




**S. RAJARATNAM SCHOOL
OF INTERNATIONAL STUDIES**
A Graduate School of Nanyang Technological University

Food Security and Climate Change Impact on Urban-Rural Linkages

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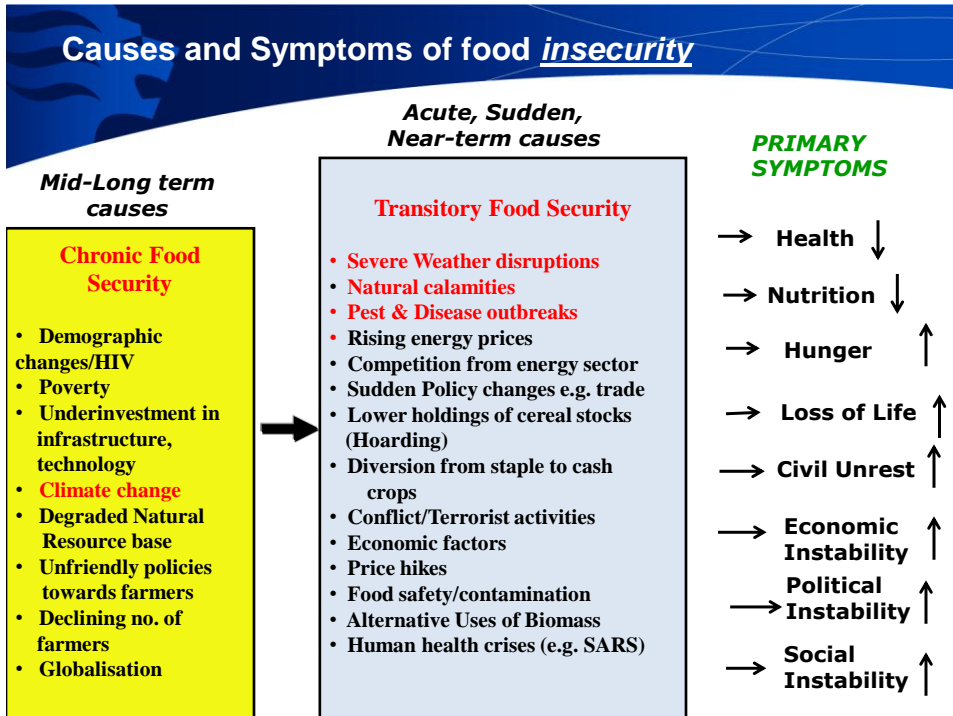
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Background points

- It is not climate change *per se* that is of concern, but it is the **impact** of climate change, short and long-term, that is of concern to all
- Climate change impact is particularly felt in environment security and food security
- There is a strong link between water, energy and food security. Adaptation and Mitigation measures need to explicitly account for this link.
- The world has become an urbanized society. CC impacts on the countryside have severe effects on people living in cities.



Acute symptoms: Civil unrest in response to price hikes






"A hungry person with low blood sugar is a very angry person – virtually ungovernable"

Ruth Oniang'o





Source: FAO (Food and Agriculture Organization of the United Nations), International Commodity Prices Database, accessed March 24, 2011, www.fao.org/es/esc/prices/PricesServlet.jspx?lang=en.

During 2007-2008, food riots in 47 countries.

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

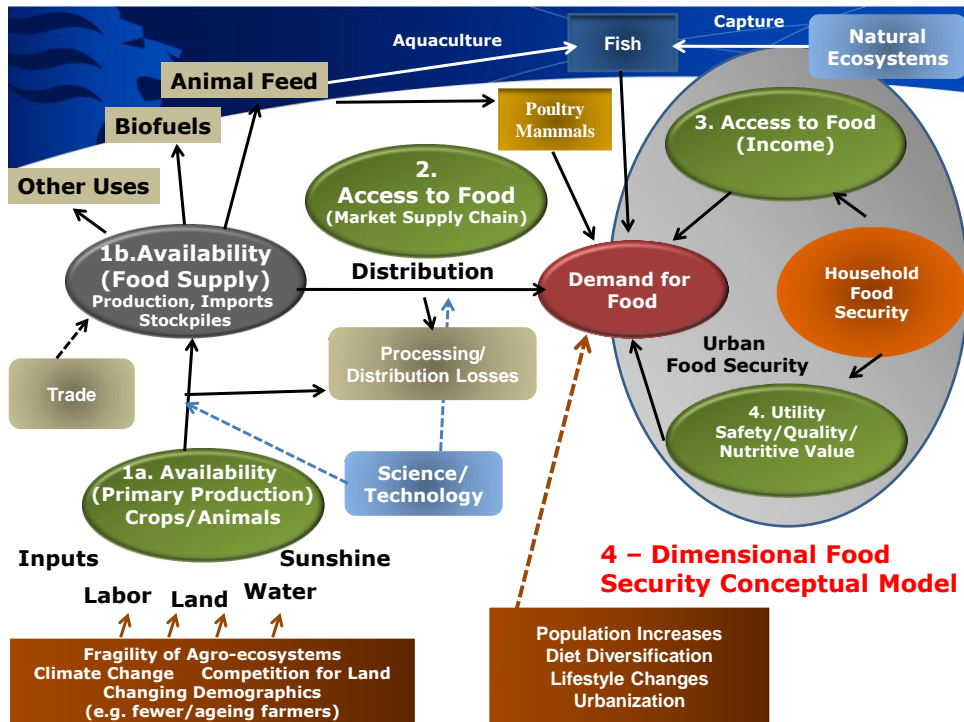
Food Security: Beyond just production!

“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.)

Availability
Physical Access
Economic Access
Sufficiency
Safety
Nutrition

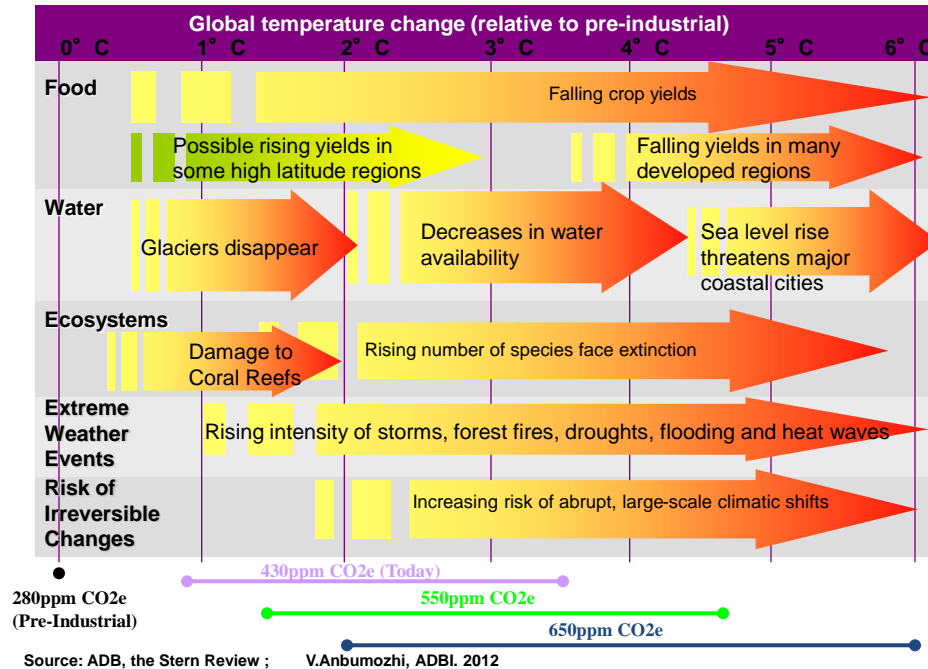
Security for Whom?
Individual
Family Unit
(Households)
Communities
(Country)
Regions



How and Why is Food Security linked To Climate Change?

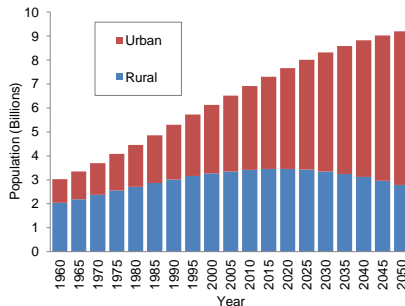
- Food Security depends on a productive natural resource base (environment) to sustain productivity
- Food Security depends on open access to food, either physically or economically
- Food security depends on safe utilization of nutritious food
- Food Security depends on there being surplus production over consumption

Complex impacts of Climate Change on food availability



Why the concern about urban: rural linkages?

- Most people live in cities, but feeding cities requires rural surplus production
- Inter-dependence of urban and rural food security means the need to synergize and to maintain seamless flows between both, to ensure stability and resilience in supply



• Past the turning point (2008). At present, >50% of the world's population lives in cities.

• By 2050, 67% Asians will live in cities
By 2025, 15 megacities in Asia out of anticipated 27-29 globally (>50%).

Urban-Rural Inter-dependence



- Urban markets spur economic growth in countryside
- Urban residents depend indirectly on agriculture
- Incomes from non-agricultural activities and remittances help decrease rural poverty & increase agricultural innovation
- Commuting and circular migration for rural residents decreases dependence on subsistence production for food security
- In times of crisis, urban residents may migrate to countryside
- Cities can have a more direct link with agriculture via urban and peri-urban agriculture

FOOD SECURITY: Why should Asia be concerned?

ASIA in 2050

- Asia predicted to have 5.1 Billion people, with about 3.7 Billion urban dwellers
- Need to increase food supply by >70% by 2050 (FAO)
- Need to increase agricultural productivity by 200% in small farms and 20% in commercial farms (IFPRI)
- Continuing increase in demand for animal protein food and higher value imported food
- Protein production puts pressure on grain and water; continued reliance on imports from outside Asia for grains.

MORE FOOD
LESS LAND, LESS WATER, LESS LABOR
LESS PREDICTABLE WEATHER

Anticipated impact on agriculture

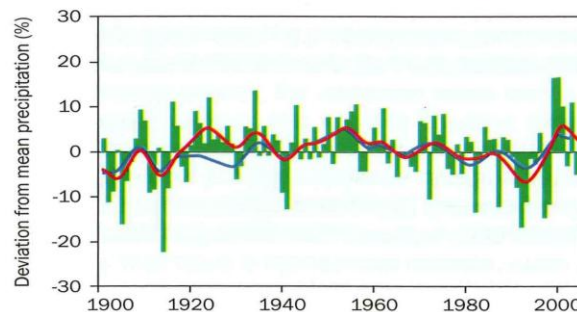
Many Studies! Many Change-Impact Scenarios!

- 1°C rise in air temp → agricultural irrigation demand increases by 6-10% or more (East Asia); rice yield declines by 10% (Korea); wheat yield decline by 4-5 million tons (India)
- 2°C rise in air temp → reduction of rainfed rice yields by 5-12% (China)
- 3°C rise in air temp → disappearance of Tibetan Plateau glaciers of <4km length (China)
- 2-4°C rise in air temp → Increase of tropical cyclone intensity by 10-20% (East Asia)
- 30cm sea level rise → increase of area under coastal flooding by 5-6 times (Chanjiang and Zhujiang deltas of China)
- **40cm sea level rise by 2100** → 13-94 million people to be at flood risk in Asia
- 1m sea level rise → Inundation of 2643km² of Korean peninsula

Source: IPCC 2007

Erratic Rainfall Patterns

Figure 3.2. Annual Precipitation in Southeast Asia (1901–2005)



Note: Mean precipitation (2455 mm) is computed from 1961 to 1990. Green bars indicate annual variations in precipitation. Colored lines highlight decadal variation. The blue line used Global Historical Climatology Network data from the National Climatic Data Center. The red line used data from the Climatic Research Unit.

Source: IPCC (2007).

Heavier rainfalls in wet season; Dry seasons becoming drier

Acute Food Insecurity: Climate Risk Index in Asia

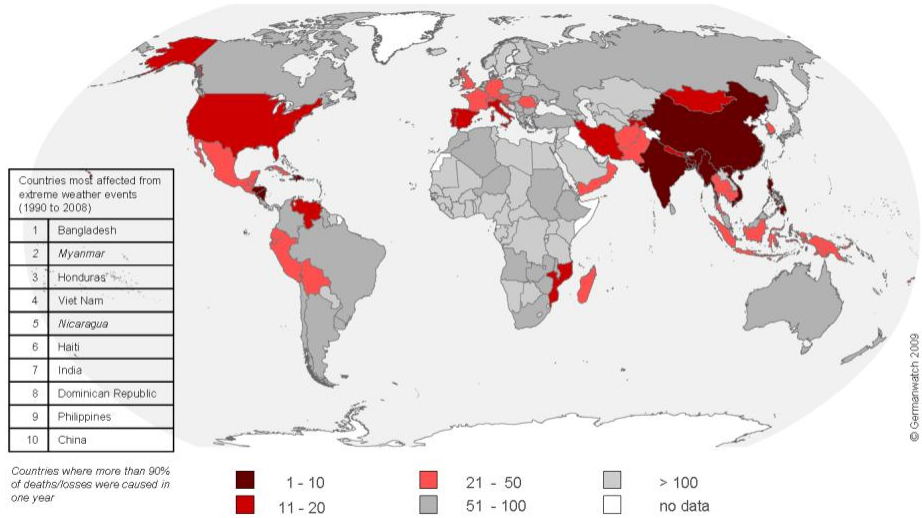
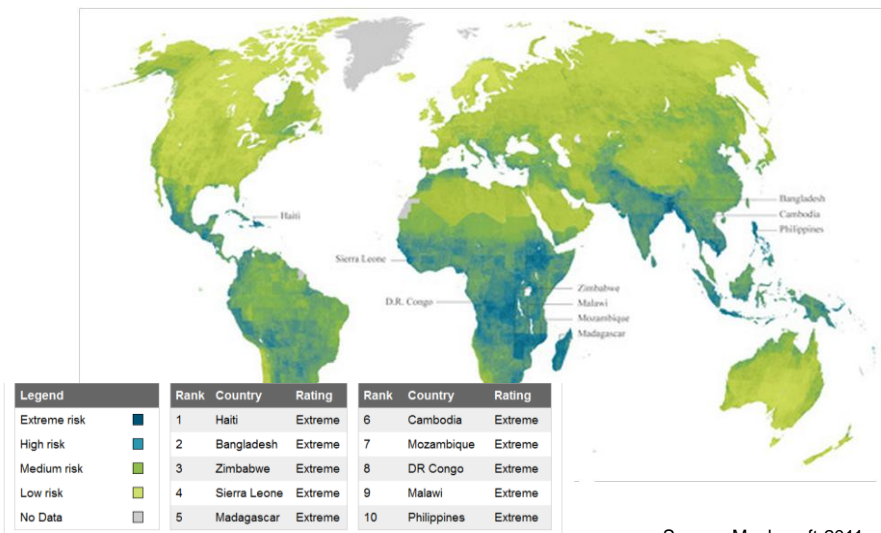


Figure 1: World Map of the Global Climate Risk Index 1990-2008
Source: Germanwatch and Munich Re NatCatSERVICE®

Hamerling 2009
Slide from Lasco, 2011

Asia Pacific Region is more Vulnerable to Climate Change

- Climate Change vulnerability Index 2012



Source: Maplecroft 2011

Temperature effects on crop yield of several major crops

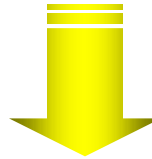
Crop	T _{opt} ° C	T _{max} ° C	Yield at T _{opt} t/ha	Yield at 28 C, t/ha	Yield at 32 C t/ha	% decrease (28 to 32 ° C)
Rice	25	36	7.55	6.31	2.93	54
Soybean	28	39	3.41	3.41	3.06	10
Dry bean	22	32	2.87	1.39	0.00	100
Peanut	25	40	3.38	3.22	2.58	20
Grain sorghum	26	35	12.24	11.75	6.95	41

Source: V. Anbumozhi, ADBI. 2012

With Climate Change by 2050

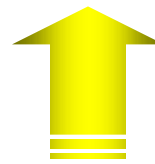
Yield

- Rice 14-26%
- Wheat 32 – 44%
- Maize 2-5%
- Soybean 9 – 18%



Price

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



Source: V. Anbumozhi, ADBI. 2012

SOME FOOD SECURITY Key Events in 2011/12

2011

- World food prices surged to historic highs in January and February but dropped in March
- **Drought in China (wheat producing regions), parts of Africa**
- **Floods in Southern Thailand, Brazil, Australia**
- Earthquakes in New Zealand and Japan
- Unrest in North Africa and Middle East
- **Floods in Philippines, Vietnam, Thailand in September/October**

2012

- Drought in corn and soybean belt of U.S.A. --12-13% supply reduction -- Price Hikes expected up to 35% in H1 2013
- Food production reduced in Asia: Pest (armyworm) outbreaks in China; floods in China & Philippines; Drought in India, etc
- Potential for export restrictions with potential to precipitate panic reactions

Adapting to climate change: technological options

- **Private**
 - Alter crop species and varieties
 - Alter livestock species and breeds
 - Alter timing of planting and harvest
 - Multiple cropping season
 - Rehabilitation of on-farm structures
 - Change land use
- **Public**
 - Plant and animal breeding
 - Public awareness and extension
 - Insurance schemes and conditional cash transfers
 - Modernization of irrigation systems

Source: V. Anbumozhi, ADBI. 2012

Near term policy options for adapting to climate change and securing food supply

Climate Change Response Measure	Policy Option
Near Term Actions (5-10 years)	
Crop insurance for risk coverage	Improved access to information, risk management , revised pricing incentives
Crop/livestock diversification to increase productivity and protect against diseases	Availability of extension services, financial support etc
Adjust timing of farm operations to reduce risks of crop damage	Extension services, pricing policies etc
Changes in cropping pattern, tillage practices	Extension services to support activities, policy adjustments
Modernization of irrigation structures	Promote water saving technologies
Efficient water use	Water pricing reforms, clearly defined property rights
Risk diversification to withstand climate shocks	Employment opportunities in non-form sectors
Food buffers for temporary relief	Food policy reforms
Redefining land use and tenure rights for investments	Legal reforms and enforcements

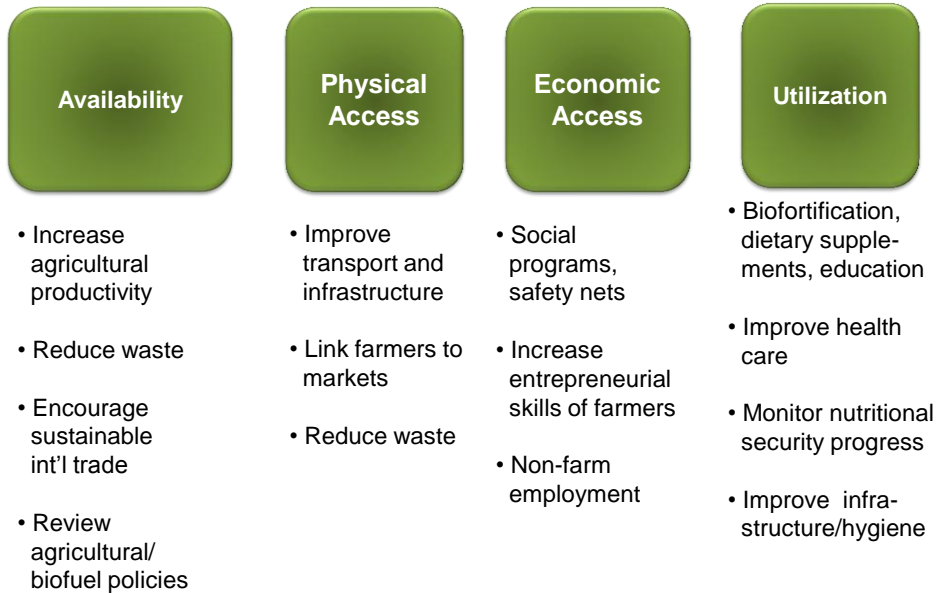
Source: V. Anbumozhi, ADBI. 2012

Medium term policy options for adapting to climate change and securing food supply

Medium Term Targets (2030)	
Development of crop and livestock technology adapted to Climate Stress: drought and heat tolerance etc	Agricultural research (cultivar and live stock trait development)
Develop market efficiency	Invest in rural infrastructure, remove market barriers, property rights etc
Irrigation and water resources consolidation	Investment by public and private sector
Promoting regional trade in stable commodities	Pricing and exchange rate policies
Improving early warning/forecasting mechanisms	Information and policy coordination across the sectors
Capacity building and institutional strengthening	Targeted reforms on existing institutions on agriculture and skills development

Source: V. Anbumozhi, ADBI. 2012

Food Security - Policy & Action Interventions



Asia Biobusiness APEC Report. 2012



The Future is Now!

Thank you!

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