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2015 IFA CROSSROADS ASIA PACIFIC CONFERENCE

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KUALA LUMPUR
MALAYSIA
20-22 OCTOBER 2015

Adapting agriculture

Climate change trends and challenges for the Asia-Pacific

Dr Lilly Lim-Camacho
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Climate change trends and challenges for the Asia-Pacific

Lilly Lim-Camacho, Mark Howden and Steven Crimp

21 October 2015

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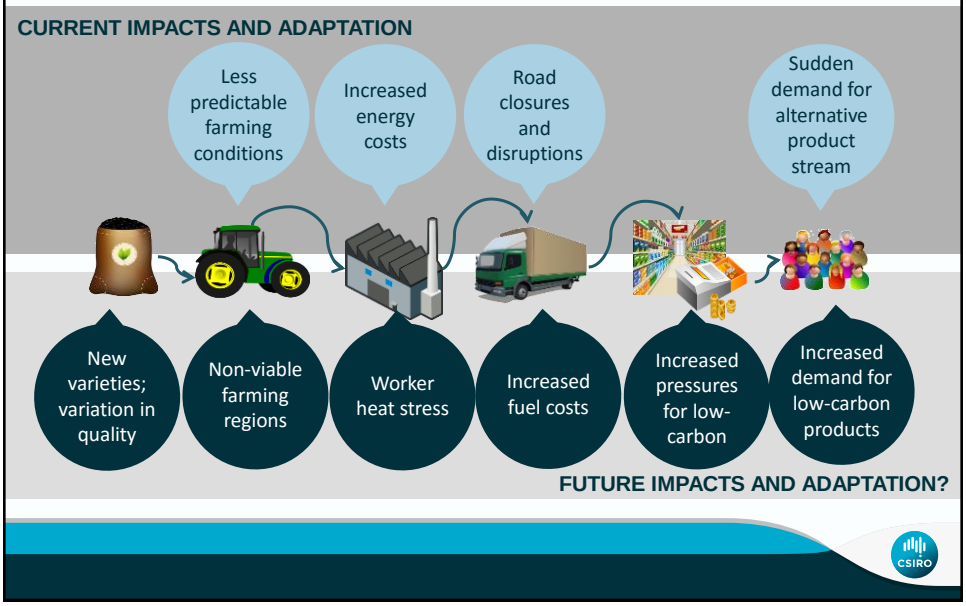
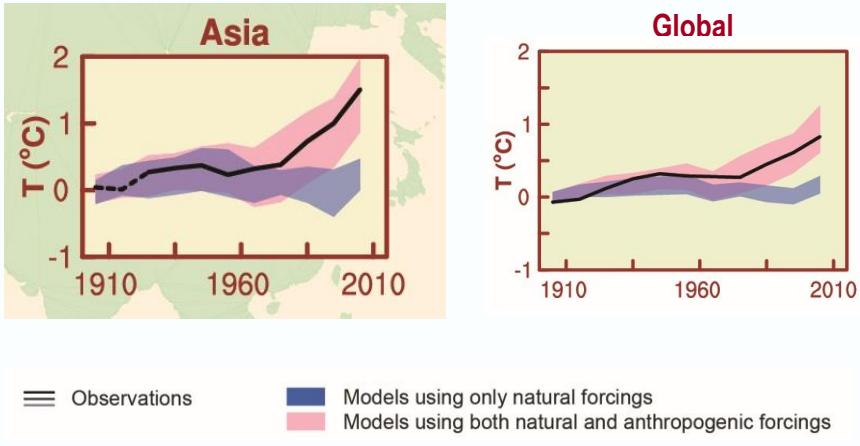
Aspiration: Climate change impacts and adaptation on food systems and value chains

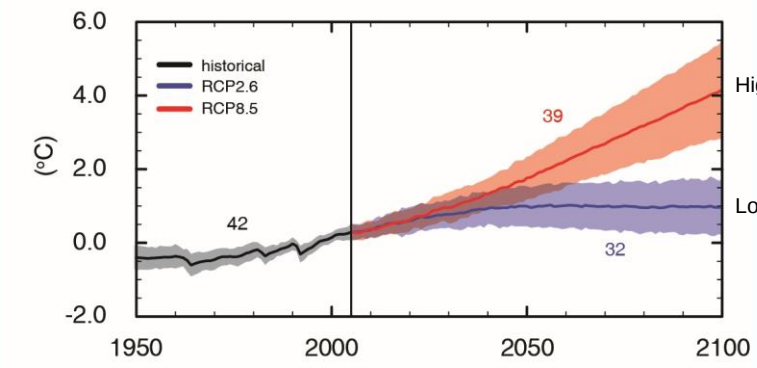


Temperatures are already increasing, and humans have an influence



IPCC WG1 2014

Global emissions and temperatures

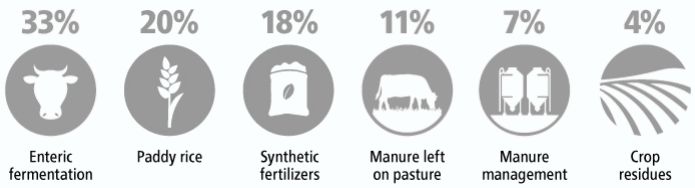


IPCC 2014

Agriculture is a significant contributor

- Agriculture is the largest contributor of non-CO_2 GHGs
- Emissions from synthetic fertilizers grew 900% over four decades.
  - Expected to overtake emissions from pasture manure by 2020.
  - 70 % of these emissions were from developing countries, with Asia as largest emitter.

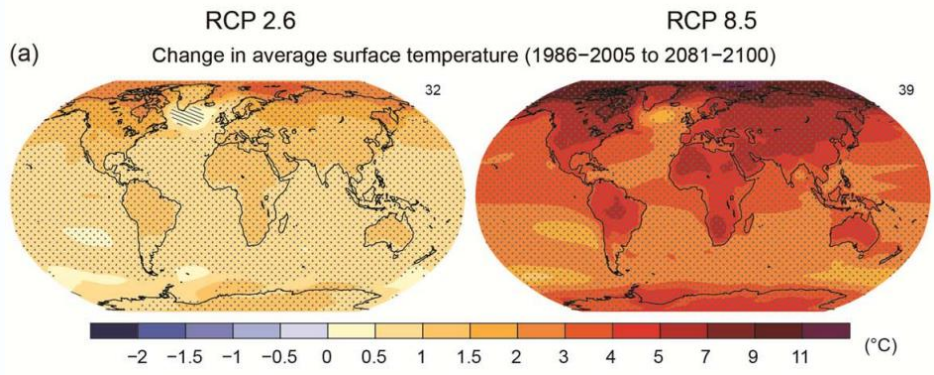
In Asia, the largest emitters in agriculture are:



Fertilisers are part of the problem, and also part of the solution.

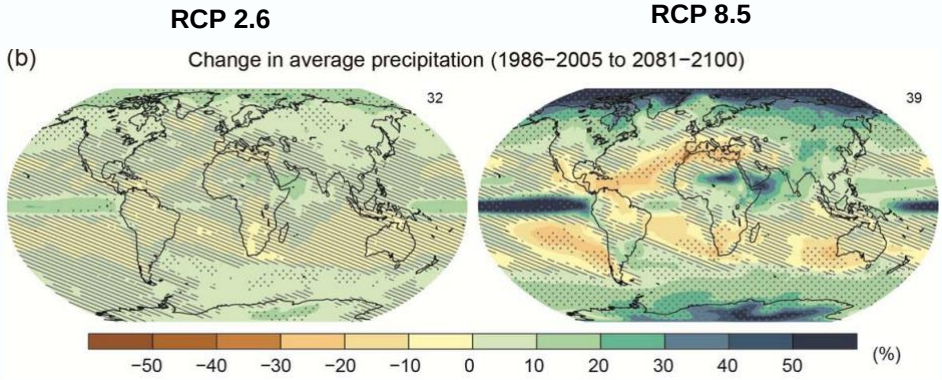
IPCC 2014; FAOSTAT 2014

Regional projections: Temperature



IPCC 2014

Regional projections: Rainfall



IPCC 2014

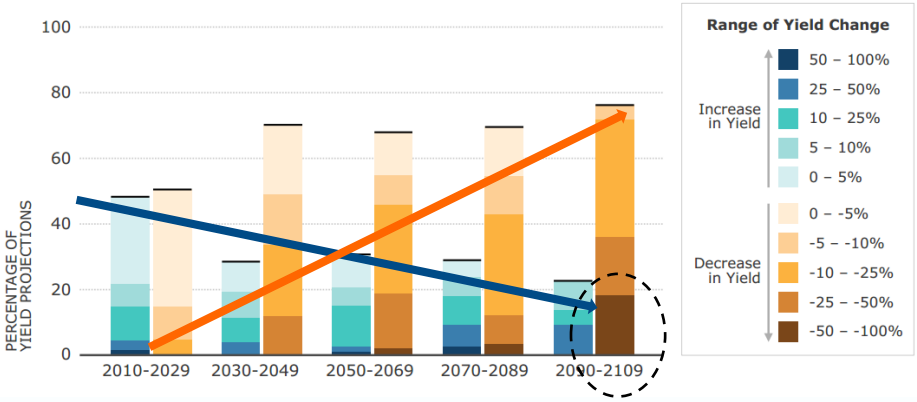
The changing food landscape

Agricultural production needs to increase by 60% over the next 40 years to meet rising demand = 1Gt cereal and 200Mt meat p.a. by 2050.

The scope for area expansion is limited. Total arable land projected to increase by only 69Mha (less than 5%) by 2050.

Image: theconversation.com.au; Images: gatesfoundation.org; getty images

Climate change is already affecting yields …More negative and less positive over time



- By 2050, none of the increases occur in developing countries, potentially limiting market expansion.
- Yield variability is likely to increase, resulting to less input use.

Porter et al. 2014

Food quality is already being impacted

- Wheat:
  - Grain quality is likely affected, with 14% reduction in proteins
- Potatoes
  - 20 to 30% decline in vitamin C
- Soya beans
  - 10 to 30% decline in calcium and zinc

Lieffering et al., 2004; Loladze, 2002; Lobell and Field 2008

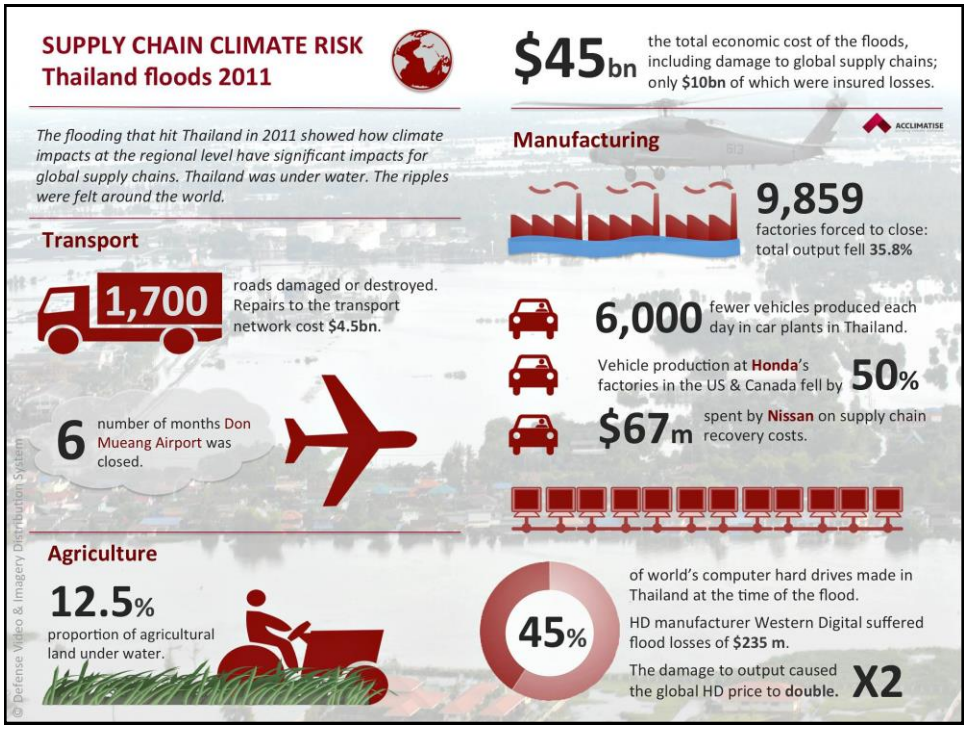
Image: theconversation.com.au; Images: gatesfoundation.org; getty images

Production seasons are impacted

- Area encompassed by monsoon systems will increase
- Monsoon precipitation is likely to intensify
- Lengthening of the monsoon season in many regions
  - Earlier onset, and later retreat

IPCC 2014

Image © GMB Akash 2013

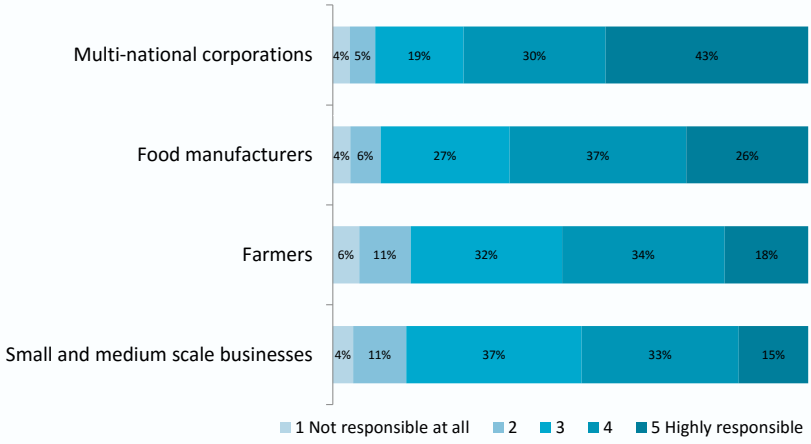


Farmers are considered most vulnerable by consumers

Q: Thinking of all the businesses that are part of the food chain, from farmer all the way to retailers, how vulnerable do you think is each part of the chain to the impacts of climate change and extreme weather events?

Lim-Camacho et al. 2014

Consumers do not link vulnerability to expected adaptation, but to resources



Q: On a scale of 1-5 where 1 is not responsible at all and 5 is highly responsible, how much do you think each of the following groups are responsible for adapting to the impacts of climate change?

Lim-Camacho et al. 2014

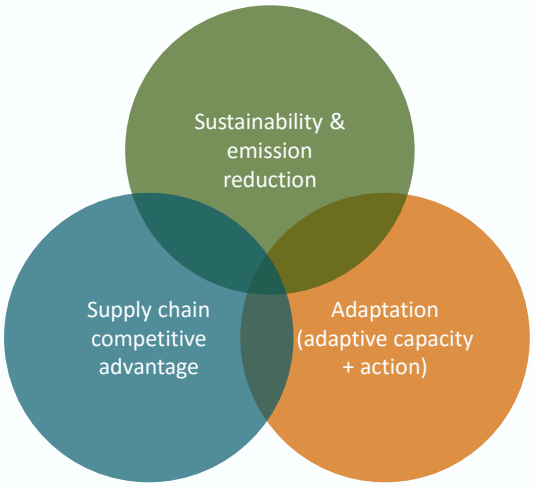
Different adaptations, different effectiveness

Management option	Benefit (%) from adapting
Cultivar adjustment (n=56)	**23**
Planting date adjustment (n=19)	**3**
Planting date and cultivar adjustment (n=152)	**17**
Irrigation optimisation (n=17)	**3**
Fertiliser optimisation (n=10)	**1**

This is just a small subset of the possible adaptations.

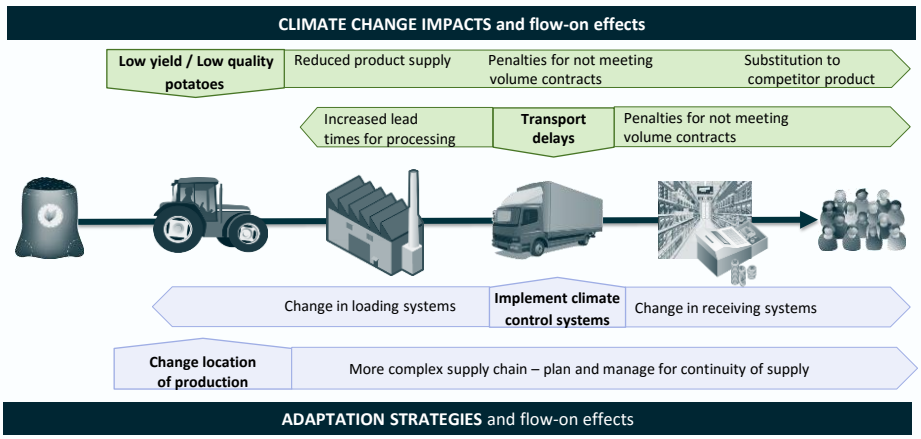
Porter et al. 2014

Co-benefits to adaptation, mitigation and competitive advantage



Lim-Camacho et al. 2015

Consideration of direct and indirect action is vital



Lim-Camacho et al. 2015

Incremental change may not be enough

- Focus on existing systems only may result in maladaptation

  …and in missed opportunities
- Need to consider more systemic and transformational adaptations

  …increasingly so as changes continue

Howden et al. (2010), Park et al. (2012), Rickards and Howden (2012)

Conclusions

- Climate change is already impacting on the way we live, the way we do business
- Significant GHG reduction is needed – is there an opportunity for the industry?
- Adaptation is important, to minimise risk and to take advantage of opportunities
- Synergies between sustainability, adaptation and competitive advantage can be achieved
- Look beyond to supply chains and food systems for incremental systemic and transformational changes

Thank you

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