

IPS Roundtable on
Climate Change and Food Security
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Climate Change &
Food Production

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Presentation outline

- nature & extent of climate change & impacts
- adaptation options in agriculture
- AKST investment implications
- concluding remarks

Key drivers in agricultural markets

- Demand side:
 - Population growth
 - Rising incomes in developing countries
 - Changing tastes and diets
 - Urbanisation
- Supply side
 - **Climate change**
 - Non-climate eco-systems (soil degradation, biodiversity)
 - Competition for scarce resources & input costs
 - Technology development & yield improvements
- Policy
 - R&D investment
 - Market access
 - Mandates/procurement policies

nature of climate change

- changes in average temperature and rainfall
- changes in the severity and frequency of extreme weather and climatic events
 - droughts
 - floods
 - frosts, and
 - heat waves
- uncertainty and limited regional details

climate change impacts

- **biophysical** (land, water, ocean acidification)
- **environmental** (ecosystems, biodiversity)
- **social** (human health, permanent displacement)
- **economic** (cascading effects of all the above)

impacts on agriculture

- agriculture is particularly affected
- changes in rainfall, temperature and climate extremes
- changes in land, water, human and animal health
- changes in agricultural productivity

impacts on Australian agriculture

1°C increase in temperature

- 250-310 litre (or 6%) pa decline in milk production per cow in Hunter Valley
- 4.2% decline in total factor productivity in wheat production in NSW
- 1.8% decline in total factor productivity in sheep meat production in NSW

impacts on Australian agriculture

(continued)

1-2°C increase in temperature

- 15% decline in pasture productivity
- 12% decline in liveweight gain in cattle

3-4°C increase in temperature

- 28% increase in tick related losses in net cattle production weight

impacts on Australian agriculture

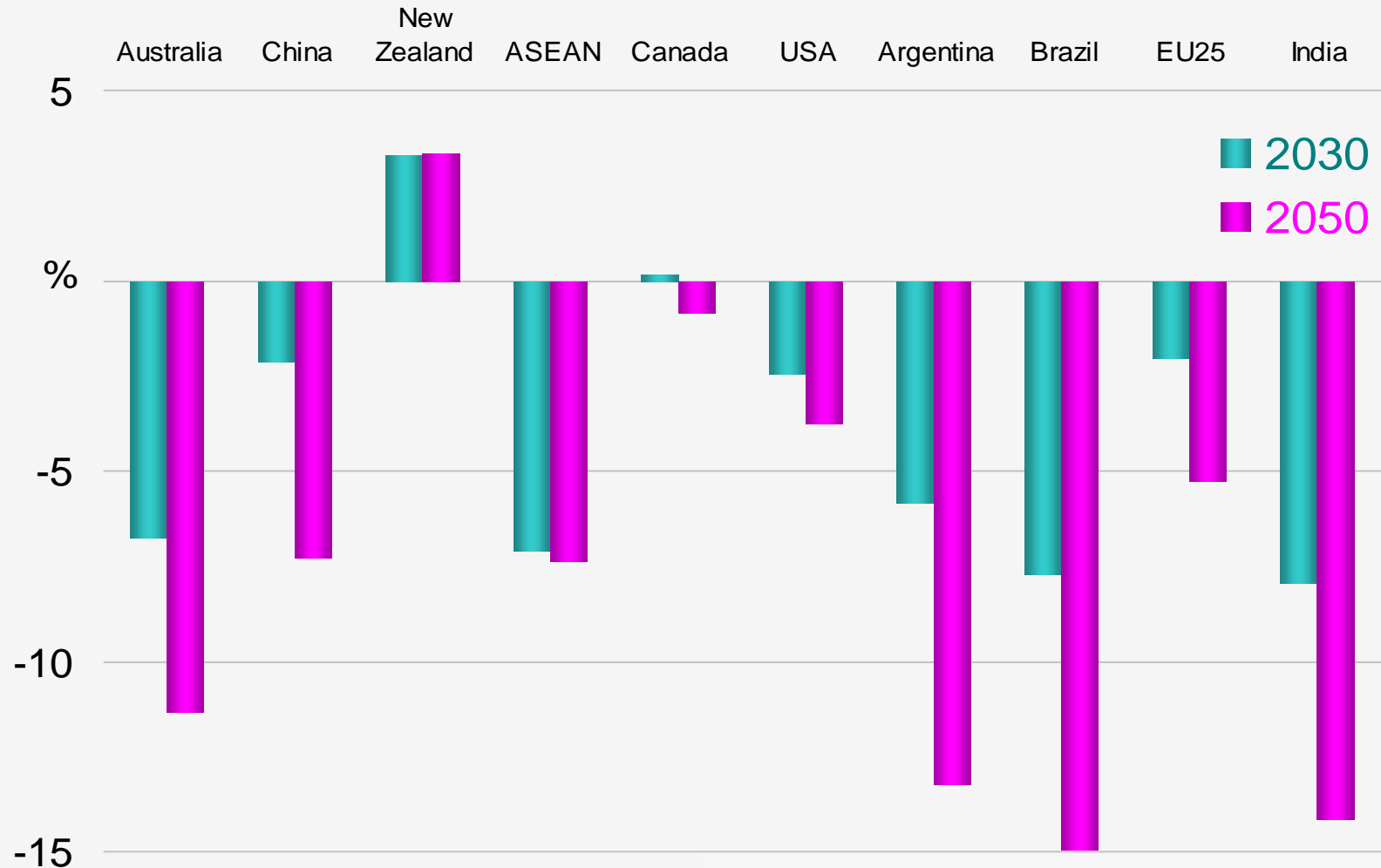
(continued)

ABARE's illustrative scenario analysis

- assumed changes in agricultural productivity by 2050 (Cline 2007)
 - increase by 1% in NZ
 - decline by 17% in Australia
 - decline by up to 25% in other key economies
- assumed decline in overall economic activity by 2050 (Stern 2006)
 - 5% in developed countries,
 - 10% in developing countries
- assumed no mitigation and adaptation

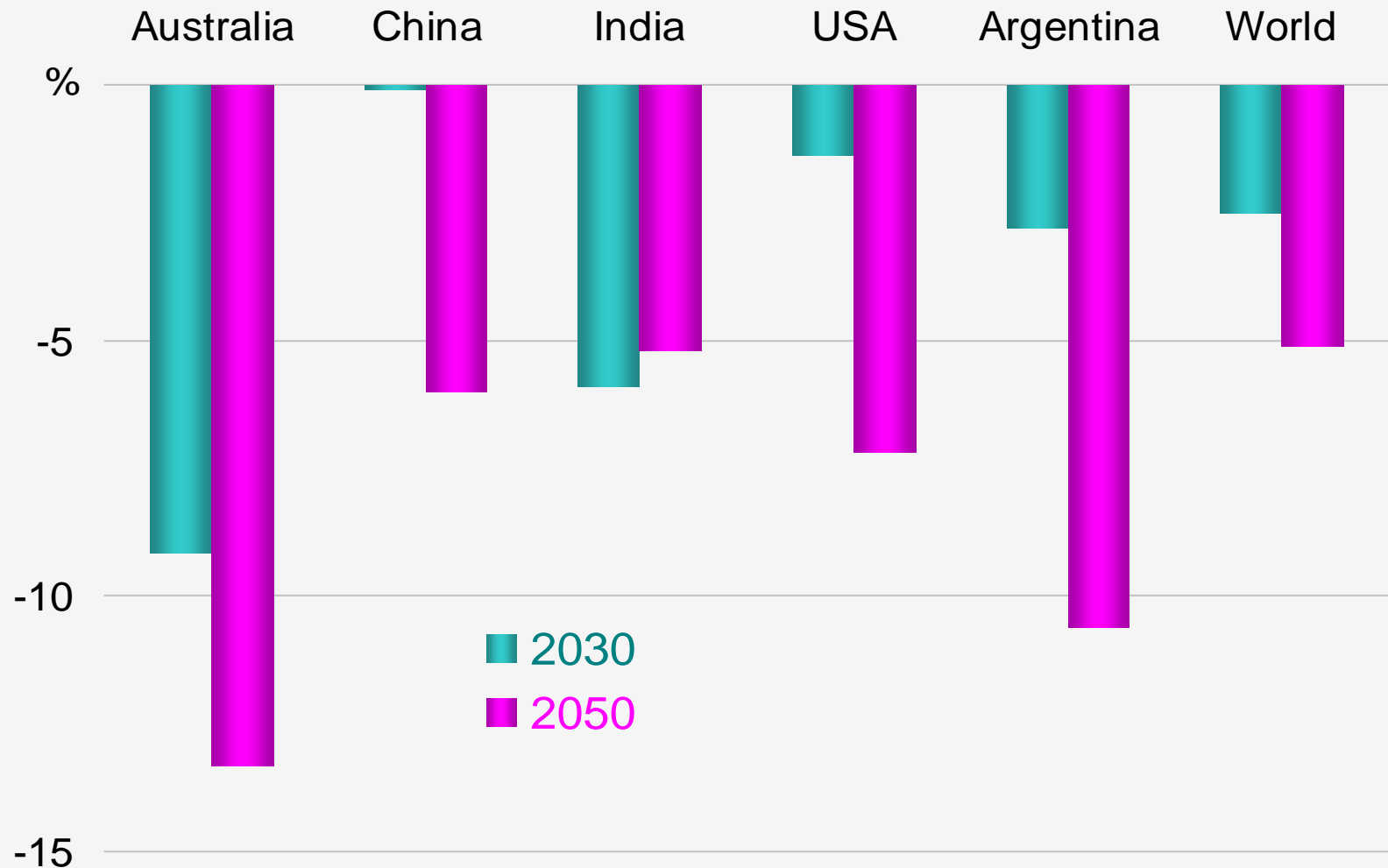
Climate change – percentage change in total agricultural production

relative to the reference case (no adaptation or mitigation)



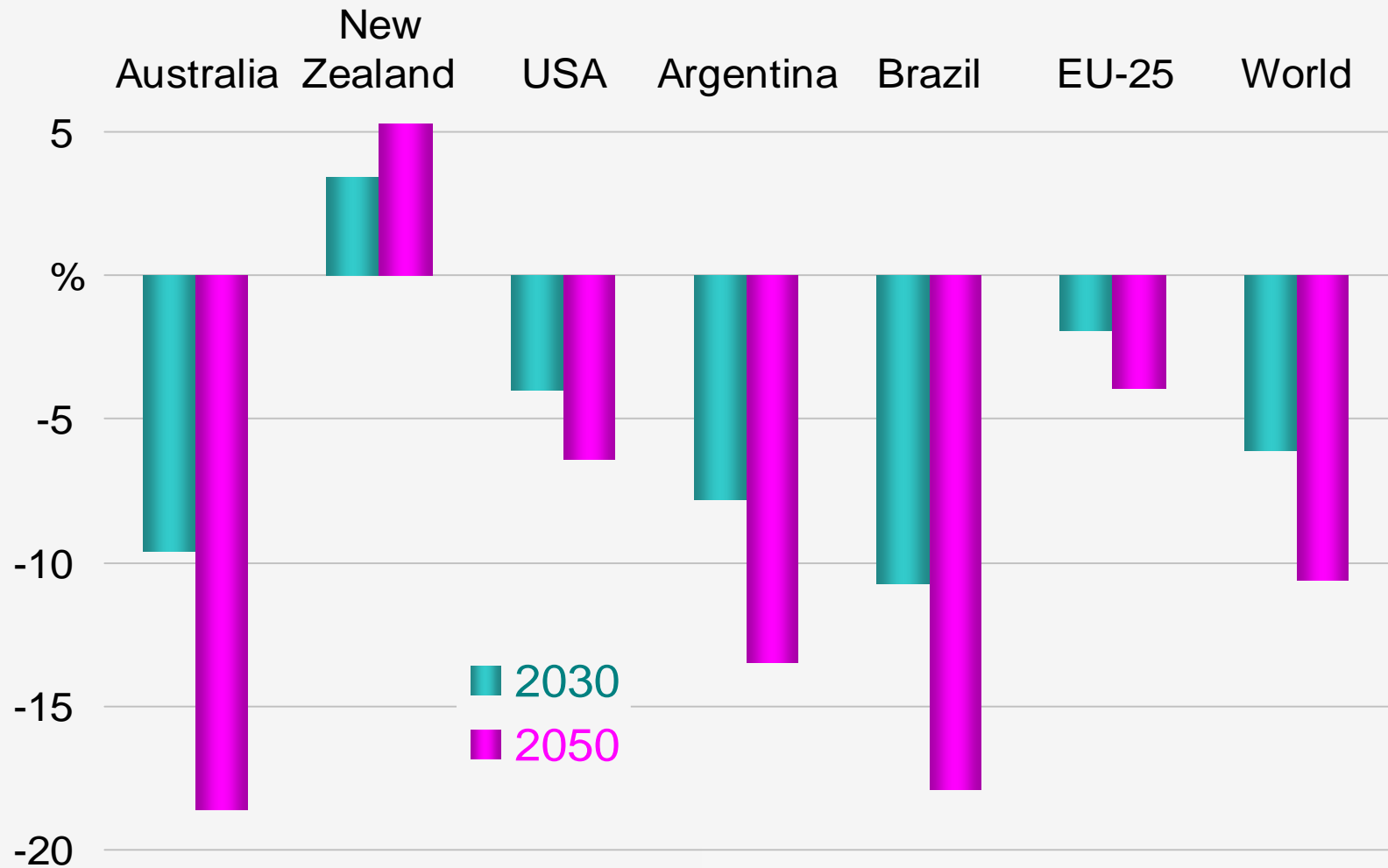
Climate change – percentage change in global wheat production

relative to the reference case (no adaptation or mitigation)



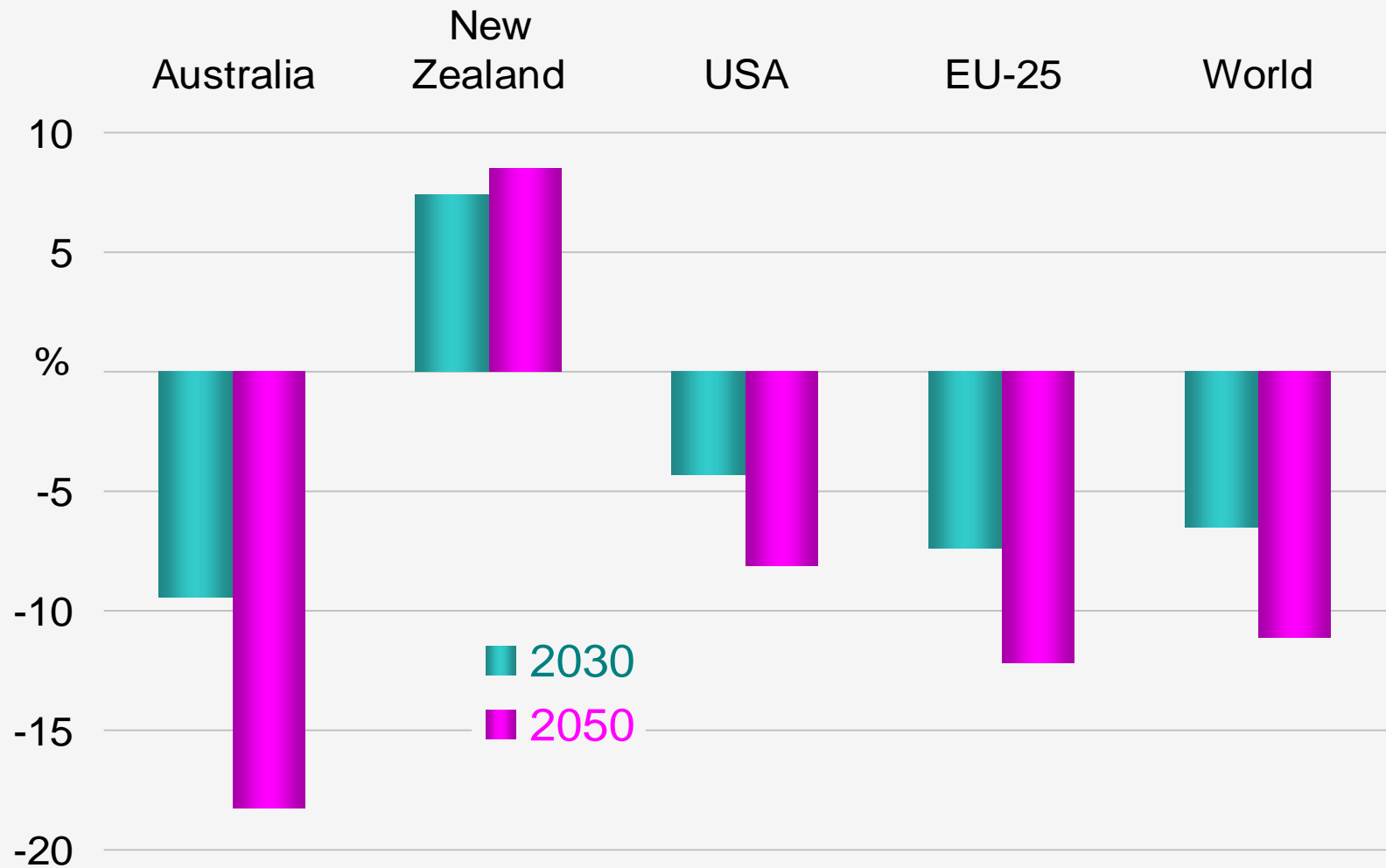
Climate change – percentage change in global beef production

relative to the reference case (no adaptation or mitigation)



Climate change – percentage change in global dairy production

relative to the reference case (no adaptation or mitigation)



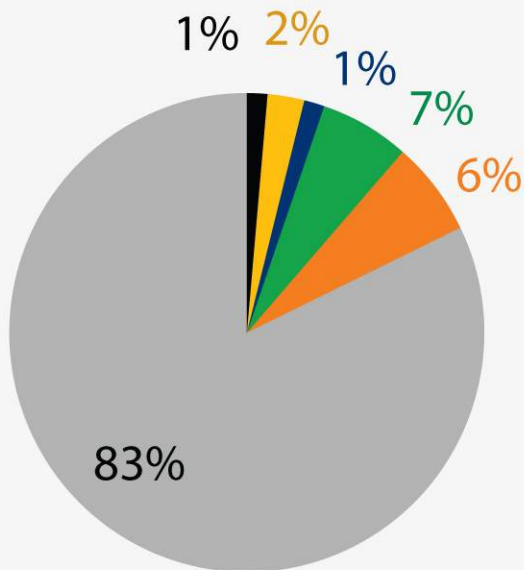
ways to respond to climate change

- mitigating GHG emissions
- adapting to climate change

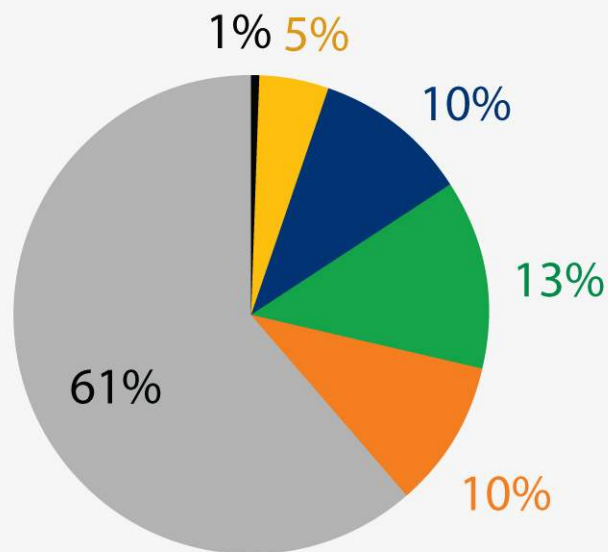
average share of emission intensive inputs in total costs

Australia, 2005-06

livestock

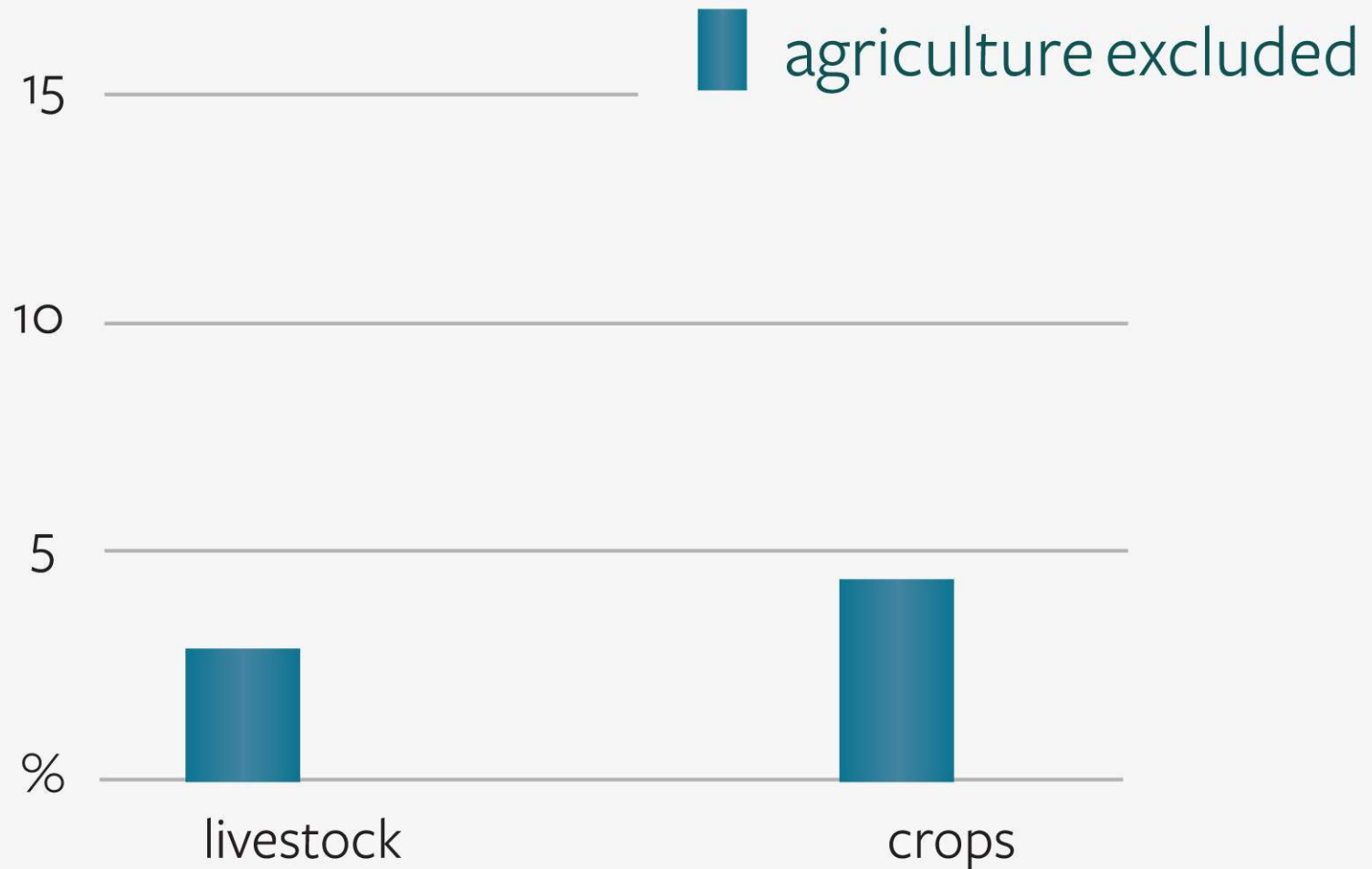


cropping

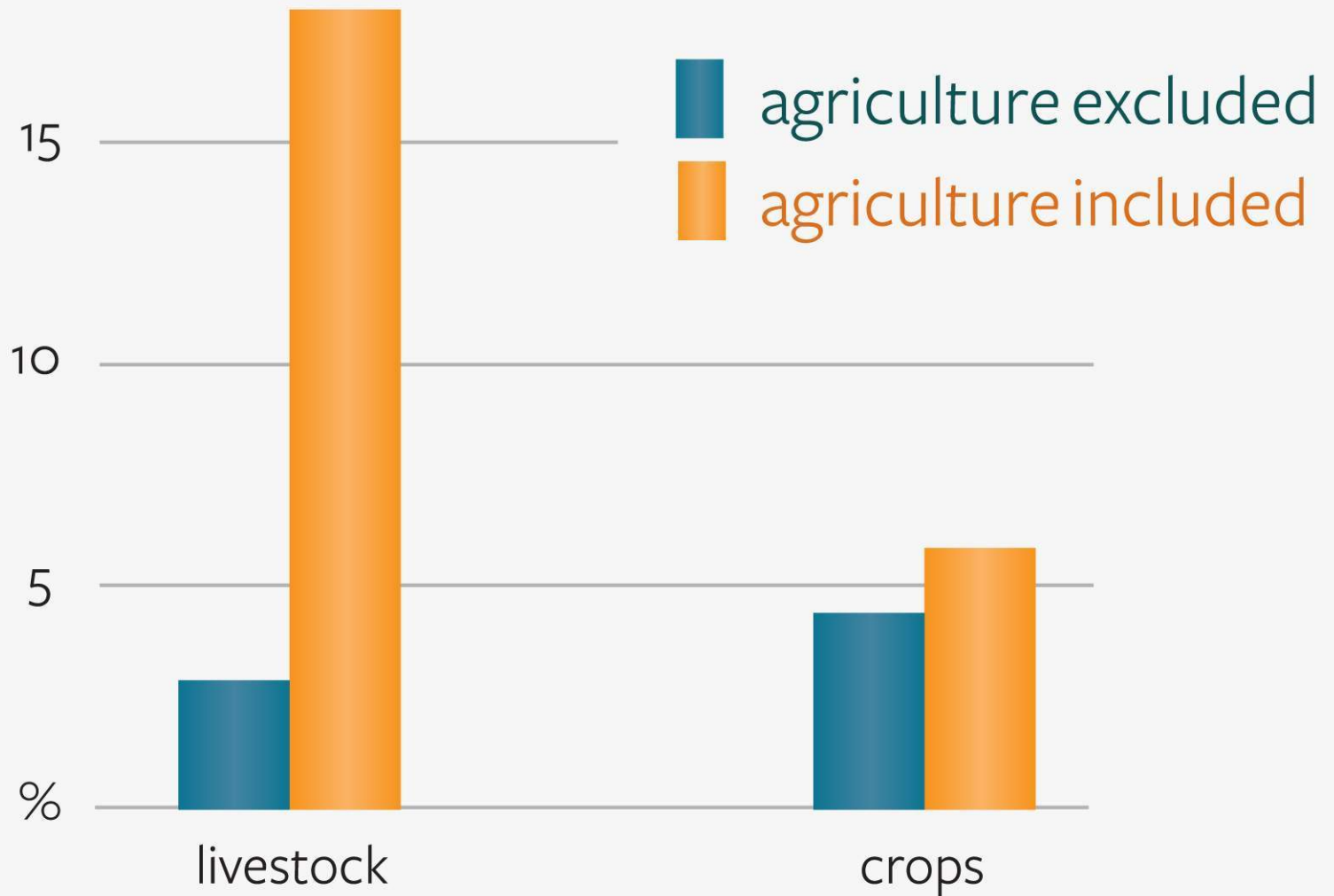


- electricity
- freight
- chemicals
- fertiliser
- fuel
- other expenses

impacts of a carbon penalty of \$40/t CO₂-e on agricultural production costs



impacts of a carbon penalty of \$40/t CO₂-e on agricultural production costs



agriculture adapting to climate change

- will occur on-farm and will be ongoing
- considerable productivity improvements will be required

adaptation options in agriculture - cropping

- alter crop varieties
 - increased resistance to heat, frost, drought, pests or diseases
- alter fertilisation and water application times and amounts
- alter timing and location of cropping activities
- use zero tillage, retain crop residues, change planting patterns, reduce fallow times
 - enhance water efficiency
 - reduce soil erosion
- conserve soil moisture

adaptation options in agriculture - livestock

- alter pasture rotations and modify grazing times
- alter forage and animal species or breeds
- provide supplementary feeding
- change or improve feed concentrates

Adaptation to climate change: Policy options

- Information transfer
- Research, development & diffusion
- Ensuring appropriate market settings
- Facilitating productivity growth
- Maintaining critical services

Gains from trade liberalisation and AKST investment

- Additional AKST investment
 - US\$579 to US\$1,030 billion: 2005 to 2050
- potential ‘static’ gains from global trade liberalisation
 - US\$2.4 trillion: 2010 to 2025
- Gains from trade >> estimated additional AKST investment

Concluding remarks

- Climate change
 - real and formidable challenges for agriculture
 - uncertainty
- Options for action
 - international CC mitigation effort
 - research & development
 - significant additional AKST investment
 - Ensure right policy setups and market efficiency

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innovation in economics