oil |
| Vietnam | Rice, sugar cane, cassava vegetables, maize, pigmeat, fruits | 1- cashew pepper;<br>2 - coffee; 3 – |

**Source: FAOSTAT**

# ASEAN COUNTRIES
# ARE GLOBAL FOOD PLAYERS
# (2011)

| Global Rank | 1 | 2 | 3 |
|---|---|---|---|
| **Rice, paddy** | China | India | **Indonesia** |
| **Palm oil** | **Indonesia** | **Malaysia** | **Thailand** |
| **Coconuts** | **Indonesia** | **Philippines** | India |
| **Coffee, green** | Brazil | **Vietnam** | **Indonesia** |
| **Sugar crops** | **Myanmar** | Bangladesh | **Indonesia** |
| **Banana, fresh** | India | China | **Philippines** |
| **Pineapple** | **Thailand** | Brazil | Costa Rica |

*Source: FAOSTAT*

# ASEAN COUNTRIES ARE GLOBAL FOOD PLAYERS (2011)

| Global Rank | 1 | 2 | 3 |
|---|---|---|---|
| Cloves | **Indonesia** | Madagascar | Tanzania |
| Cinnamon | **Indonesia** | China | **Vietnam** |
| Pineapples | **Thailand** | Brazil | Costa Rica |
| Nutmeg | Guatemala | **Indonesia** | India |
| Mangoes, mangosteens, guavas | India | China | **Thailand** |
| Cashew | **Vietnam** | Nigeria | India |
| Cassava | Nigeria | Brazil | **Indonesia** |

*Source: FAOSTAT*

# Intra-ASEAN trade

- Intra-ASEAN trade in agro-food products is < 7% of total trade in 2010
- Trend is towards increasing intra-ASEAN sourcing of agro-food products
- Transport logistics and costs is a factor

# PRODUCTION AND IMPORTS OF FOUR KEY FOOD COMMODITIES INTO ASIA

| Crop | Item Million MT | 06/07 | 07/08 | 08/09 | 09/10 | 10/11 | 11/12 | 12/13 |
|---|---|---|---|---|---|---|---|---|
| **WHEAT** | Global Production | 596 | 612 | 682 | 684 | 652 | 696 | 655 |
| | **Asia Imports** (% of Global Exports) | **35** (30) | **31** (27) | **34** (24) | **35** (26) | **38** (28) | **40** **(26)** | **39** (27) |
| **RICE (milled)** | Global Production | 421 | 434 | 448 | 440 | 449 | 466 | 468 |
| | **Asia Imports** (% of Global Exports) | 10 (31) | 8.5 (29 | 6.9 (24) | 8.6 (28) | 11 (30) | 11 **(27)** | 10 (26) |
| **CORN** | Global Production | 714 | 795 | 799 | 812 | 832 | 883 | 856 |
| | **Asia Imports** (% of Global Exports) | 34 (37) | 35 (36) | 34 (40) | 37 (39) | 37 (40) | 40 **(38)** | 37 (38) |
| **SOYBEAN** | Global Production | 237 | 221 | 212 | 261 | 264 | 240 | 270 |
| | **Asia Imports** (% of Global Exports) | 39 (56) | 48 (61) | 51 (66) | 61 (65) | 65 (71) | 71 **(78)** | 73 (75) |

Source: USDA FAS

# IMPORTS OF FOUR KEY FOOD COMMODITIES 2011/2012 TY INTO ASEAN

| REGION | WHEAT | | RICE | | CORN | | SOYBEAN | |
|---|---|---|---|---|---|---|---|---|
| | MT | %* | MT | % | MT | % | MT | % |
| E. Asia | 16,865 | **42.0** | 4,125 | **43.0** | 32,339 | **82.1** | 65,449 | **92.0** |
| S. Asia | 5,402 | **13.4** | 790 | **8.2** | 0 | **0** | 0 | **0** |
| SE. Asia | 17,863 | **44.5** | 5,410 | **56.2** | 7,064 | **17.9** | 5681 | **8.0** |
| Asia | 40,130 | | 9614 | | 39,403 | | 71130 | |
| World | 150,566 | | 36,396 | | 106,266 | | 93,055 | |

** Percent of Asia total*

Source: USDA FAS

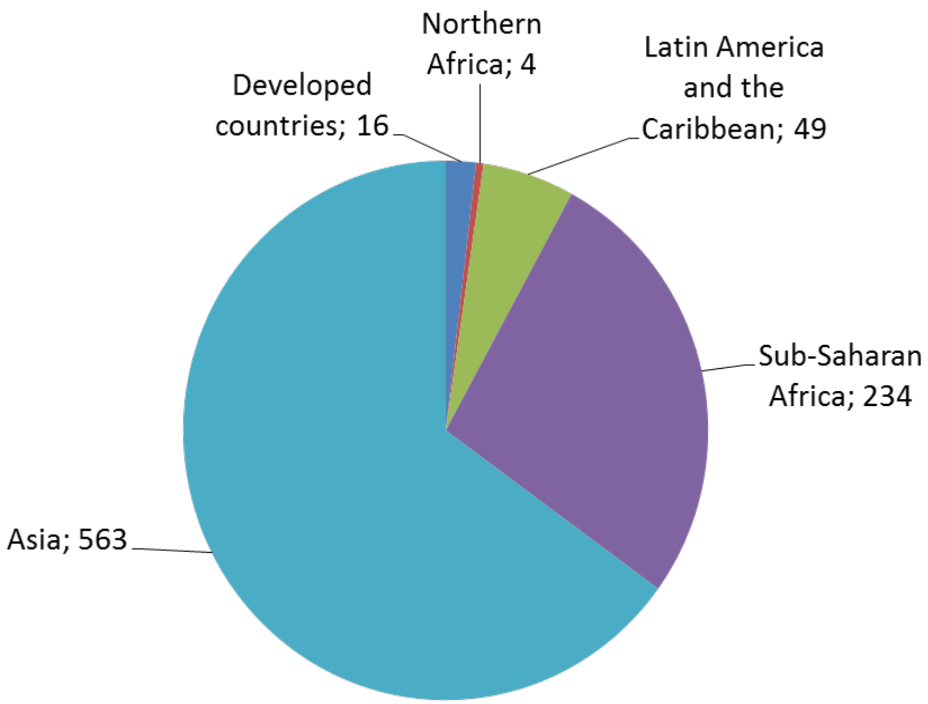
# IMPORTS OF FOUR KEY FOOD COMMODITIES 2011/2012 TY INTO AMCs

| ASEAN member | WHEAT | | RICE | | CORN | | SOYBEAN | |
|---|---|---|---|---|---|---|---|---|
| | MT | %* | MT | % | MT | % | MT | % |
| Indonesia | 6,457 | **36.1** | 1,700 | **31.4** | 1,700 | **24.1** | 1,900 | **33.4** |
| Malaysia | - | - | 1,085 | **20.0** | 3,200 | **45.3** | 570 | **10.0** |
| Philippines | 4,020 | **22.5** | 1,500 | **27.7** | - | - | 60 | **1.1** |
| Thailand | 2,578 | **14.4** | 600 | **11.0** | - | - | 1,906 | **33.6** |
| Vietnam | 2,600 | **14.6** | - | - | 1,500 | **21.2** | 1,225 | **21.6** |

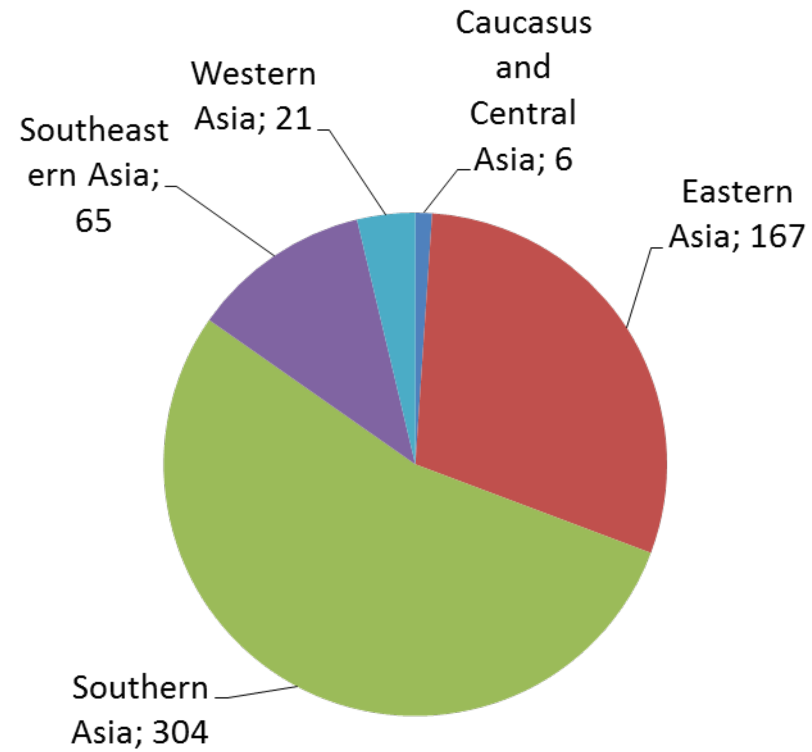
** Percent of ASEAN total*

Source: USDA FAS

# Current Reality: Where do the Hungry Live? (2010-2012)



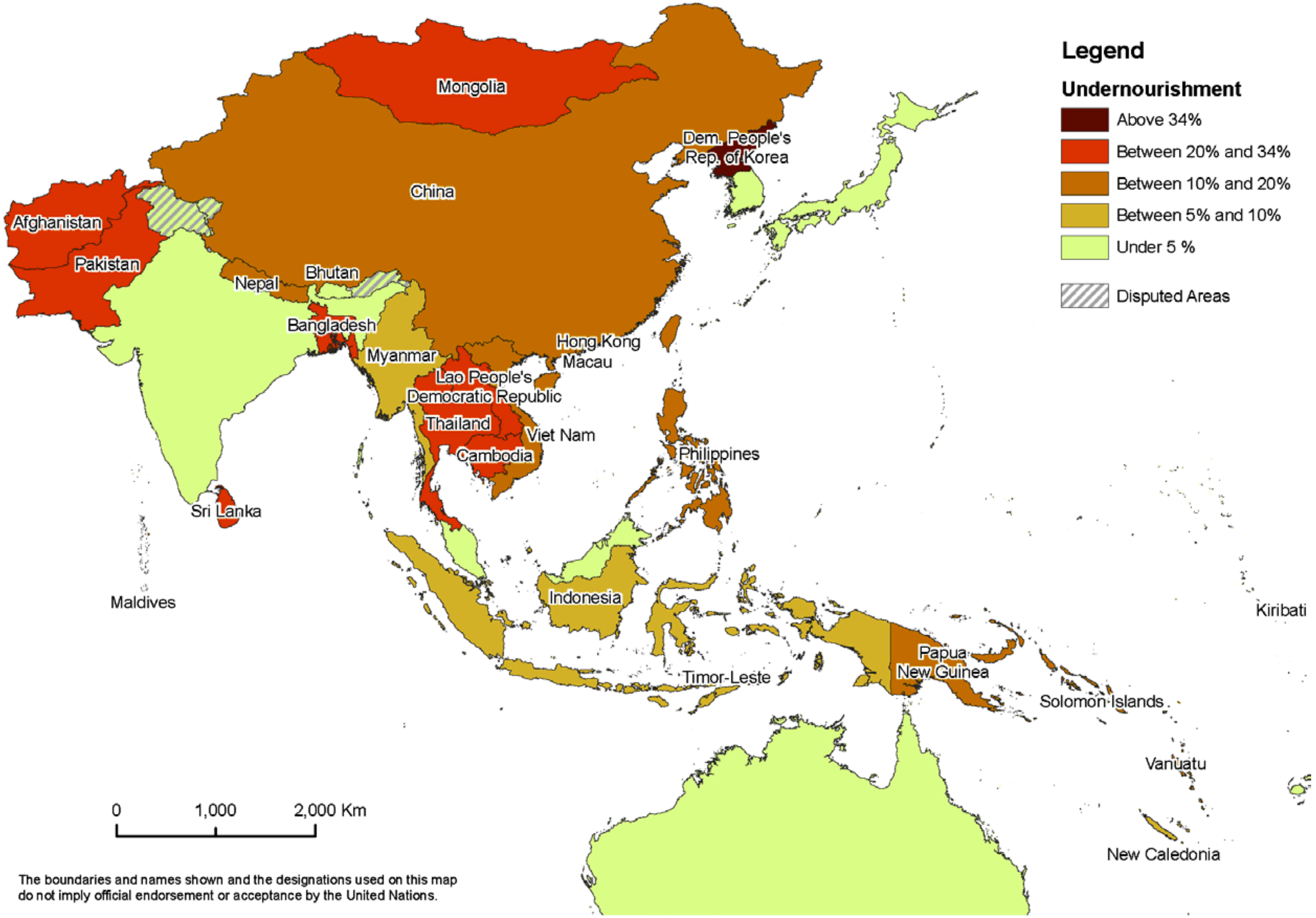

Total (world) = 868 million




Total (Asia) = 563 million

*Source: The State of Food Insecurity in the World, FAO (2012).*

# Prevalence of Undernourished (MDG indicator)




The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

# Chronic symptoms: Nutrition Insecurity – An added dimension

## Link between nutritional insecurity and learning abilities

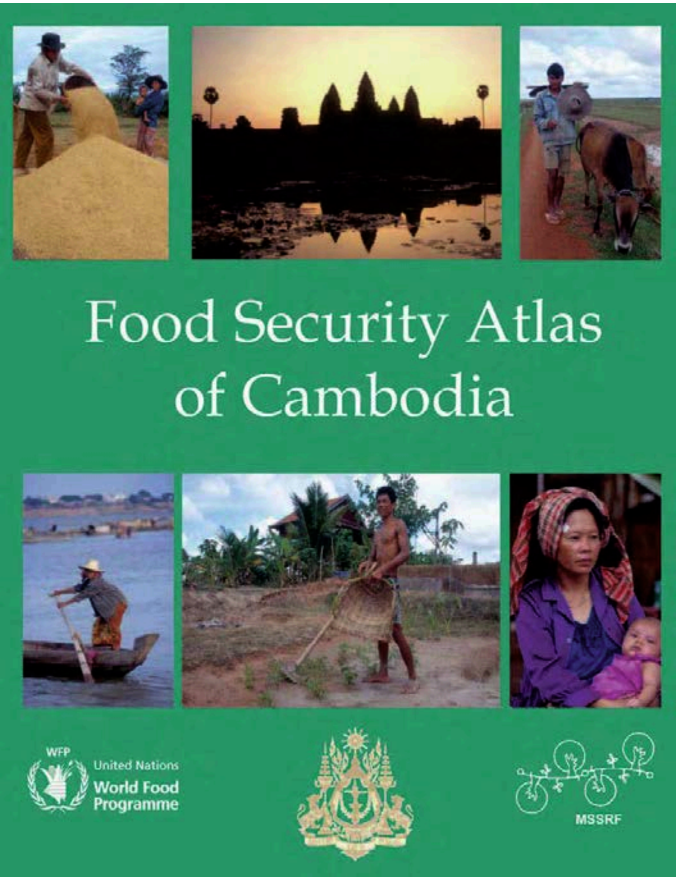
- 2008 Survey -- One-third of Filipino children stunted by lack of food and malnutrition due to poverty

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**

# Food Security Atlas – SE Asia




# Current approach to food security

- Focus on increasing crop yields (delegation to agriculture departments)
- Ignores new complexities in food security – multiple dimensions
- Not enough pro-active planning to recognize impending “drivers”
- Lack of comprehensive approach
- Contradictions
  - Most ASEAN countries not food secure (according to Rice Bowl Index)
  - Many vulnerabilities and food insecurities exist (WFP maps, etc.)

# Approaches to food security

- **Food self-sufficiency**: meeting food needs, as far as possible, from domestic supplies and minimizing dependence on international trade; Advocates diets that are simple and natural that can be produced domestically. (Konandreas, 2006)
- **Food self-reliance**: advocates reliance on the international market for the availability of food in the domestic market; implies maintaining some level of domestic food production plus generating the capacity to import from the world market as needed. International trade is an essential component. (Konandreas, 2006)

# Food Security Concepts

- **Food sovereignty**: ‘the right of the people, communities and countries to define their own agricultural, fisheries, land and food policies which must be ecologically, social, economic and culturally appropriate to their particular conditions’
- The ‘**right to food**’ : recognition that every person has the right to have access to a decent standard of living, including access to adequate food.

FAO, 1996

# 2. Anticipated CC downscaled scenarios, and sources of agricultural products

**Downscaled CC scenarios for Asia:**

- Average ambient temperature increase of 2 deg C
- Increased precipitation (Total, Frequency)
- Decreased precipitation (Total, Frequency)
- Sea temperature rise
- Sea level rise of 0.5 m

# Key food commodities in ASEAN

**Rice**

- Top exporters in the world/Asia: Thailand, Vietnam, India and U.S. (R. Dy)

**Caught and Cultured Fish**

- Top exporters in the world: Norway, China, Chile, Vietnam, Spain, Thailand, Indonesia and India

**Eggs**

- Top exporters in the world: U.S., Netherlands, France, India, Germany, Ukraine, Argentina, Italy, China, Poland

# Key food commodities in ASEAN (Contd.)

## Fresh Vegetables (highland and lowland)

- Top exporters in the world: Mexico, Netherlands, Italy, U.S., France, China, Kenya, Spain, Israel, India, Thailand

## Fresh Fruits

- Top exporters in the world: Vietnam, Netherlands, Spain, China, Hong Kong SAR, U.S.

# Geographic areas of concern to ASEAN food availability potentially impacted by downscaled CC scenarios

VIETNAM:

- Rice - Mekong Delta
- Fish – Whole country

THAILAND:

- Rice - Central Plains, North-East Region
- Chicken – Whole country
- Vegetables – Whole country
- Fresh fruits – Whole country
- Fish – Gulf of Thailand, Andaman Sea

MALAYSIA:

- Vegetables – Cameron highlands
- Fresh fruits – Whole country
- Fish – Peninsular Malaysia

# Geographic areas of concern to ASEAN food availability potentially impacted by downscaled CC scenarios (Contd.)

INDONESIA:

- Fish – Whole country
- Pork – Pulau Bulan

CHINA:

- Fish – Southern Coastal zone
- Eggs – South China
- Fresh Vegetables – South and South West China

INDIA:

- Rice – Punjab, East India
- Eggs - Southern states (70% of total production): Andhra Pradesh, Tamil Nadu, and Maharashtra

## **Geographic areas of concern to ASEAN food availability potentially impacted by downscaled CC scenarios** (Contd.)

- U.S.A.:
- Soybean (mid-west)
- Corn (mid-west)
- Chicken (mid-west)

BRAZIL:

- Soybean – South and Central regions: Bahia, Mato Grosse, Goias, Mato Groso do Sul
- Chicken – South and Central regions
- Corn – Southern states: Parana, Santa Catarina followed by Sao Paulo and Goias

# Climate change impact on crop yields, 2050

| ASIA | |
|---|---|
| **Crop** | **Change in Production (%)** |
| **Rice** | |
| Irrigated | **-10.47** |
| Rainfed | **0.66** |
| **Maize** | |
| Irrigated | **-5.54** |
| Rainfed | **1.71** |
| **Wheat** | |
| Irrigated | **-13.50** |
| Rainfed | **-1.91** |
| **Soybeans** | |
| Irrigated | **-6.73** |
| Rainfed | **8.58** |

**Source: IFPRI 2011**

***Need more targeted information to guide policy making in ASEAN and individual countries***

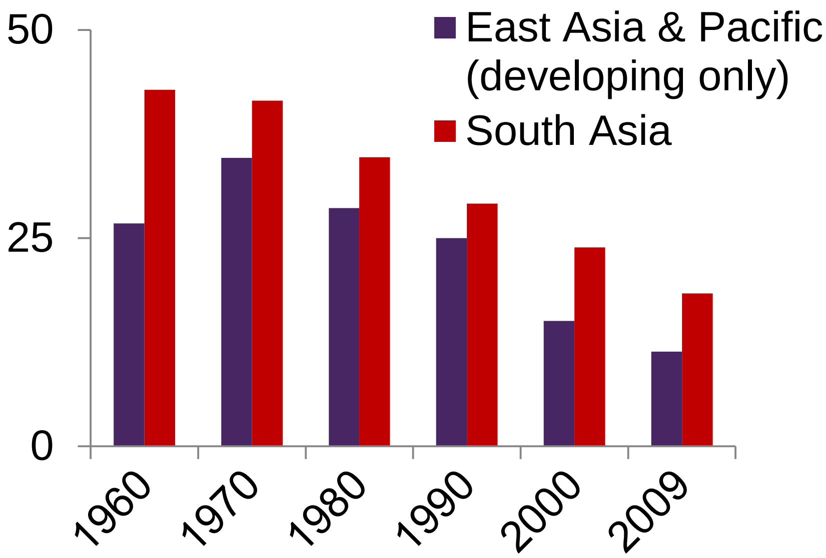
# 3. Challenges and opportunities in the region

## Food Demand Changes in Asia – A rising "middle class"

- 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

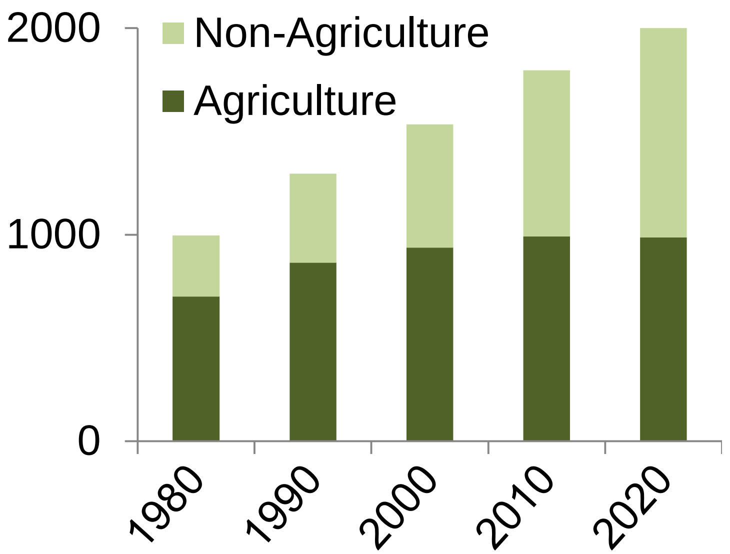
Source: Pingali, FAO 2004

**Agricultural GDP as share of total GDP, %**




**Source: World Bank 2011**

**Number of economically active people in developing South and East Asia (millions)**




**Source: FAO 2011**

<u>STEADY DECLINE</u> in agricultural GDP and proportion of economically active people employed in agriculture

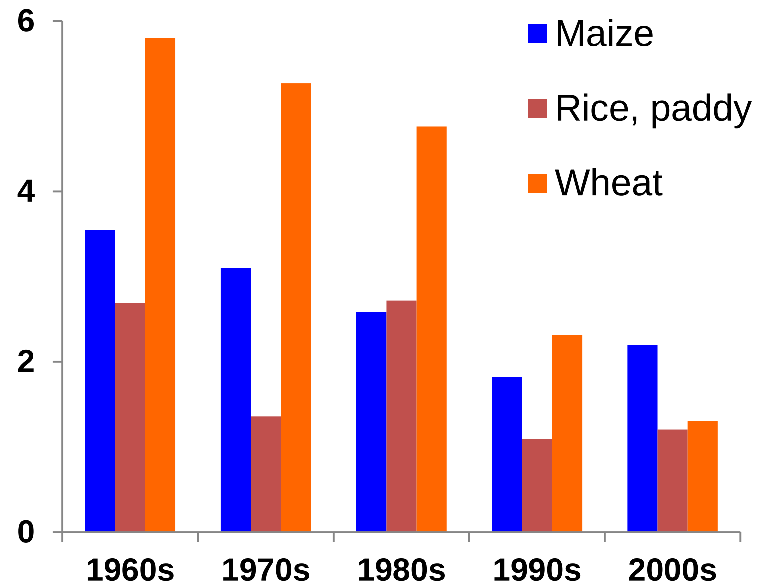
Source: Shenggen Fan, 2011

- Global aggregate yield growth of grains and oilseeds:

| | |
|---|---|
| 1970-1990 | 2 % p.a. |
| 1990-2007 | 1.1 % p.a. |
| 2007-2017 | <1% p.a. |

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

**Growth in crop yield, %**




Source: FAO 2011

# Stress Factors on the natural resource base

**Soil**

- Degradation (Erosion, Salinization, etc.)

**Water**

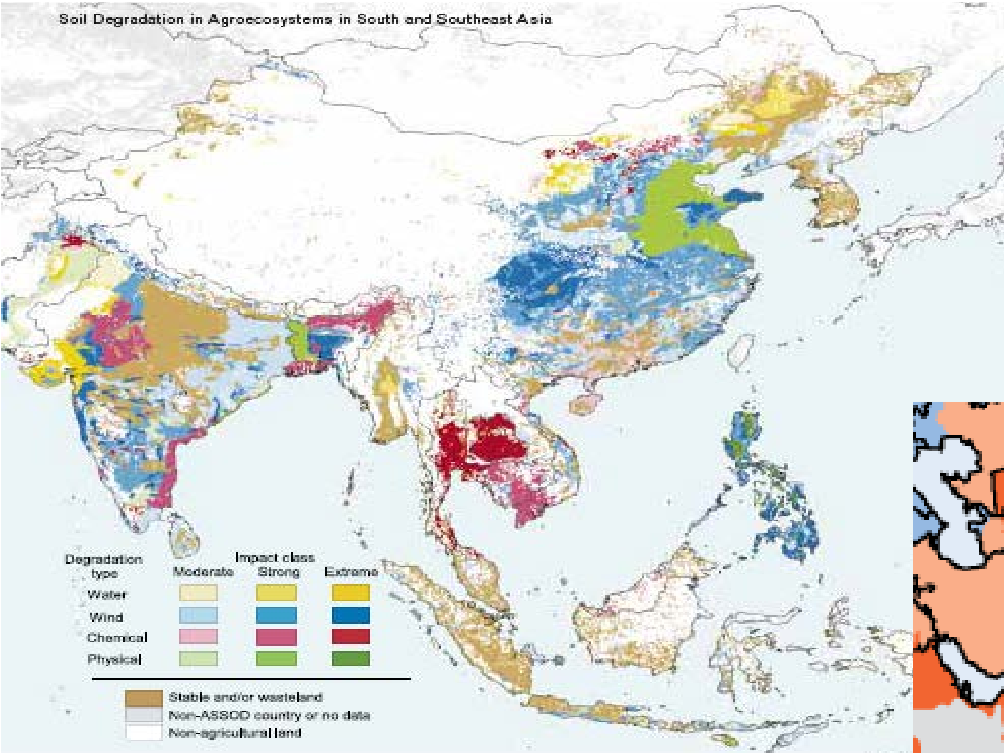
- Pollution by industrial and agricultural effluents

**Air**

- Pollution by natural and anthropogenic sources

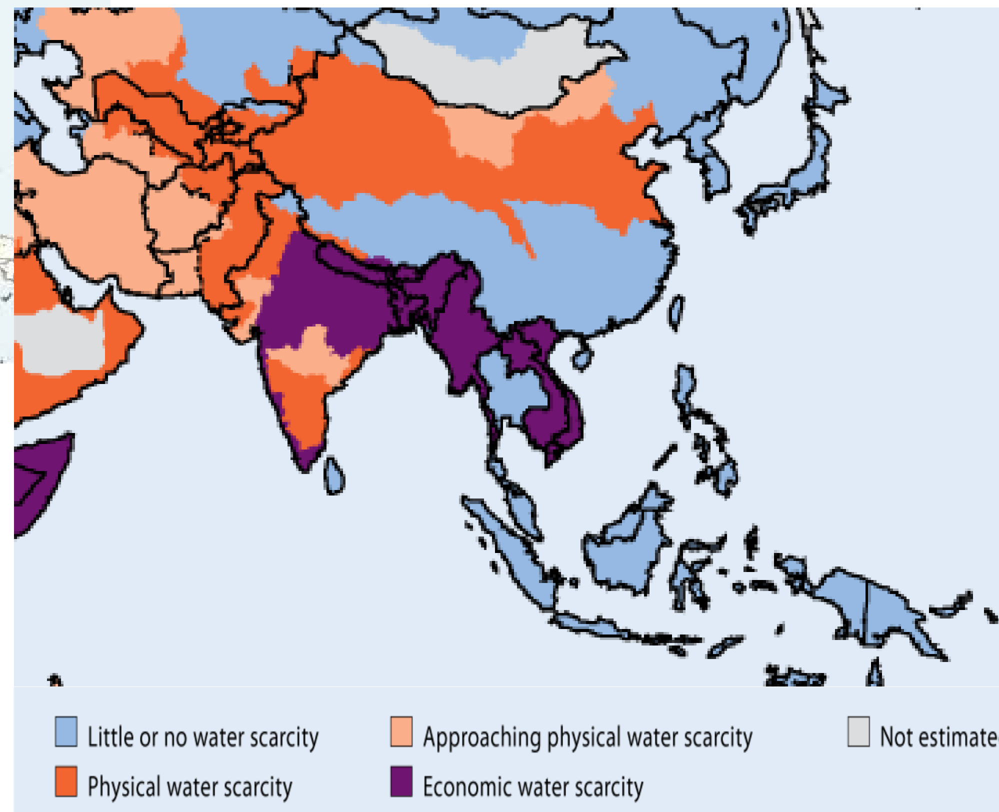
**Global Climate Change (GCC)**

# Land & Water Constraints




**Soil degradation**

**Source: ISRIC**




**Areas of water scarcity**

**Source: IWMI**

| | Arable Land (1000Ha) (2011) |
|---|---|
| Brunei Darussalam | 3 |
| Cambodia | 4000 |
| Indonesia | 23500 |
| Lao PDR | 1400 |
| Malaysia | 1800 |
| Myanmar | 10786 |
| The Philippines | 5400 |
| Singapore | 0.63 |
| Thailand | 15760 |
| Viet Nam | 6500 |
| **Total** | **69149.63** |
| **Arable Land/Total Land** | **15.59%** |

*(Source: FAOSTAT)*

**Current loss of arable land due to other competing uses and degradation**

# Rapid transformation of Supply Chains

- Emergence of supermarkets and large wholesalers/processors in the last two decades
- Rapid transformation of wholesale, logistics, processing, food retail – fastest in the world, in history
- Based mainly on massive investments by private sector (domestic and foreign)
- Higher quality and safety standards
- 50-57% of food cost from post farmgate expenses in supply chain

Potential Impact: Lower food prices for urban consumers BUT lower market participation among poorer small farmers

Source: Thomas Reardon, 2011

# Why should ASEAN be concerned?

**Sustaining a food production capacity**
**Sustainable agriculture**
**Food Security as the *raison d'être* for sustainable agriculture**

- Food Security depends on a productive natural resource base (environment) to sustain productivity: valuing ecological services
- Food Security depends on a productive workforce of farmers who can derive their livelihoods from farming
- Food Security depends on there being surplus production over consumption, i.e. exportable volumes at affordable prices

# Multi-sector, integrated approaches to food security

**FOOD SECURITY: Multiple Dimensions**

Agriculture

Water Supply

Health & Nutrition

Trade

Energy

Transport

Finance

Education

Land use

Environment

Social development

Economic development

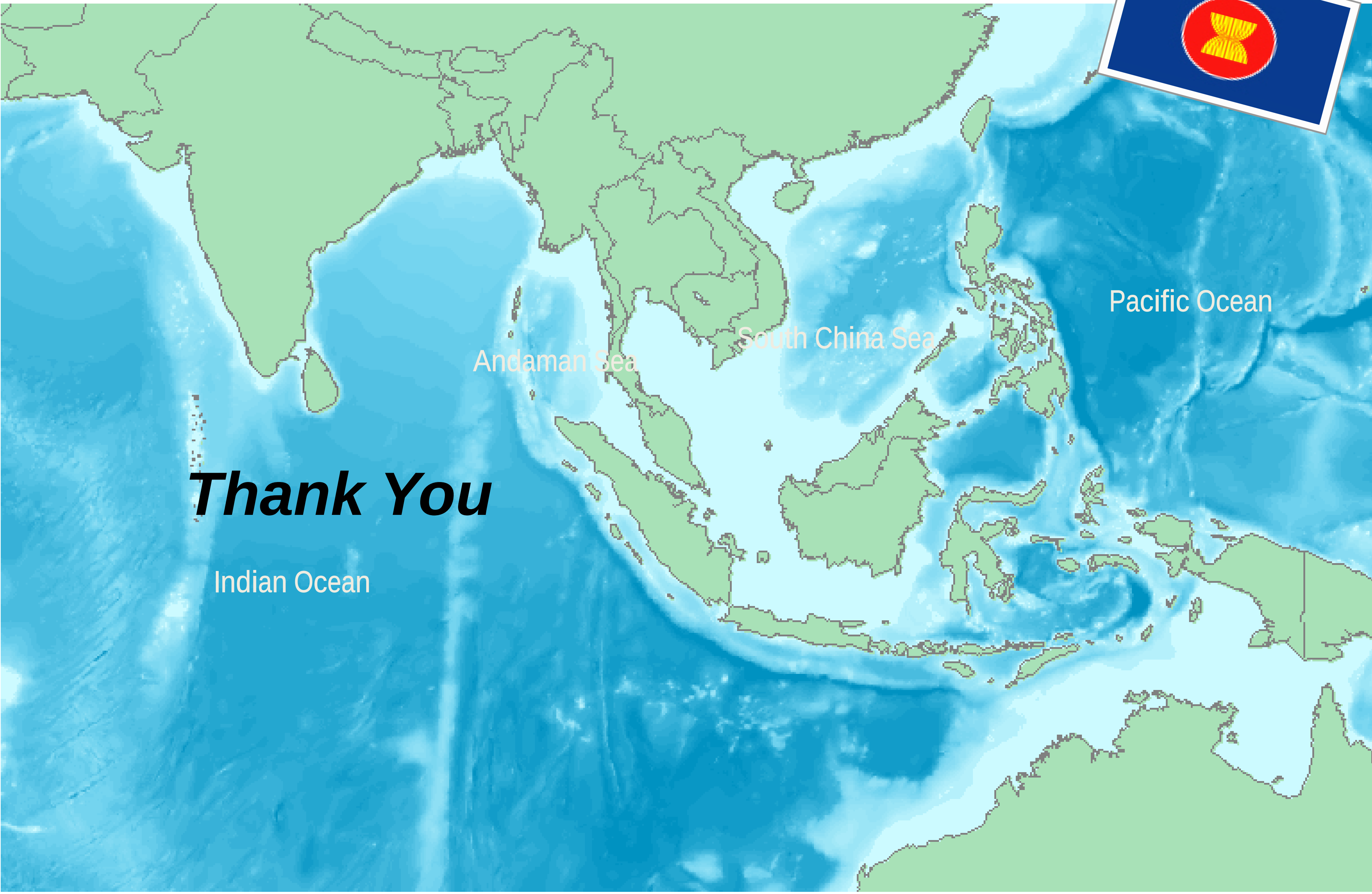
National security

Migration

Labour & Employment

Political stability

Public works


Thank You
Andaman Sea
South China Sea
Pacific Ocean
Indian Ocean