Food and Agriculture Organization of the United Nations

Agriculture and climate change

With a focus on Southeast Asia and Rice

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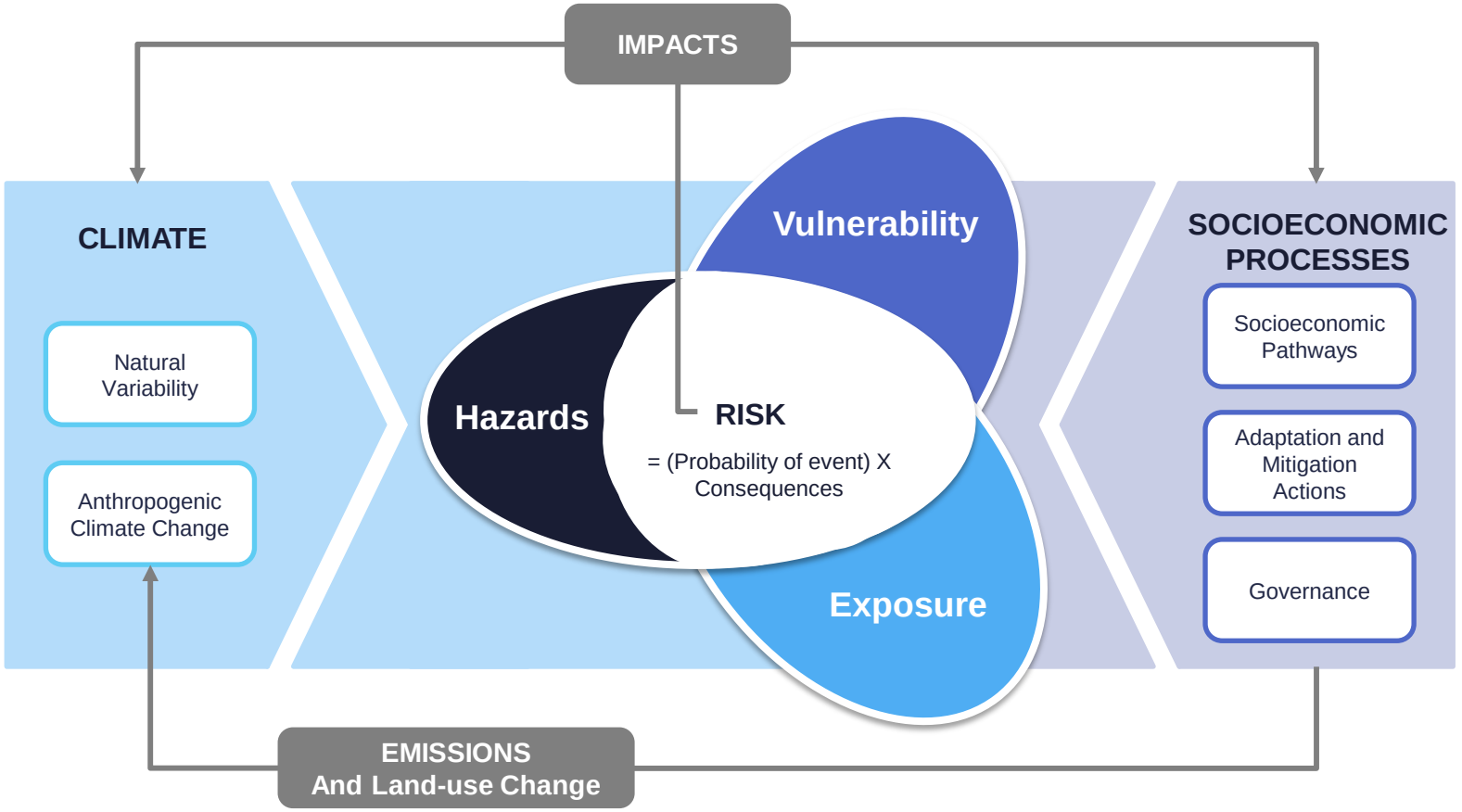
Overview

1. Systems view of climate risk
2. Agriculture systems trends in Southeast Asia
3. Climate risks and agriculture
4. Issues for climate action
5. Ways forward – Addressing climate change in rice landscapes

Climate Risks: A systems view



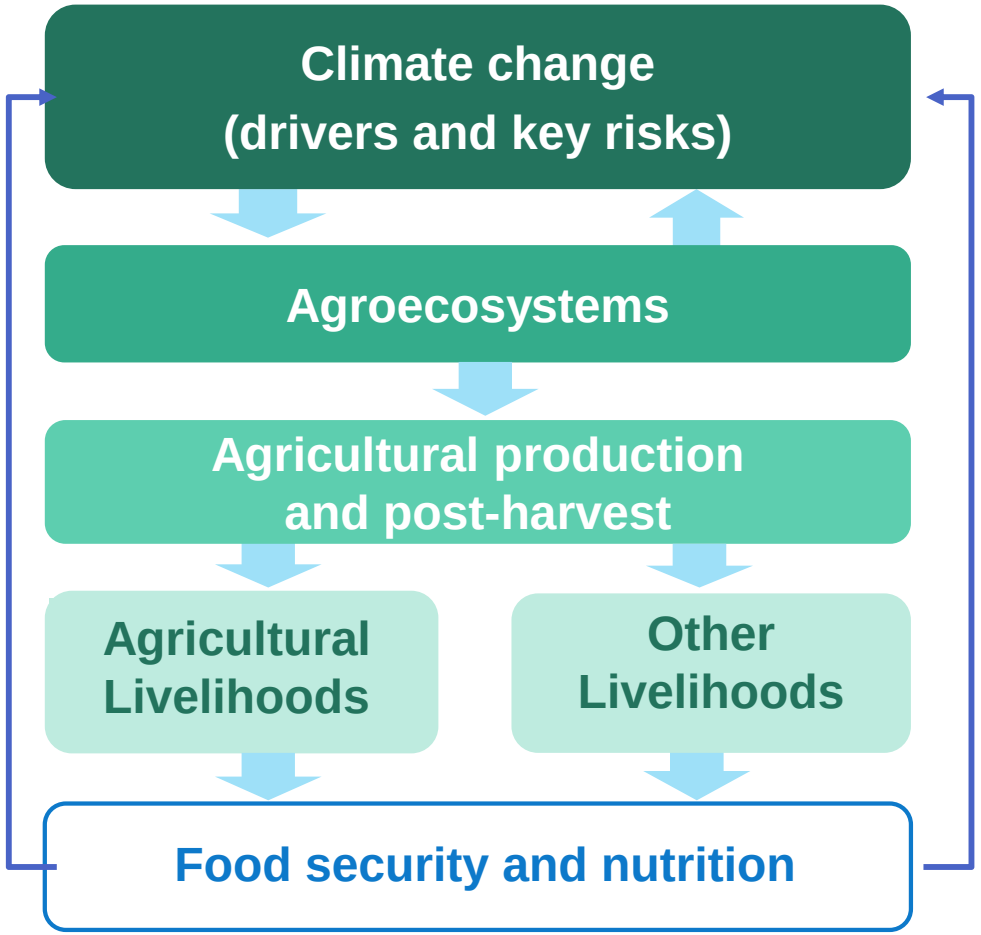
- Risk of climate-related impacts results from the **interaction** of climate-related hazards with the vulnerability and exposure of human and natural systems

- Mitigation and adaptation activities are **socio-economic processes** that **influence** both **drivers and impacts** of climate change

Figure - Schematic of the interaction among the physical climate system, exposure, and vulnerability producing risk
Illustrative Example

Source: IPCC (2014)

Systems view of climate and food security



- **Systematic view** shapes thinking at FAO on climate change and food security
- **Food security** is **impacted** by both climate change **drivers and impacts**
- Action to address near and long-onset impacts from climate change to **enhance resilience essential**
- Action to **address emissions** – in any sector – will **lessen risks** and strengthen food security over time

Figure - Links between climate change and food security
Illustrative Example

Source: FAO, 2016

System Trends in Asia

Food security and Nutrition

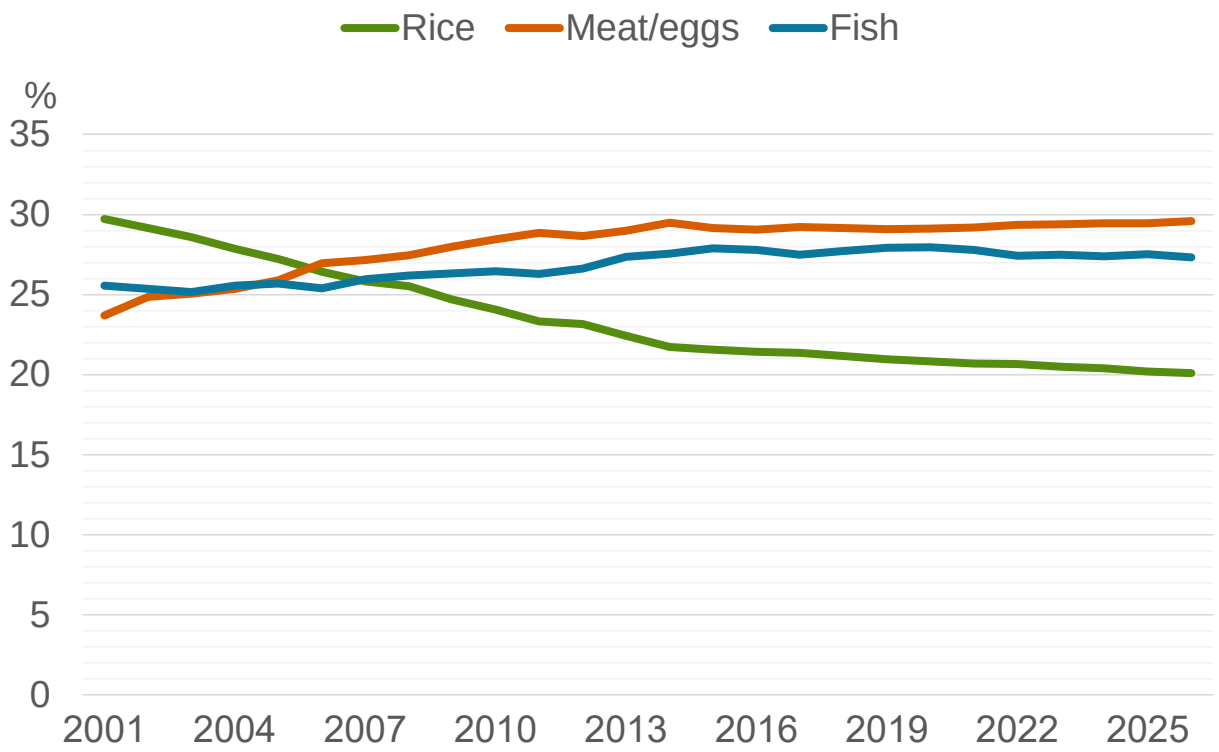


Figure - Changes in consumption in Southeast Asia

Food expenditure shares (%)

Source: OECD-FAO Agricultural Outlook 2017-2026

- Significant **reduction** in **undernourishment**
- Achieved through **income growth** and improved availability and access of food
- **Higher** per capita **consumption** of livestock products, fish, fruits and vegetables
- These **trends will intensify** into the future to match new demand

System Trends in Asia

Food security and Nutrition

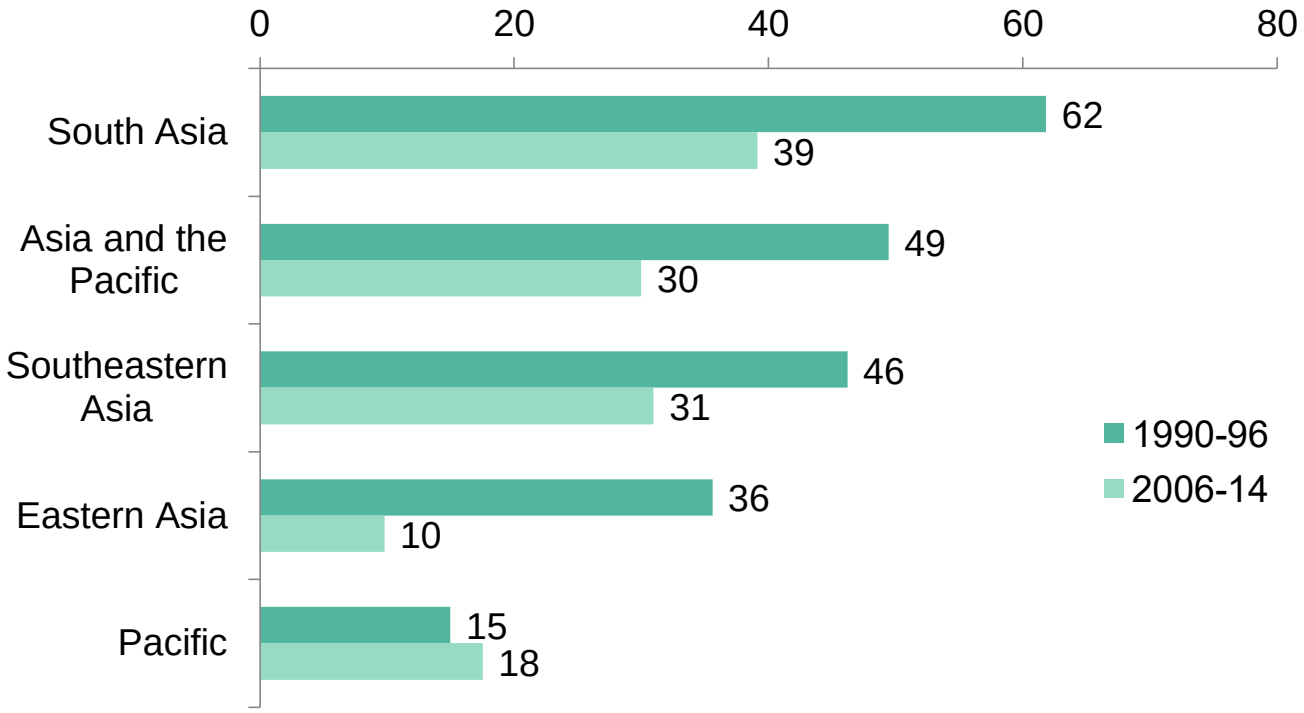


Figure - Share of children under 5 stunted: then and now
Percentage

- **Poor nutrition** & micronutrient deficiencies **persist**
- **Obesity** & **diabetes** are growing **problems**
- **Future**, food security and nutrition strategies need to **focus** more on the **quality** of food consumption (e.g. micronutrients) **than** on **quantity**
- **Farmers** have the potential to **increase** their **incomes** by **growing non-rice crops**, which are often more profitable

Source: UNICEF, WHO, WORLD BANK 2015: Joint malnutrition dataset.
http://data.unicef.org/nutrition/malnutrition.html

System Trends in Asia

Food security and Nutrition

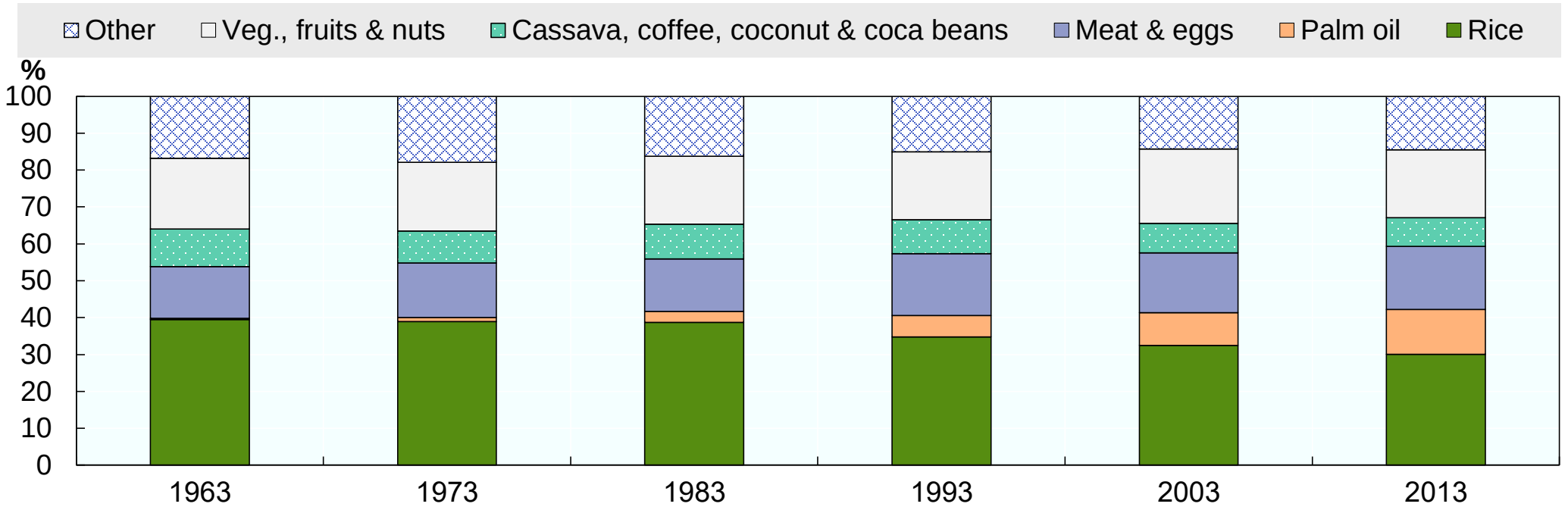


Figure - Agricultural production in Southeast Asia

Commodity shares of gross production value in constant 2004-2006 international dollars, 1963 to 2013

Source: OECD-FAO Agricultural Outlook 2017-2026

System Trends in Asia

Agricultural and Rural Livelihoods

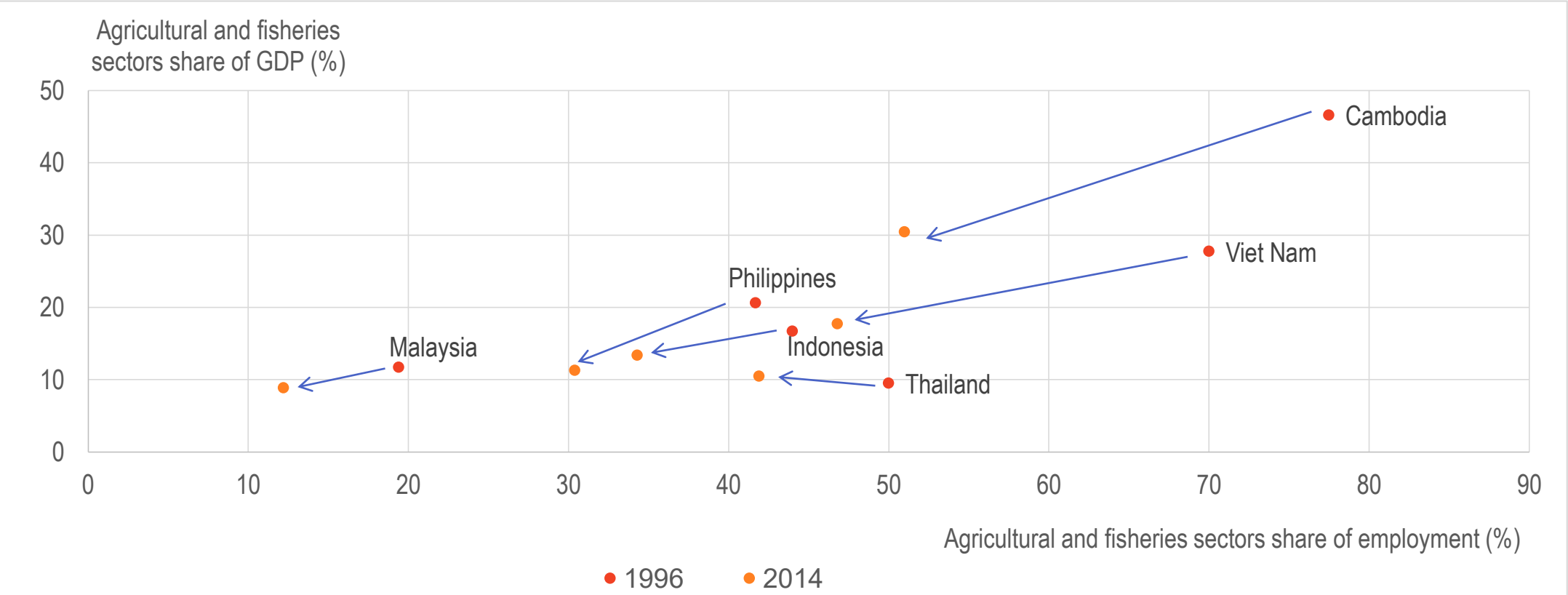


Figure - Agricultural and fisheries sectors share of employment and GDP in Southeast Asia

Source: OECD-FAO Agricultural Outlook 2017-2026 .

System Trends in Asia

Livelihoods

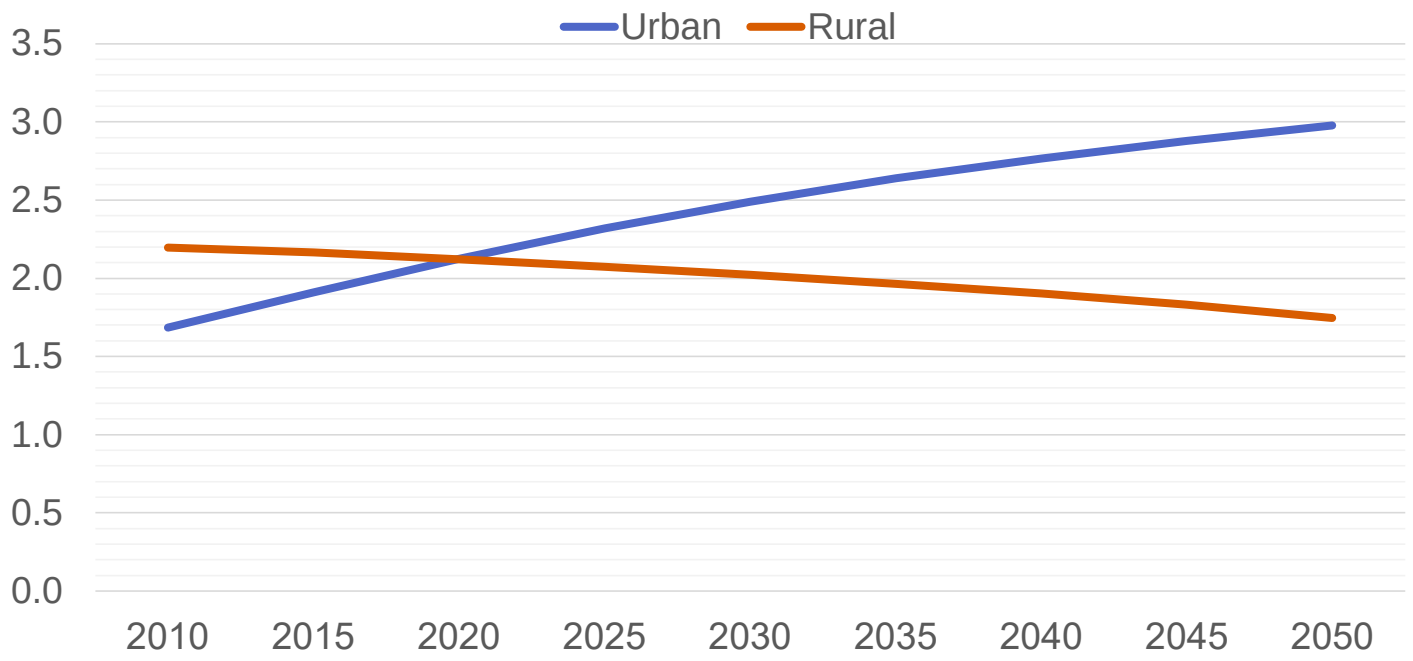


Figure - Projected urban and rural populations: Asia and the Pacific

Billions of people

Source: UN, DESA, Population Division (2014). World Urbanization Prospects: The 2014 Revision, CD-ROM Edition.

- **Farm sizes** are **decreasing** on average, but policies are emerging to aggregate small farms
- Farmers will need to **diversify income** sources for their incomes to **keep up** with other sectors
- **Urbanization** is **intensifying**; particularly in small and medium sized towns
- **Urban centers** are not just consumers but can be **key actors** in the **food value chain** and **investors** in rural areas

System Trends in Asia

Agricultural production and post harvest

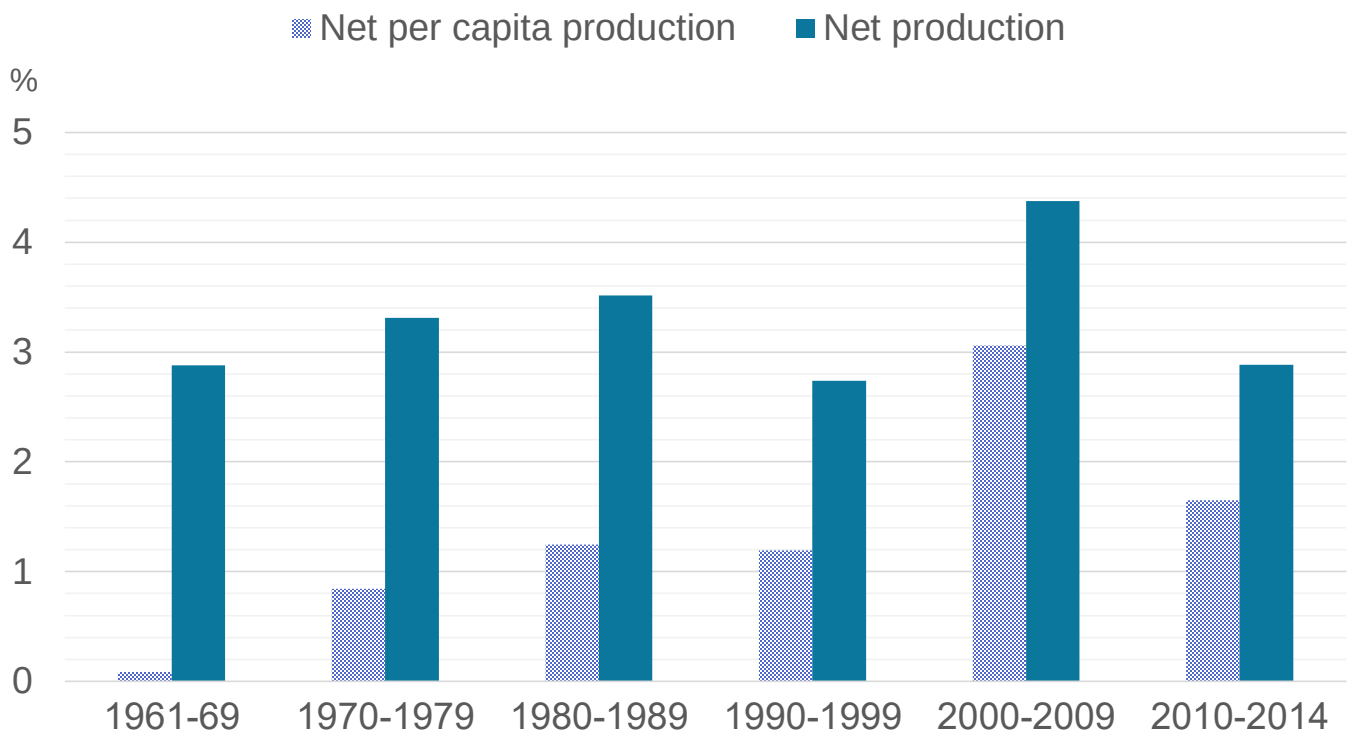


Figure – Production growth in Southeast Asia

Decadal annual compound growth rates (%) 1960-2014

Source: OECD-FAO Agricultural Outlook 2017-2026

- **Productivity growth** in agricultural systems has started to **flatten and decline** in some countries
- **Mechanization** is **spreading** in in nearly all countries in the region
- Integration of **ICT** & other **technology** has potential to enhance farm productivity
- But, **current public R&D investments** are **not sufficient** to drive reversal of decline in productivity growth

System Trends in Asia

Global value chains

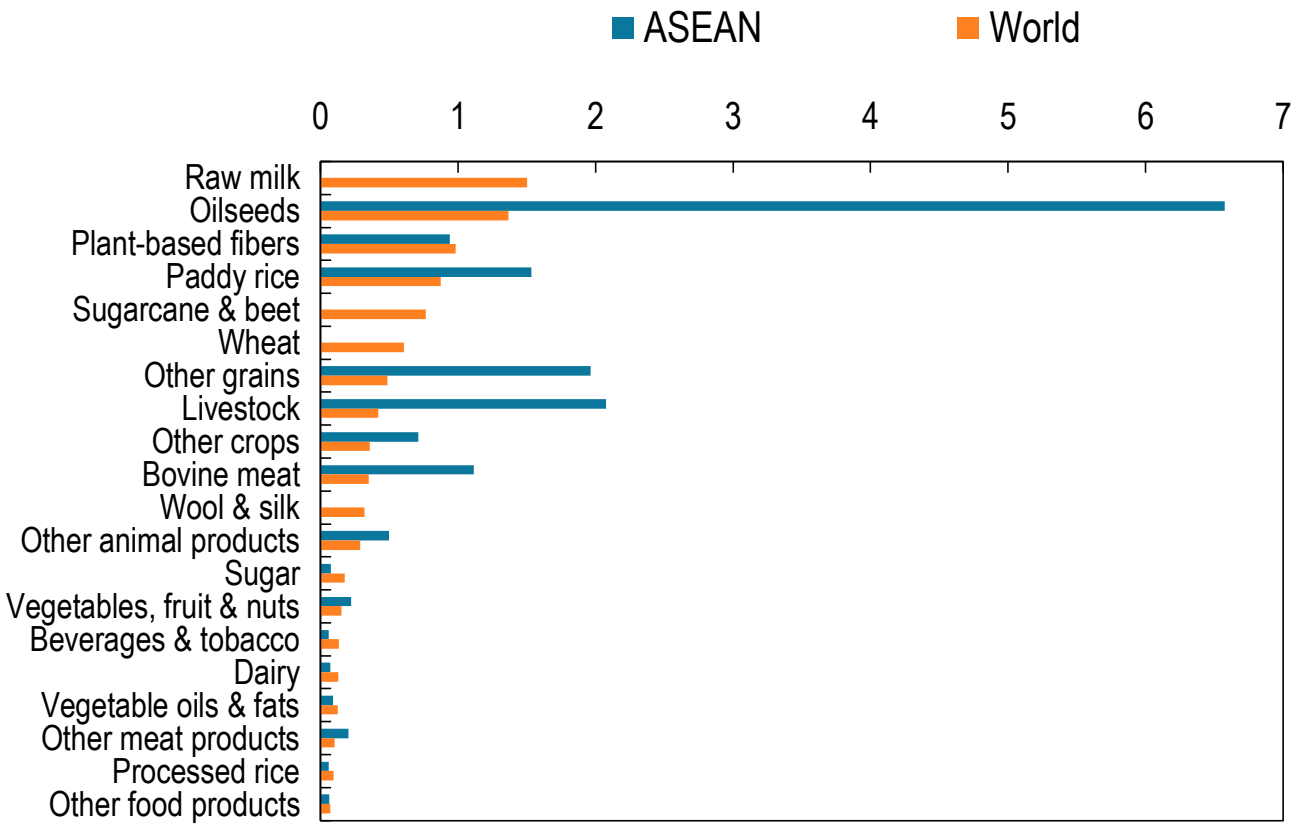


Figure – ASEAN and world GVC participation

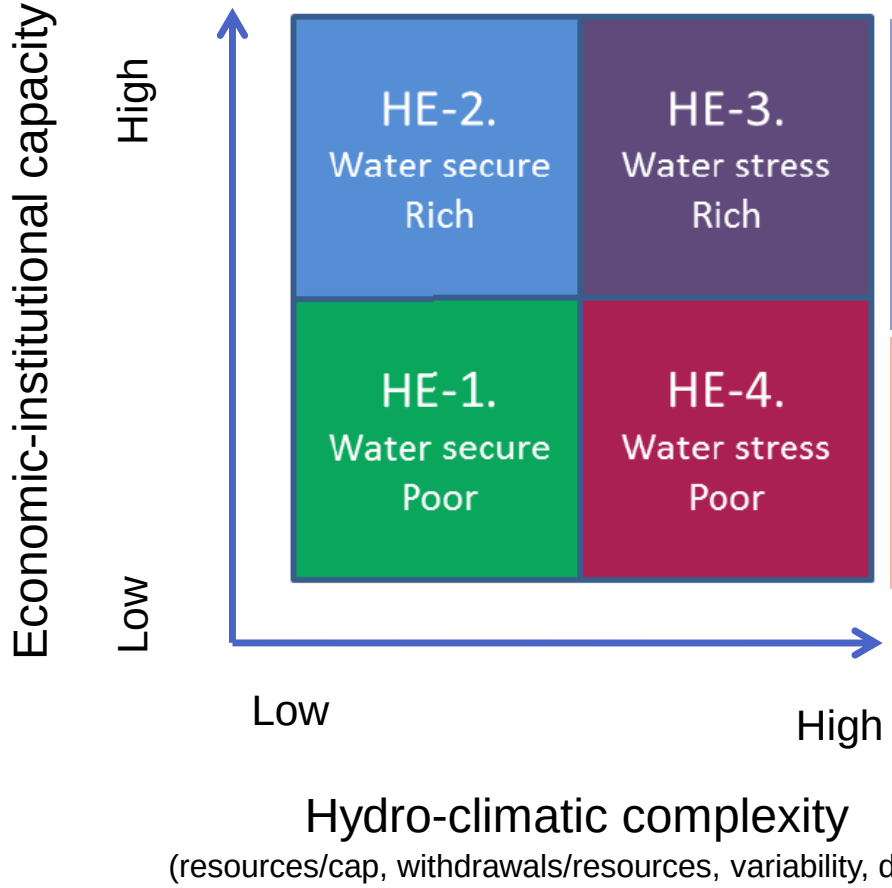
Forward Linkages in Global Value Chains

Source: OECD-FAO Agricultural Outlook 2017-2026

- **ASEAN farmers** are comparatively **well integrated** into **global commodity value chains** in oils, livestock, and grains; particularly rice
- Intra-regional **GVC participation** is higher in Southeast Asia than anywhere else in the world
- Extra-regional participation also high
- Procurement practices in global value chains, if oriented towards sustainability, **may** be able **to positively influence production practices** on-farm

System Trends in Asia

Agroecosystems



By 2050 in HE-3 and HE-4:

- 60% population, 60% GDP
- 80% of Asia's population and GDP

Currently in HE-4:

- 44% population, 20% of GDP
- 65% of Asia's population

- Significant **yield increases** necessary to meet demand
- **Resource scarcity** and **degradation** is expected to intensify
- **Trade** in commodities based on **consumer preferences in urban areas** key **driver** of natural **resource depletion**

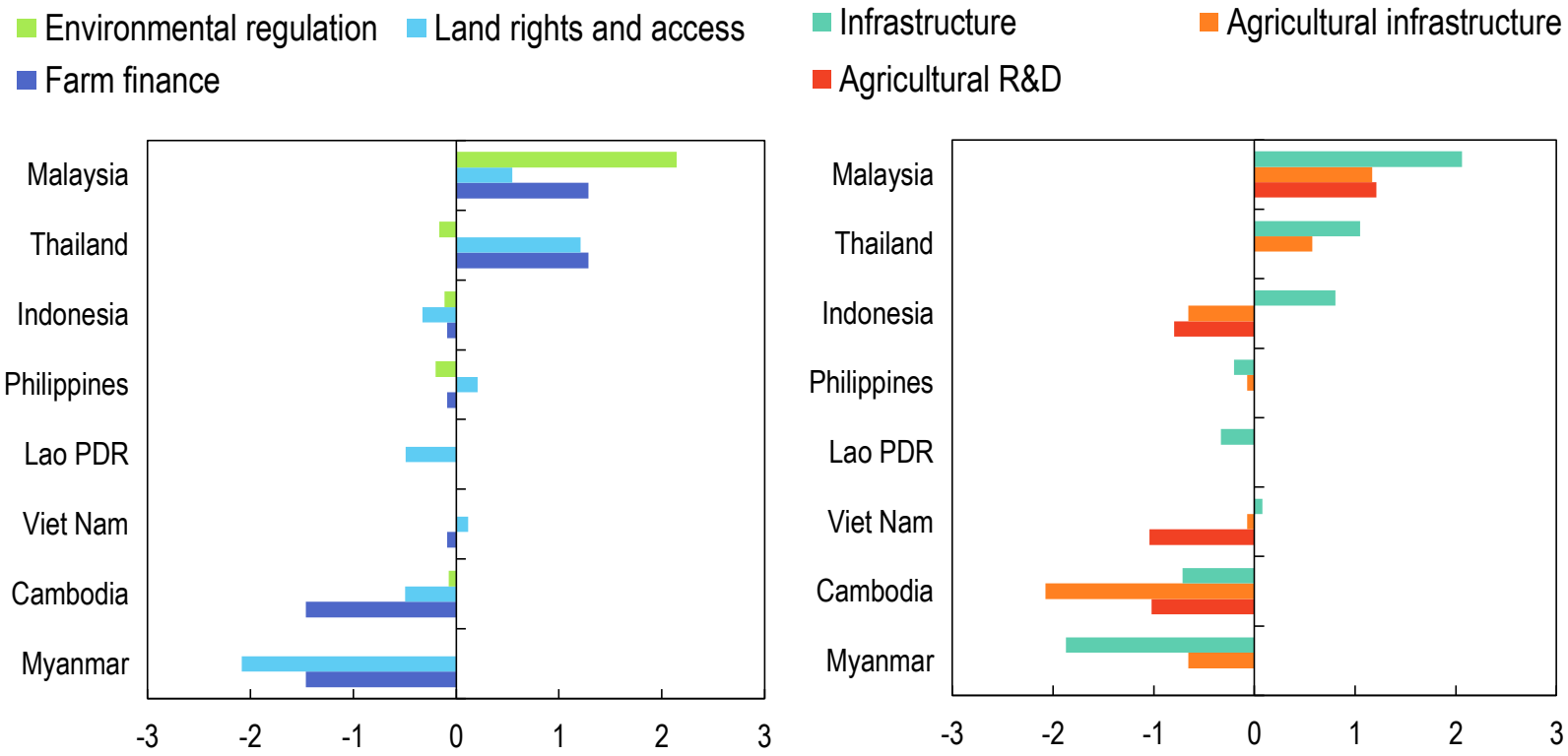
Figure - Water Security: Hydro-Economic Conditions, Present to 2050

Interim research by Water futures and solutions initiative - IIASA

Source: Cosgrove et al, 2015; Wiberg, 2016

System Trends in Asia

Agricultural Policy Environment



- **Enabling environment** for agriculture differs considerably across the region
- **Efforts to strengthen R&D,** farmers access to **finance**, agricultural & rural **infrastructure** and **environmental standards** could bring benefits in terms of productivity and sustainability in the region

Figure – Areas to improve enabling environment

Ag Growth Enabling Index normalised scores for each country relative to sample average

Source: OECD-FAO Agricultural Outlook 2017-2026

Climate Change and Agriculture

Impacts

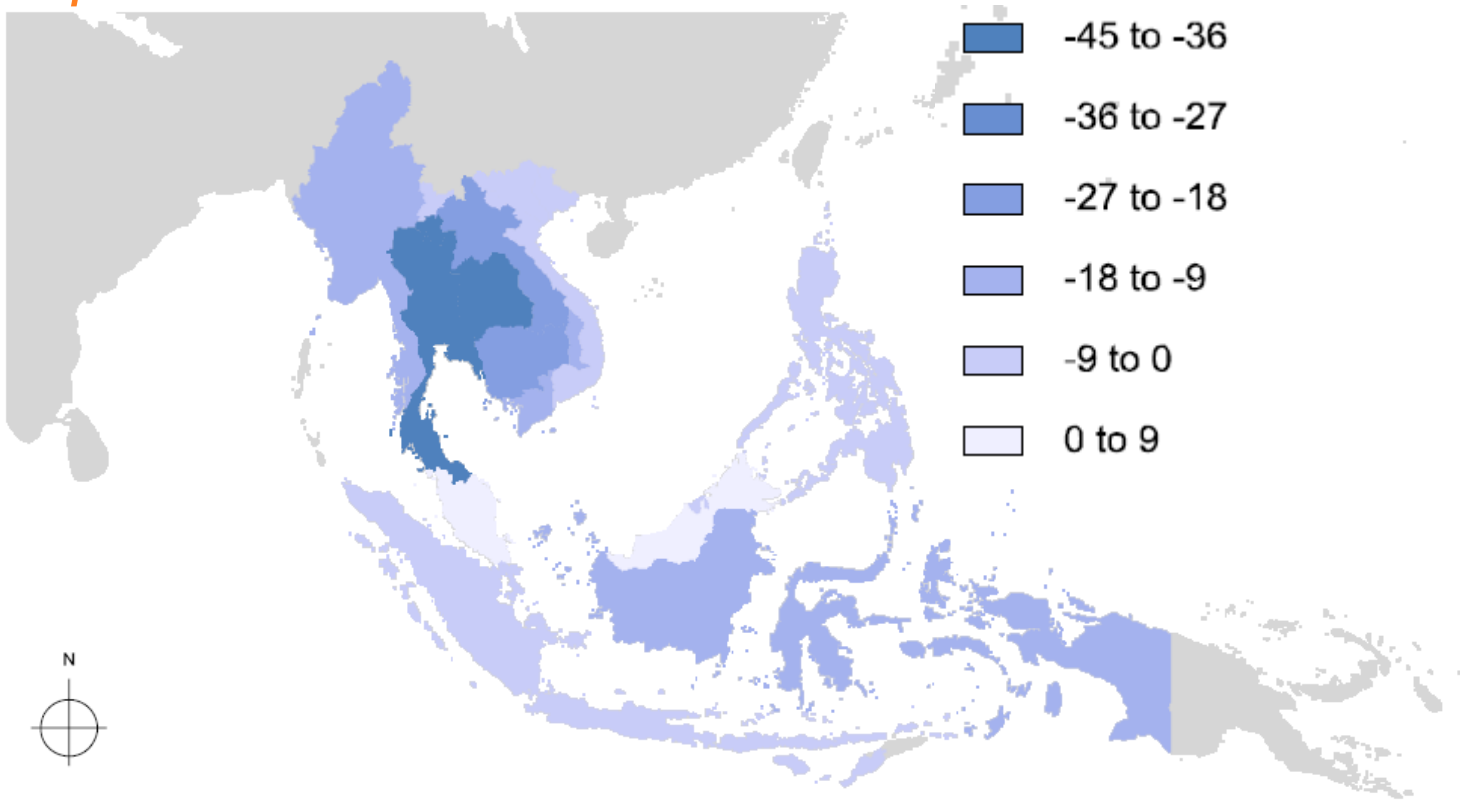


Figure - Percentage change in rice yields in 2050 compared with situation of no climate change

OECD estimates based on IFPRI IMPACT model (Hadley-Dssat-Agmip climate change scenario)

- **Projected impacts** of climate change on yield are significant
- OECD estimates rice **yields** could be 16% and 17% **lower** for non-irrigated and irrigated rice on average with climate change
- **Prices** projected to be **over 50% higher** by 2050

Source: OECD, 2017, Building Food Security and Managing Risk in Southeast Asia.

Adaptation is important

Action required

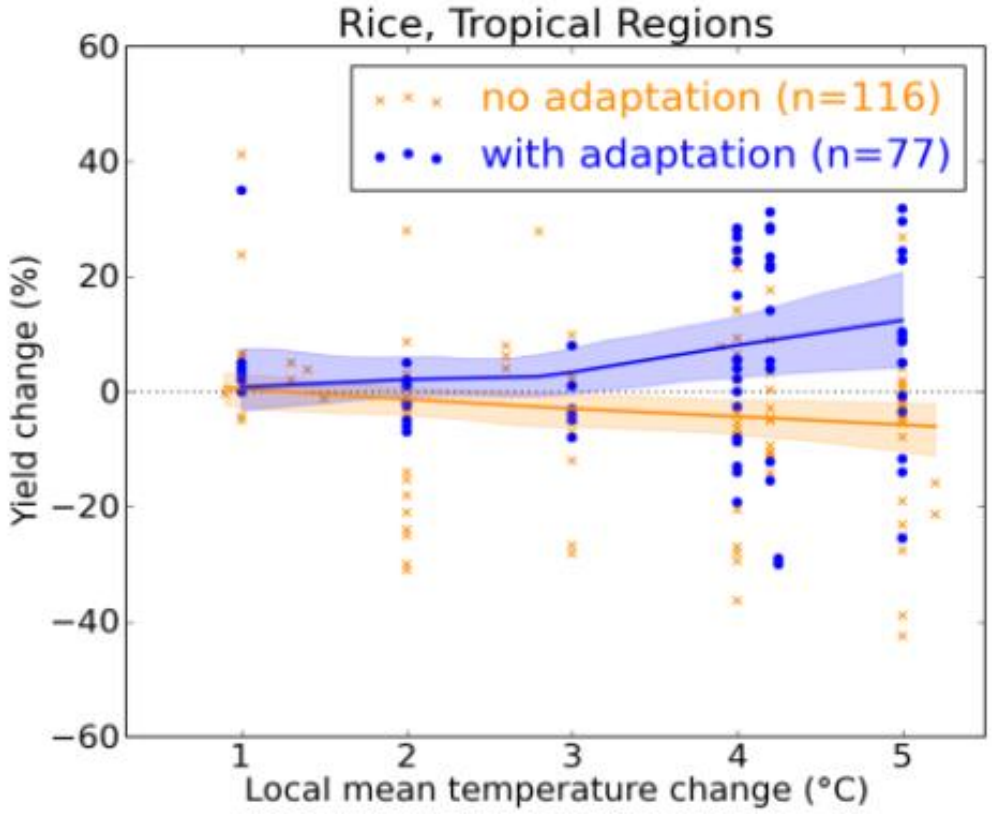


Figure - Percentage yield change as a function of temperature for rice in tropical regions

For local mean temperature changes up to five degrees

Source: Challinor et al 2014

- **Smallholder agriculture** particularly **vulnerable** to climate change risks and impacts
- Rural **women** and **marginal groups** are the **most vulnerable**
- **Adaptation** is **already happening** in farmer fields
- **Effective strategies** such as improved crop varieties and agronomy require **further research & extension support**

Tackling emissions

Action required

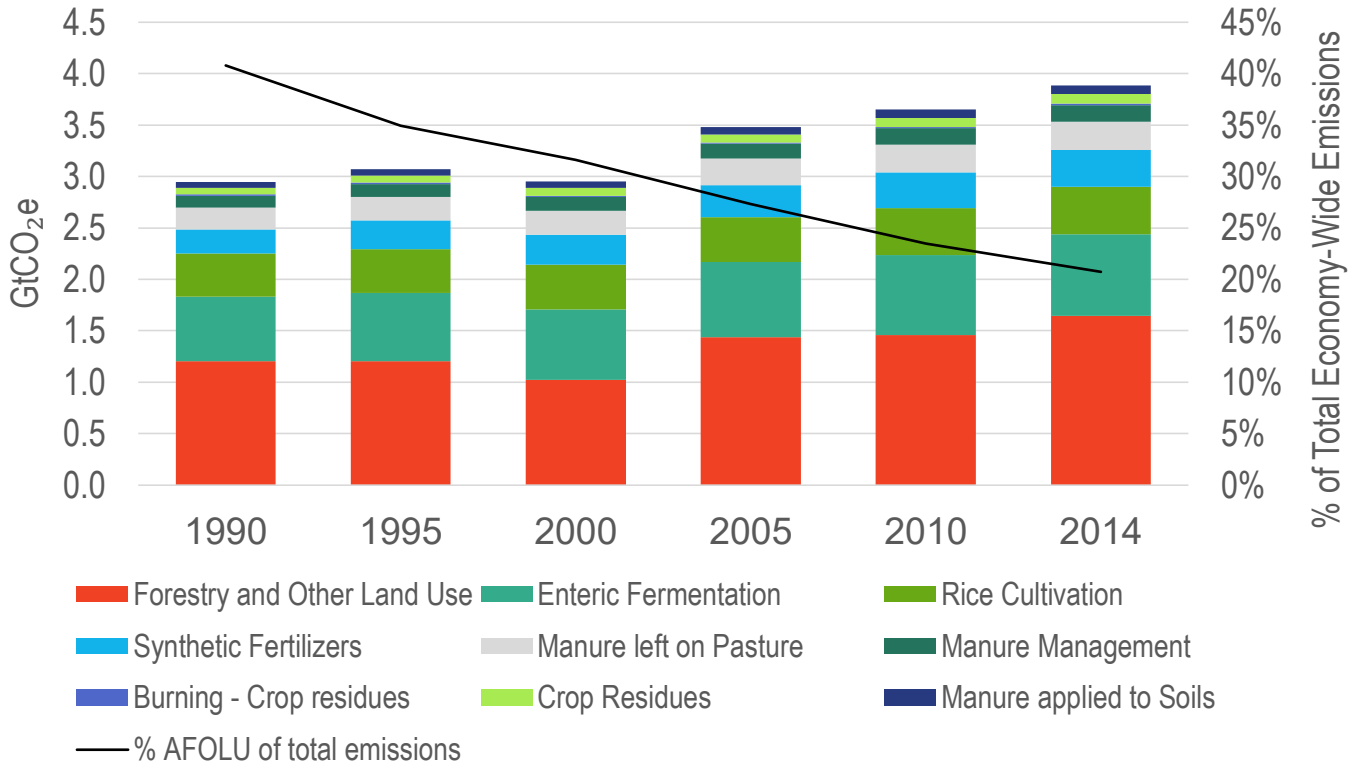


Figure – Emissions from agriculture, forestry and other land-uses and AFOLU emissions in total regional emissions
Share, 1990-2014

Source: FAO, 2016; Rosenstock et al, 2017; Wollenberg et al, 2016

- **70%** of the technical **mitigation potential** in agriculture occurs in **tropical developing countries**
- **Ability** to **quantify GHG emissions** & mitigation in these countries is **limited**
- **Gains** can be made with **more efficient production** and **lower intensity** of emissions
  - Investments in yield improvements
  - Resource-use efficiency
  - Reduction of on-farm losses
- **Wide application necessary** for desired impact

Issues for climate action

The Paris Agreement

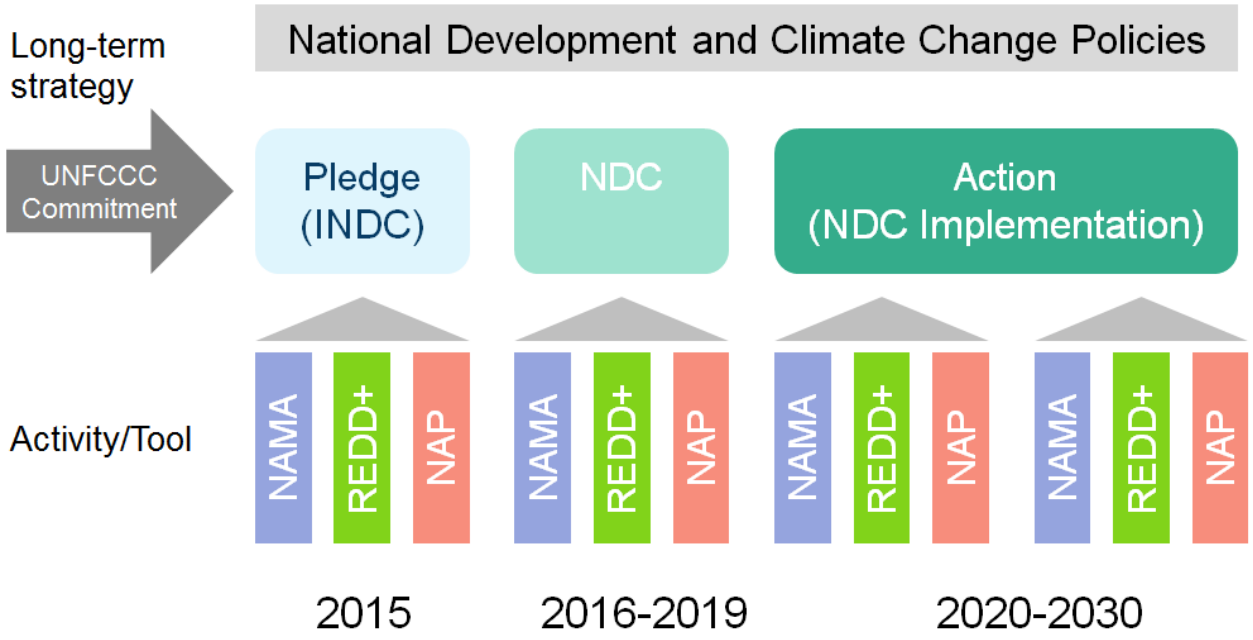


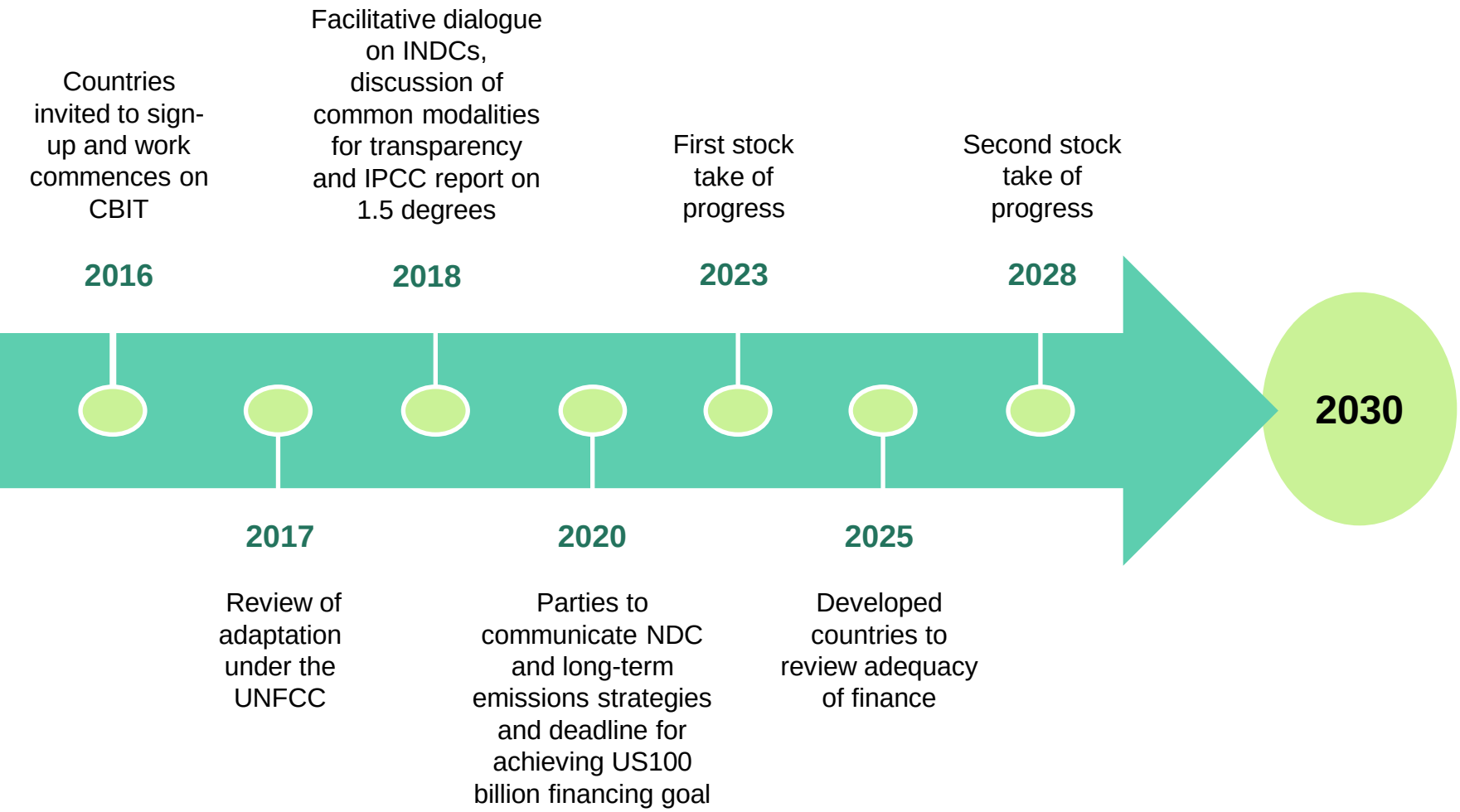
Figure – Relationship between NDCs and other UNFCC planning mechanisms
Illustrative Example

Adapted from: GIZ, 2015

- **NDC key planning document** for future climate change action
- **Rules-based system** implies need for **standardized approaches**
- Countries ability to access support may be related to ability to **demonstrate ambition** and **articulate needs**

Issues for climate action

In the agriculture sectors



- Under the **Paris Agreement** countries in **Asia** have **signaled Agriculture** (crops, livestock, forestry, fisheries and aquaculture) as a **key concern**
- **Challenges include:**
  - Scaling-up
  - Transparency
  - Finance
  - Ambition

Issues for climate action

Ambition

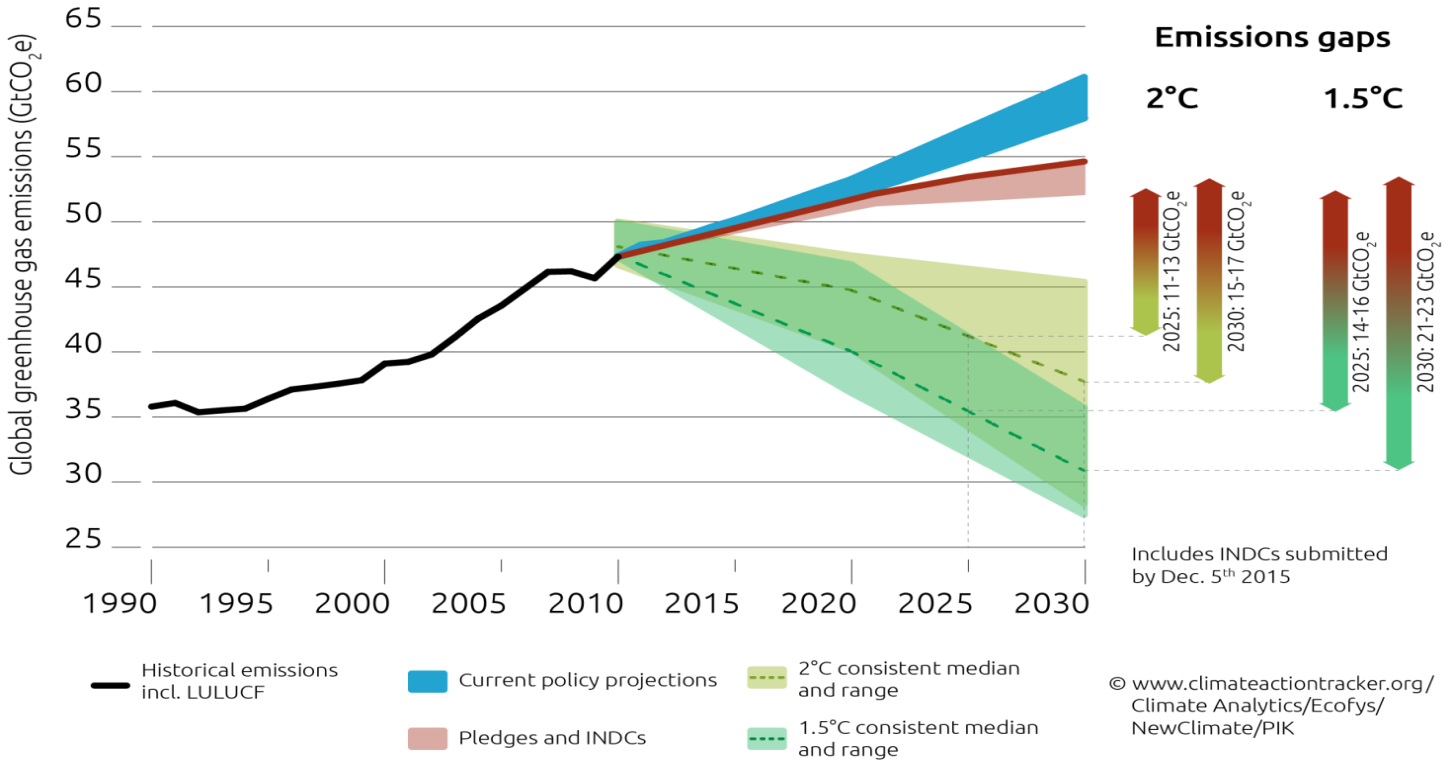


Figure – Emissions gaps between current pledges and temperature goals

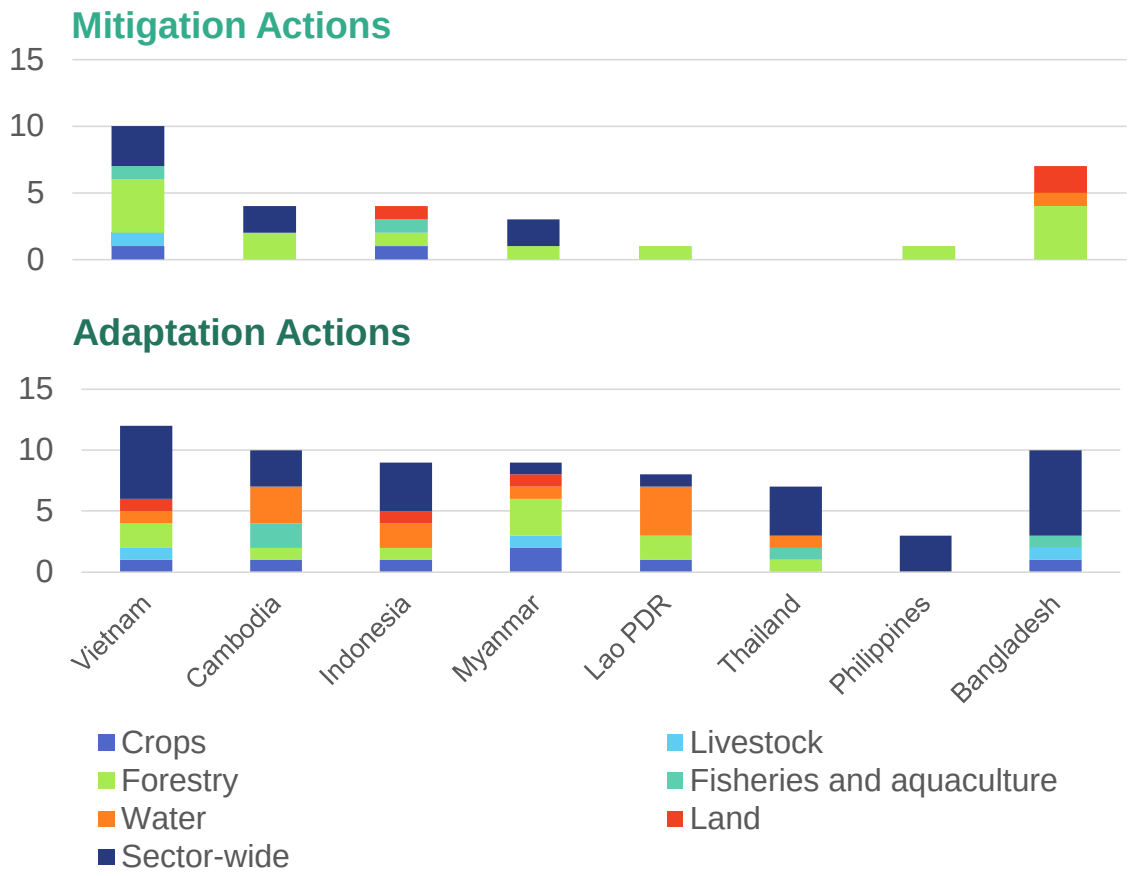
GHG emissions, GtCO2e per year

Source: CAT, 2016

- Despite its significance **Paris will not be enough**
- By 2030 the **emissions gap** to keep us on 2 degree pathway could be as much as 15-17 $GtCO_2e$
- More if 1.5 degrees is our goal
- Ambition presents **opportunities and challenges** for agriculture

Issues for climate action

Coordination



- Countries have identified key areas of **common technical focus** including resilient and, in some cases, climate-smart or low emission crop production
- Advancing agriculture priorities for agriculture **requires increased coordination** with UNFCCC focal points and negotiators
- **ASEAN collaboration** through AMAF common position is a **good example** of using the NDCs to coordinate for action

Figure –NDC Priority Actions by Sector in Southeast Asia

Source: FAORAP, 2016

Issues for climate action

Finance

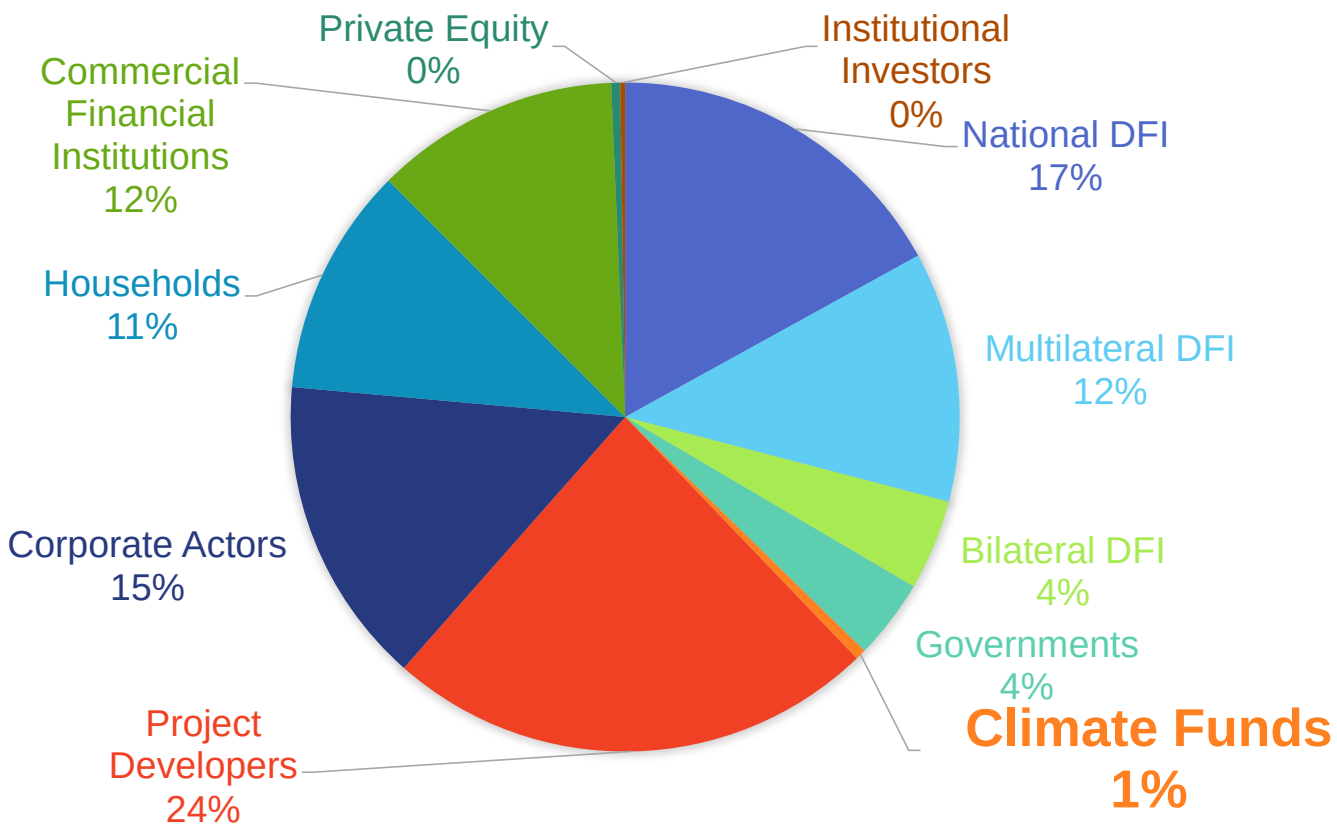


Figure - Climate Finance Contributions by source– 2015
Share, USD millions

Source: CPI, 2016

- Most **climate finance** comes from **private** sources
- **Innovative finance** products are **emerging** that could address funding gaps in agriculture and land-use
- **Aimed** at **reducing risk** – from both impacts and drivers
- **Data** crucial

Value of a landscape approach

For tackling climate change risks to rice and agriculture in Southeast Asia

- Landscape approaches recognize that the **root causes** of problems may **not** be **site-specific**
- By their nature they combine **natural resource management** with **environmental** and **livelihood considerations** as well as **broader** societal **trends**
- In this way they are **consistent** with a **systems view** of climate change risks
- **Encourage** early **assessment** of **trade-offs** and **innovation** in applying solutions

Possible ways forward

Addressing climate change risks and opportunities in rice landscapes

1. **Improve understanding** of **broader context** for agriculture in the region and systematic threats from climate change
2. **Enhance** crop and landscape specific **research and development** programmes
3. **Strengthen** public and hybrid **extension services**
4. **Enhance** systems for field level **data collection**, **monitoring** and **reporting**
5. Explore ways **generate value** from **sustainable** and climate-smart product **value chains**

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Thank You

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