

SDGs under the climate change threat: an impact assessment in the agricultural sector

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Context I: Climate Change Impacts on Agriculture

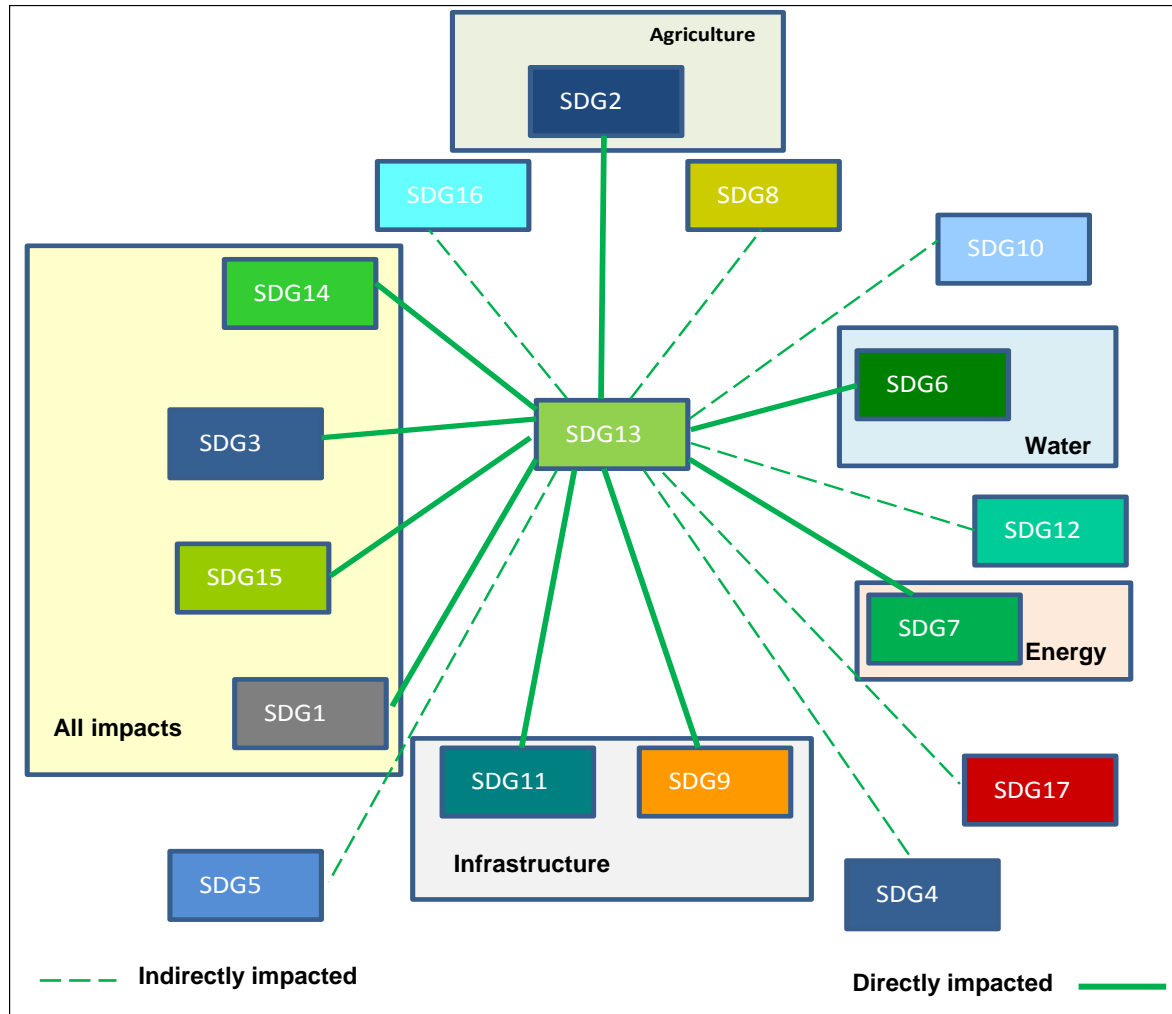
Latest FAO-IFAD report surveys an increase in hunger and malnutrition in 2016: likely causes are climate change and conflicts.

→ *What happens if we fail SDG13 (climate action) in terms of agriculture?*

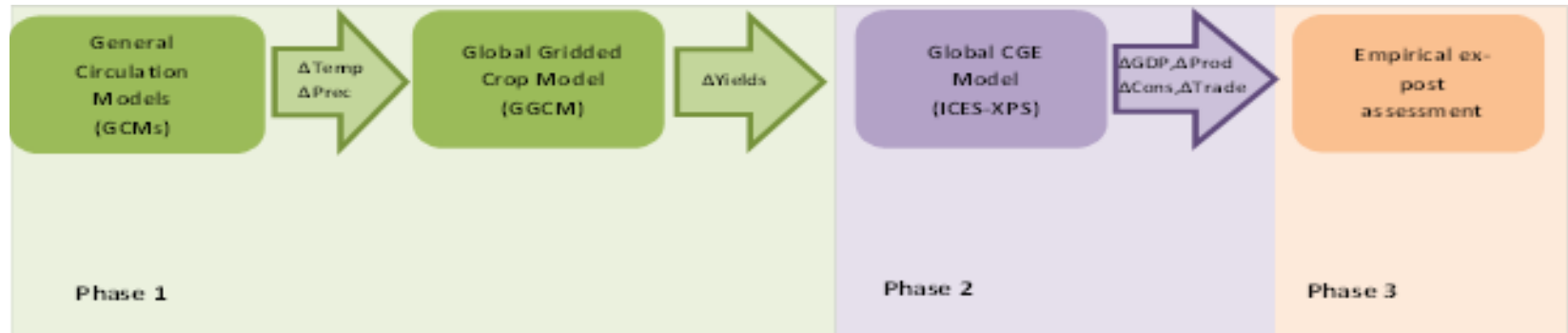
Outcomes useful to:

- 1) Assess uneven distributed impacts;
- 2) Assess vulnerability to better target adaptation measures;
- 3) This analysis gives also insights in social indicators such as poverty, undernourishment, inequality.

Context II: Climate Change in the SDG Architecture



Methodology



**Uncertainty forecasts:
5 GCMs, 2 RCPs, 1GGCM**

**Calibration on
GTAP database v.8**

**Calibration
on historical
data**

Scenarios

With CC + CO₂ fertilization

- World economies grow as SSP5 with same drivers as No CC;
- With CC, land productivity changes according to GGCM, GCMs and RCPs (RCP2.6: +1.0°C; RCP8.5: +2.0°C / +3.7°C)

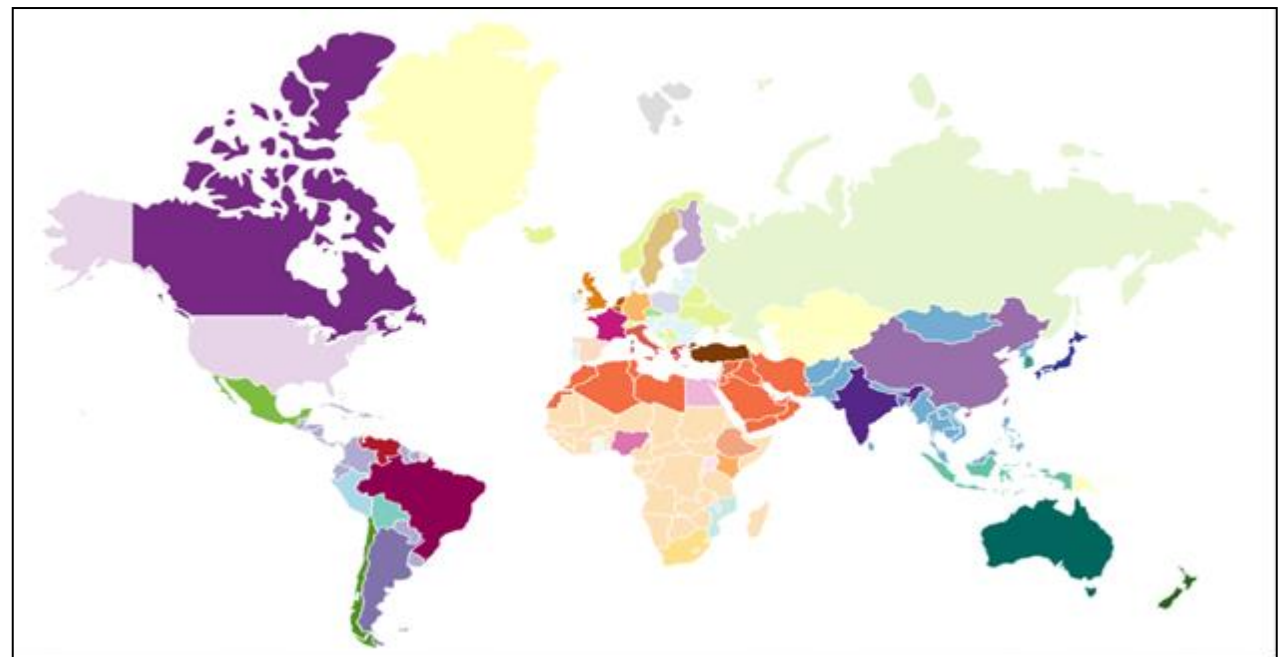
No CC (Reference scenario)

- World economies grow as an SSP5 scenario in terms of GDP, population;
- No CC, land productivity projected from historical trends;

Aggregation: Agricultural Sectors & Geographical Coverage

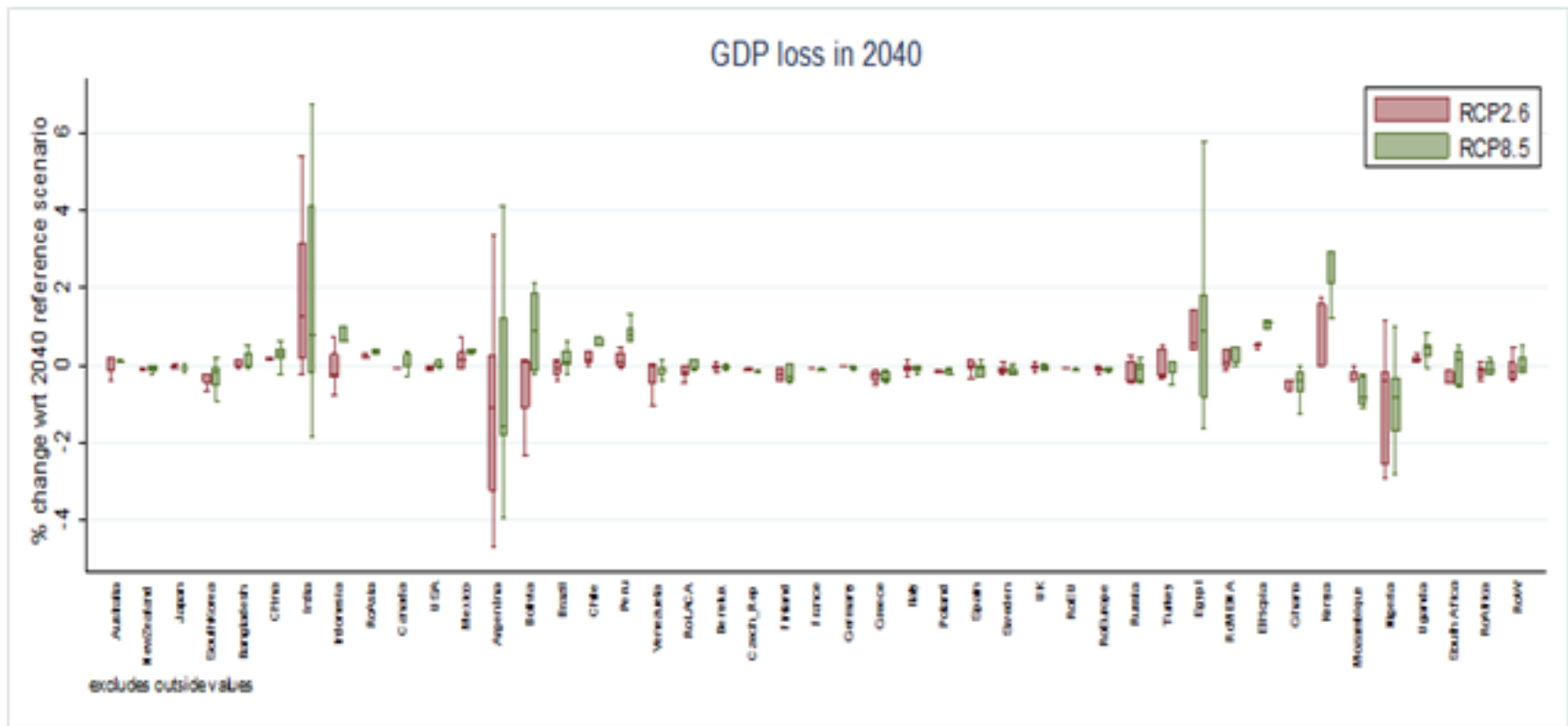
| ICES-XPS | GTAP | LPJmL |
|-----------|--|------------------------|
| Rice | Paddy rice | Rice |
| Wheat | Wheat | Wheat |
| Othgrains | Cereal grains | Maize, millet |
| Othseeds | Oil seeds | Rapeseed, soybeans |
| Sugar | Sugar cane, sugar beet | Sugar cane, sugar beet |
| Othcrops | Vegetables, fruit, nuts Plant-based fibers Crops nec | -- |

Crop sectors from GGCM (LPJmL) to GTAP database and ICES-XPS model



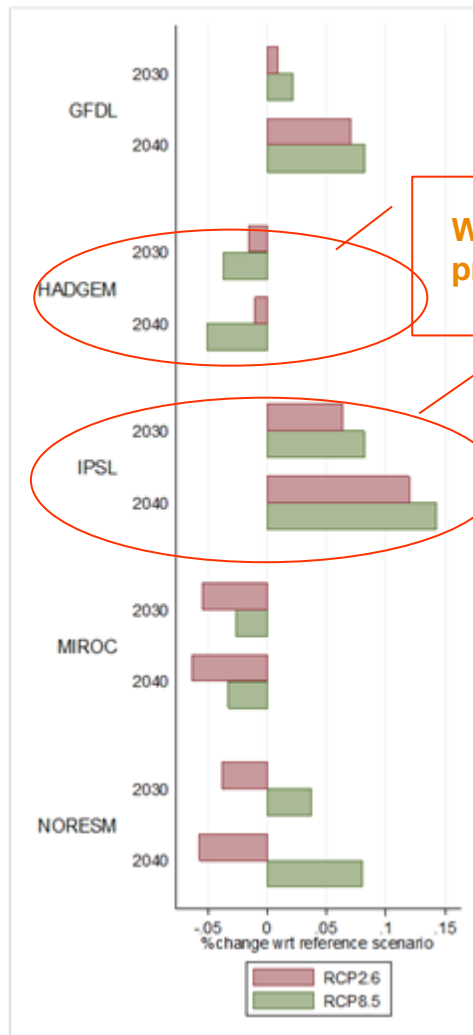
Countries and regions presented in APPS

Outcomes: GDP Effects



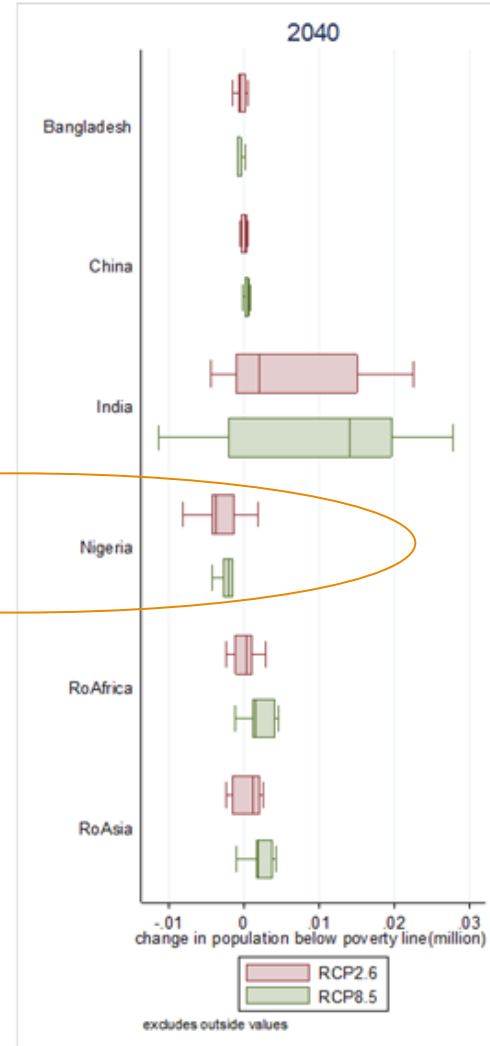
- 1) RCP8.5 more heterogenous than RCP2.6;
- 2) EU countries not affected;
- 3) North America small gains but South America loses or increases uncertainty;
- 4) North Africa gains;
- 5) Losses more evident in Sub- Saharan Africa.

Outcomes: Poverty Indicator



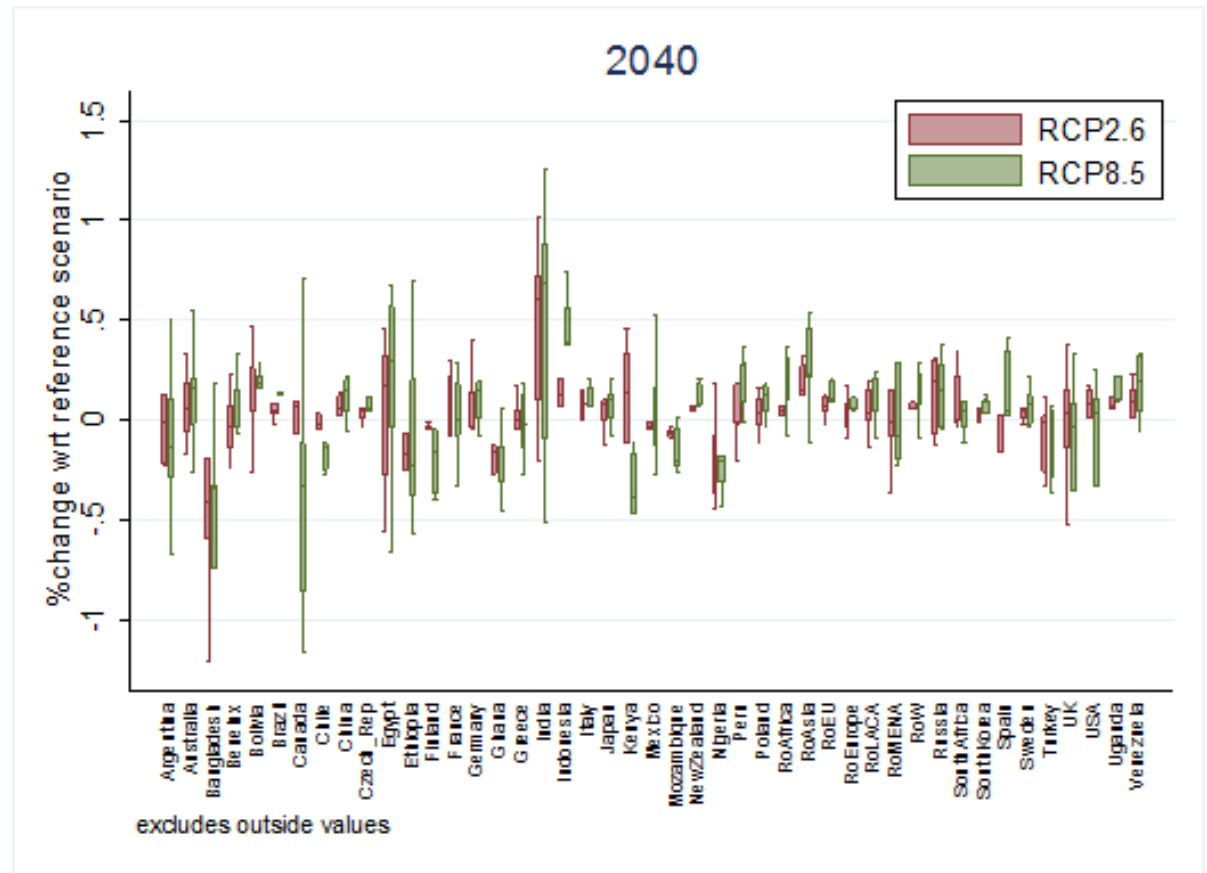
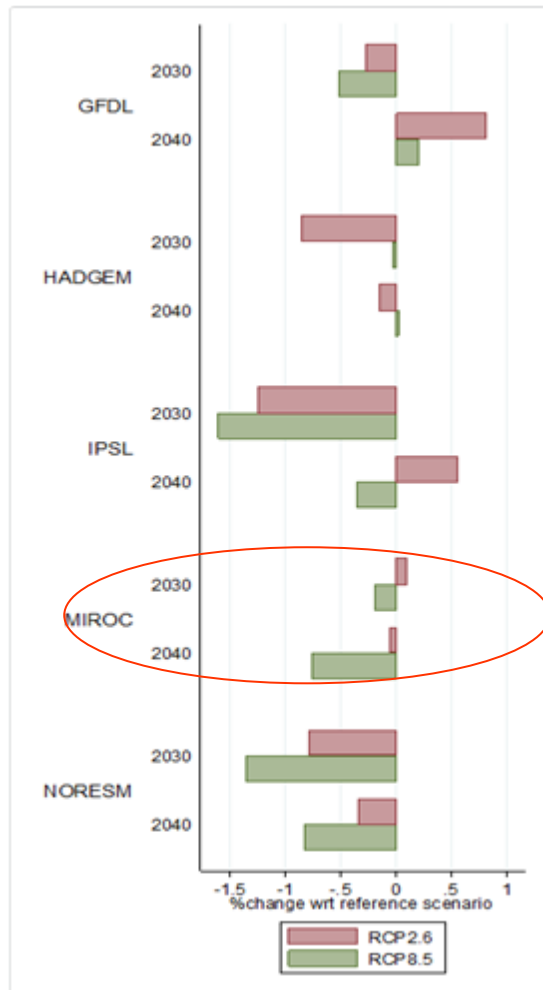
Wettest prediction

Driest prediction

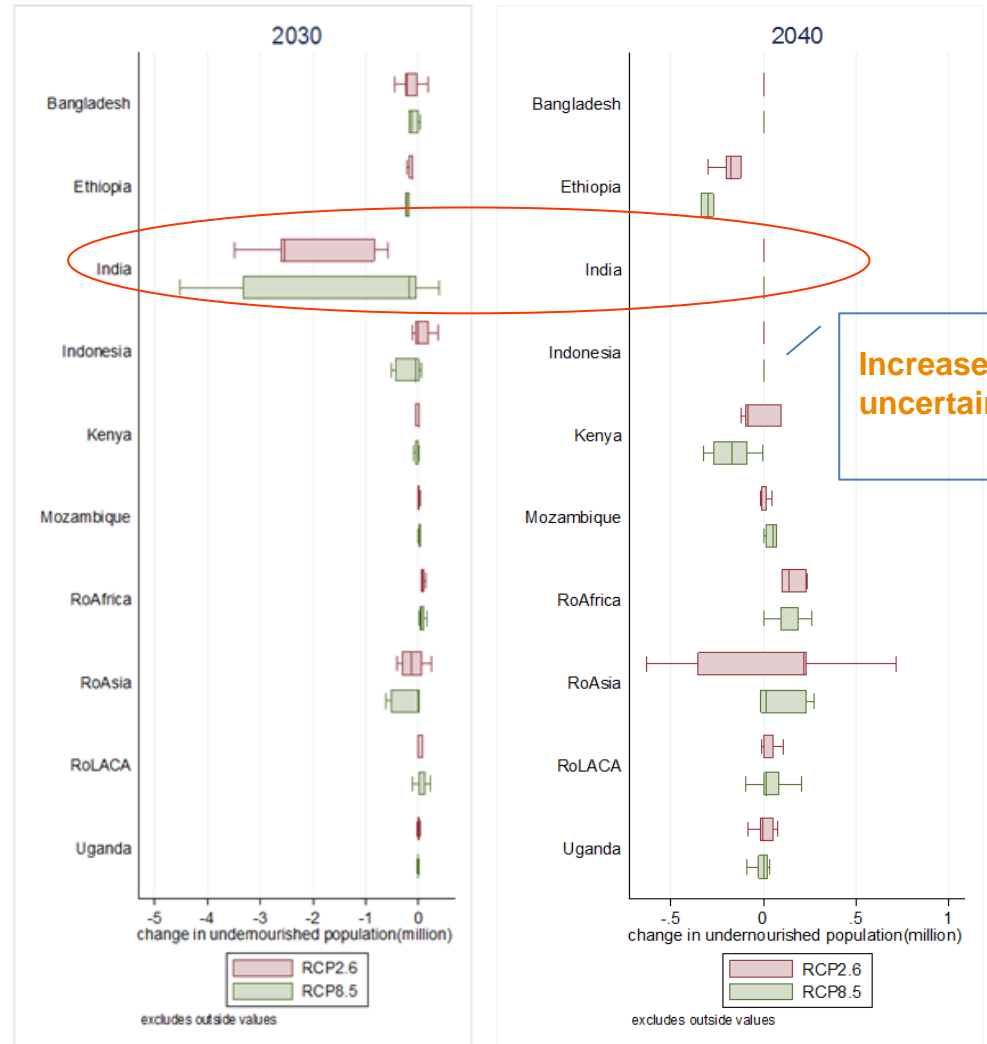
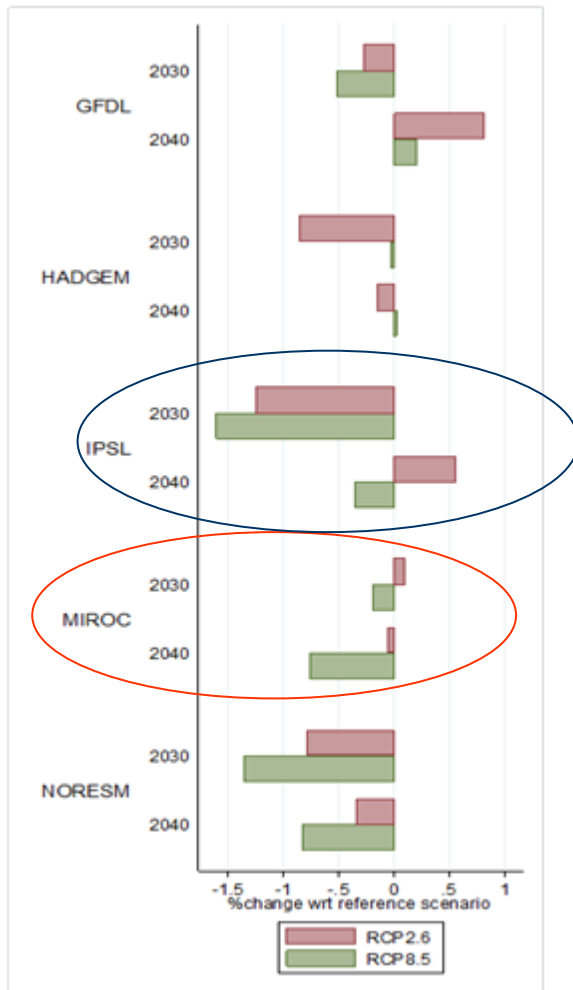


Countries with more than 3% poverty rate

Outcomes: Within Country Inequality Indicator



Outcomes: Malnutrition Indicator



Countries with more than 5% poverty rate

Conclusions

- 1) High uncertainty on long run impacts of failing SDG13 on agriculture and uneven distributed effects;
- 2) Effects are often more positive in RCP8.5 than in RCP2.6 because higher emissions and positive effect on fertilization
→ inverse effect of emission and GDP growth;
- 3) As supposed, using driest GCM worsens the effects on poverty, malnutrition and inequality (increase in each case).

Further research:

- 1) Explore how much the choice of the CO₂ fertilization option counts in results?
- 2) Moving into other SSPs with different population and GDP growth rates changes the outcome?

The research is an output of FEEM “Climate Change Economic Impacts and Adaptation” (EIA) Research Program and part of FEEM cross-cutting Research Theme "Agenda 2030".

For more information on the APPS framework and methodology visit: <http://www.feemsdgs.org>

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Thank you for your attention!