Connection of the ViWA Project to other global simulation activities

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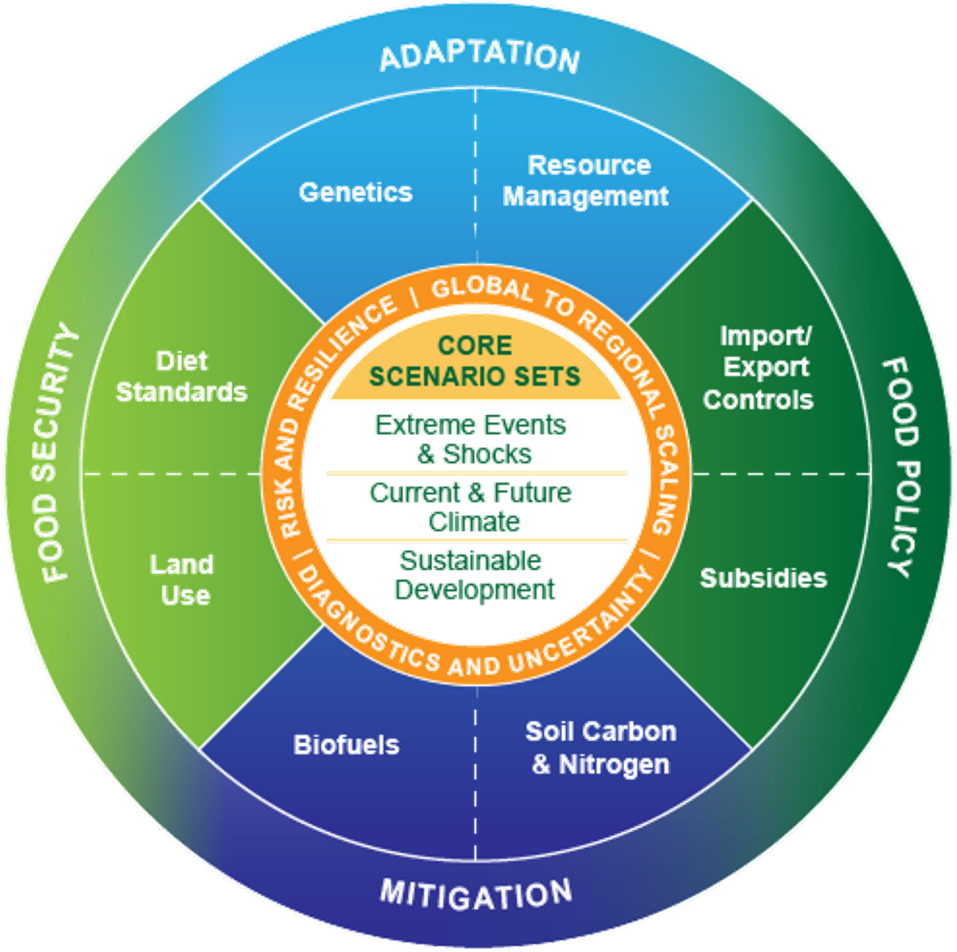
AgMIP The Agricultural Model Intercomparison and Improvement Project

Why AgMIP?

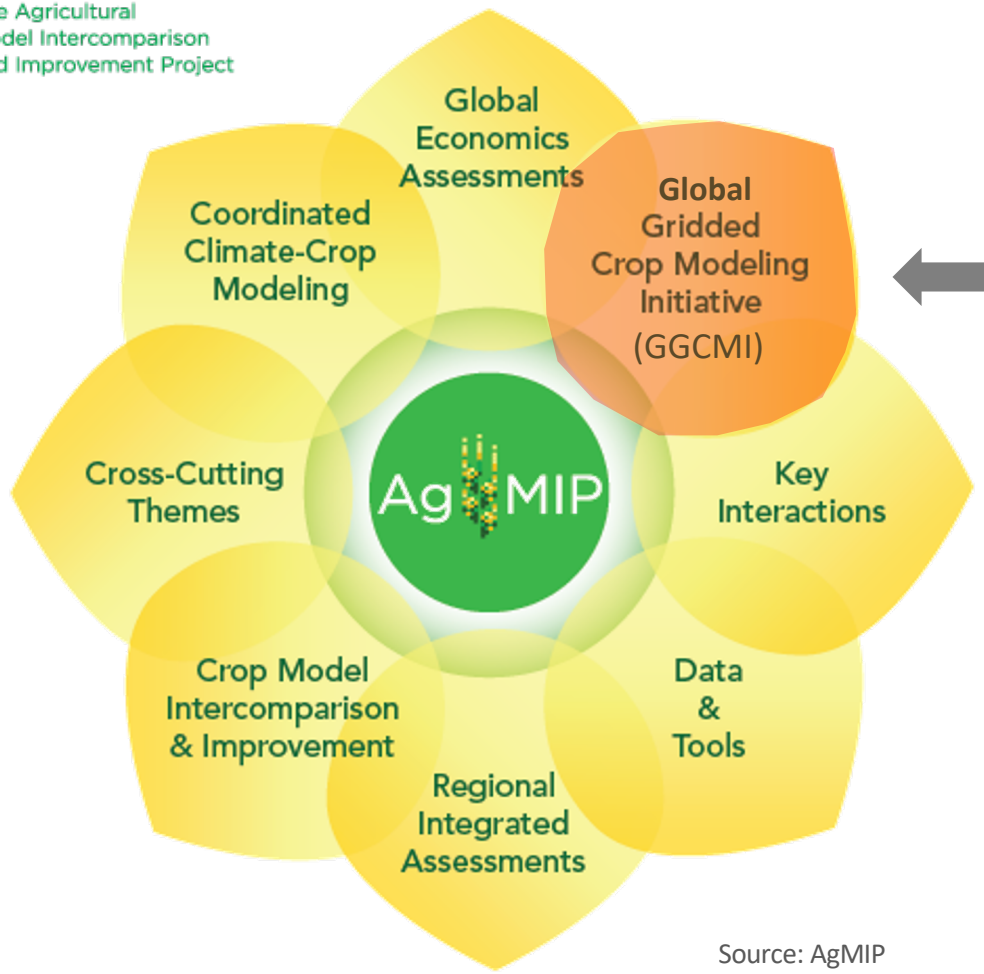
- Probabilistic risk analysis
- Consistency
- Model improvement



Source: AgMIP

AgMIP/GGCMI

AgMIP The Agricultural Model Intercomparison and Improvement Project

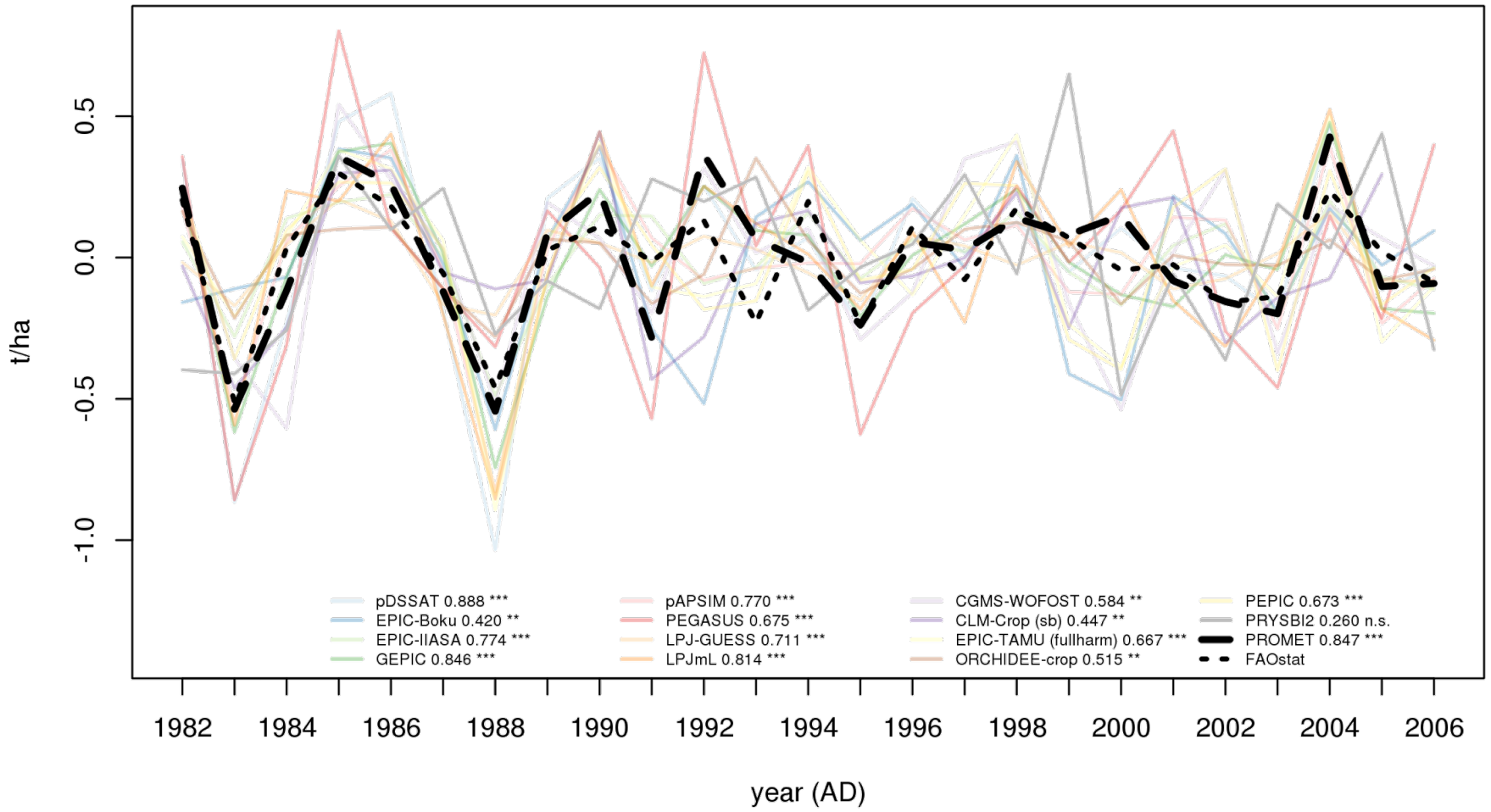


Source: AgMIP

ISIMIP Inter-Sectoral Impact Model Intercomparison Project

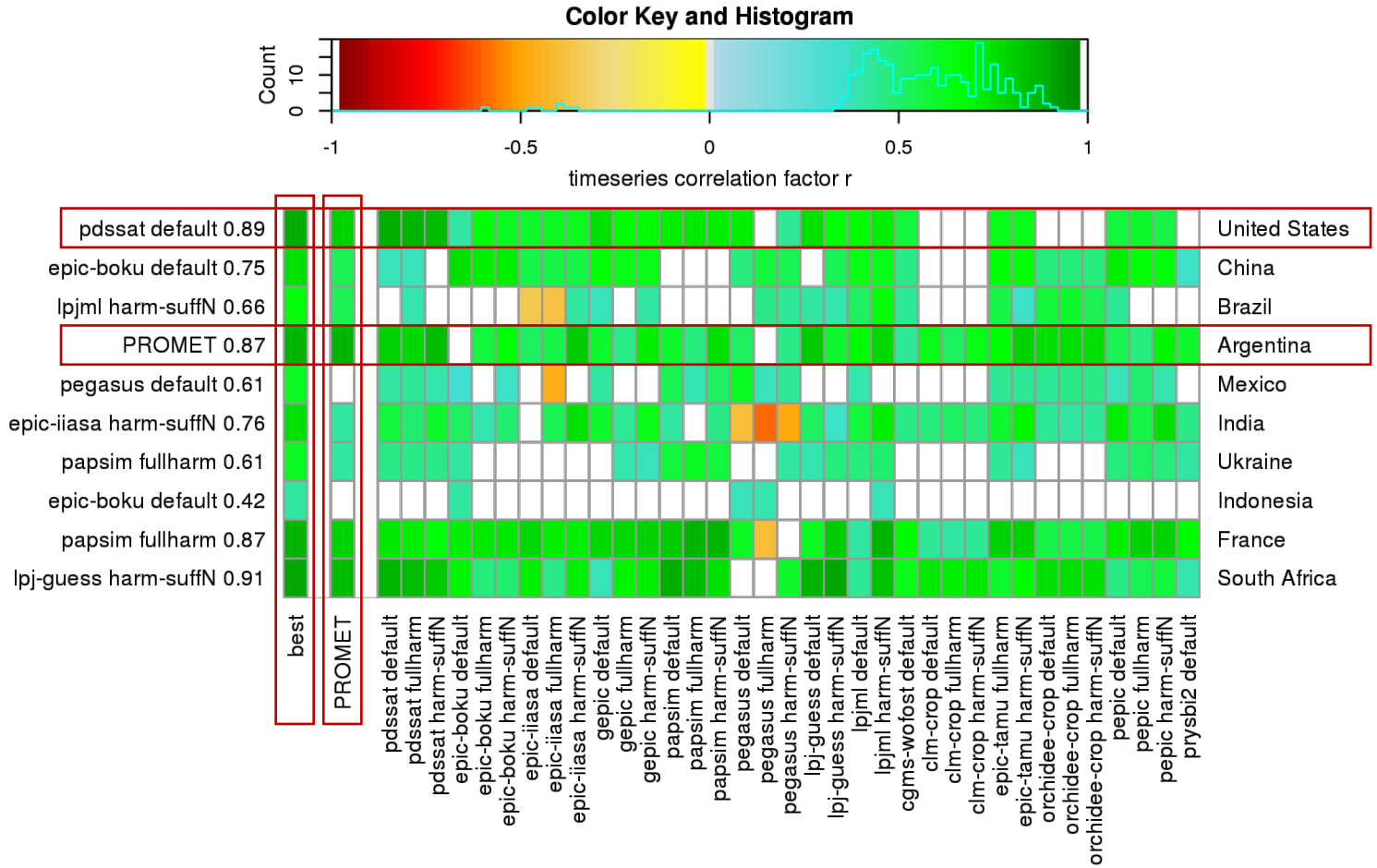
Agricultural Sector

Evaluation, Intercomparison & Benchmarking



Müller, C., et al. (2017): Global gridded crop model evaluation: benchmarking, skills, deficiencies and implications. Geosci. Model Dev., 10, 1403–1422. DOI: 10.5194/gmd-10-1403-2017

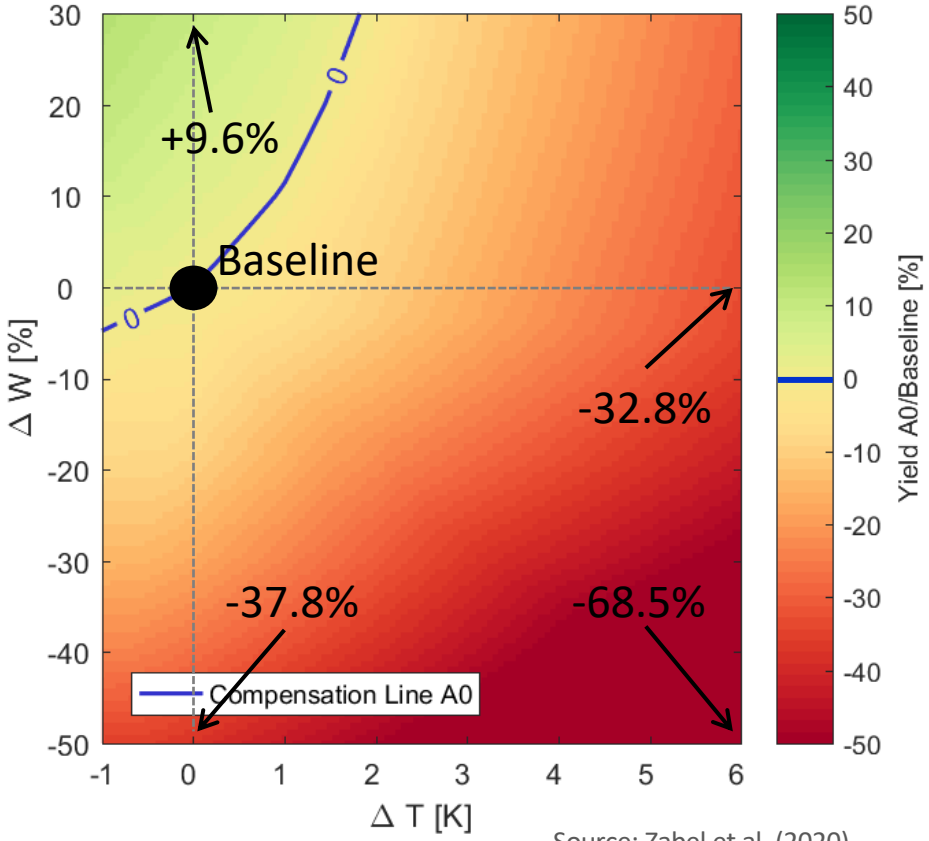
Evaluation, Intercomparison & Benchmarking



Müller, C., et al. (2017): Global gridded crop model evaluation: benchmarking, skills, deficiencies and implications. Geosci. Model Dev., 10, 1403–1422. DOI: 10.5194/gmd-10-1403-2017

Global Sensitivity

Model median for CARAIB, GEPIC, LPJ-GUESS, LPJmL, pDSSAT, PEPIC, PROMET



Source: Zabel et al. (2020)

>20.000 global simulation time series
>400 Million spatially explicit time series
>12 billion data points

CTWN-A

- CO_2
  360,510,660,810 ppm
- Temperatures
  -1 to +6 K
- Water (Precipitation)
  -50 to +30 %, Winf
- Nitrogen supply
  20,60,**200** kg/ha
- Adaptation
  true, **false**

Crops

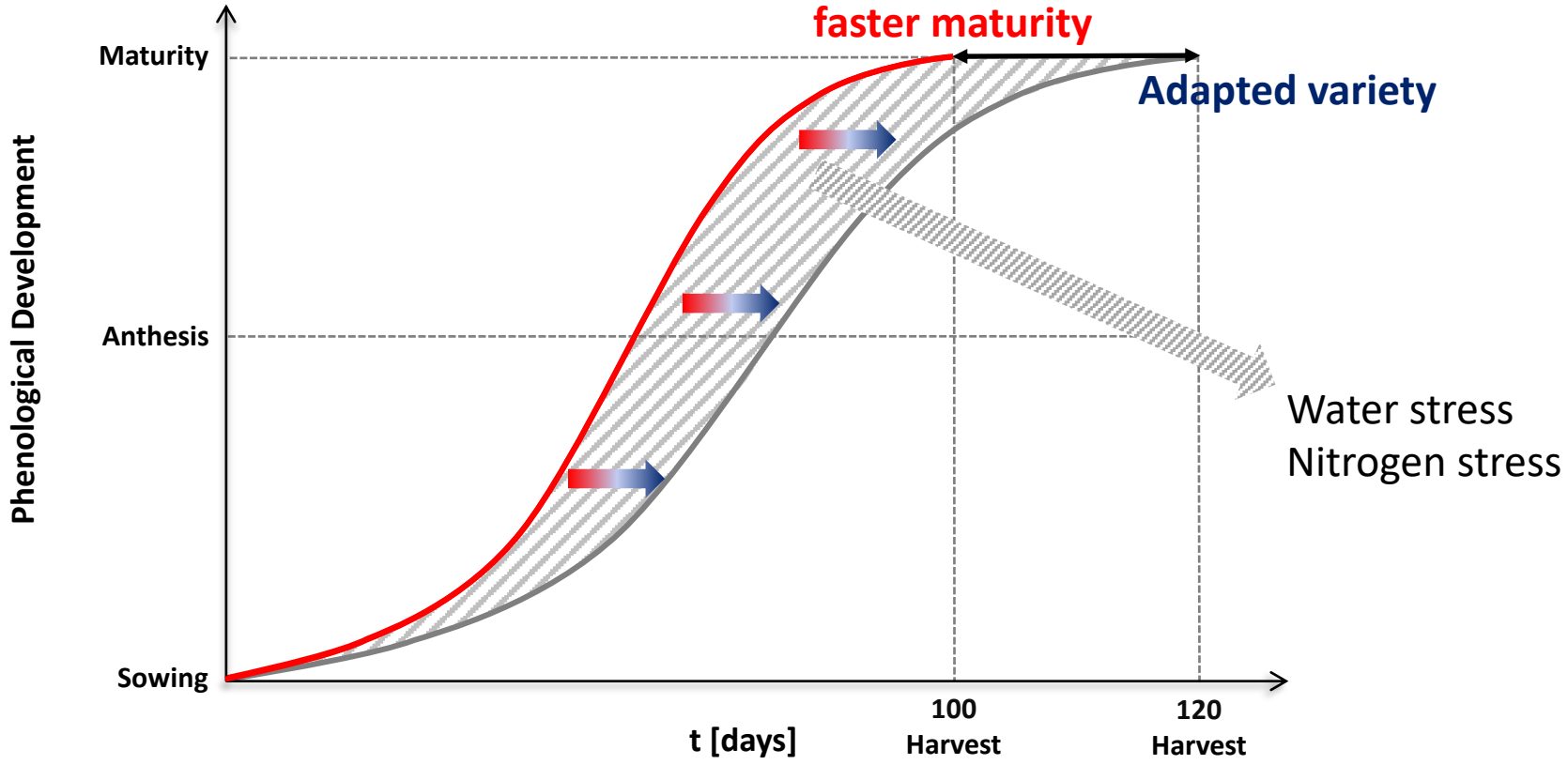
- **Maize**
- Soy
- Rice
- WiWheat
- SuWheat

Climate driver

- AgMERRA dataset
  ERA-Interim
- Bias corrected
- 1980-2010
- 0.5° resolution

Variety Adaptation & Climate Change

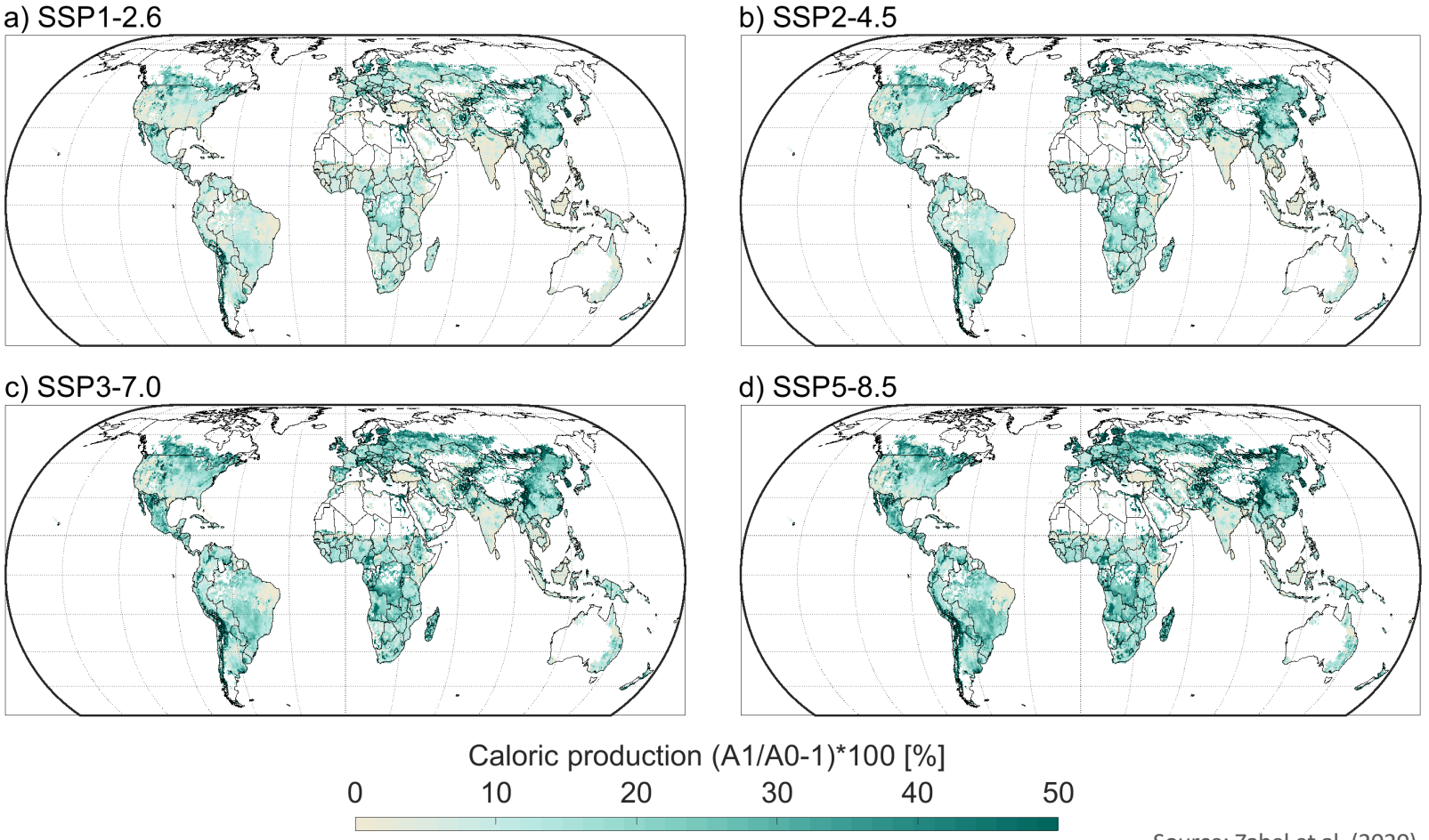
Variety adaptation: Regain of original growing period without warming



Source: Zabel et al. (2020)

Variety Adaptation & Climate Change

Potential adaptation effectivity (2070-2100): Model median 7 GGMs x 5 GCM
Considered crops: maize, rice, soy, spring wheat, winter wheat.



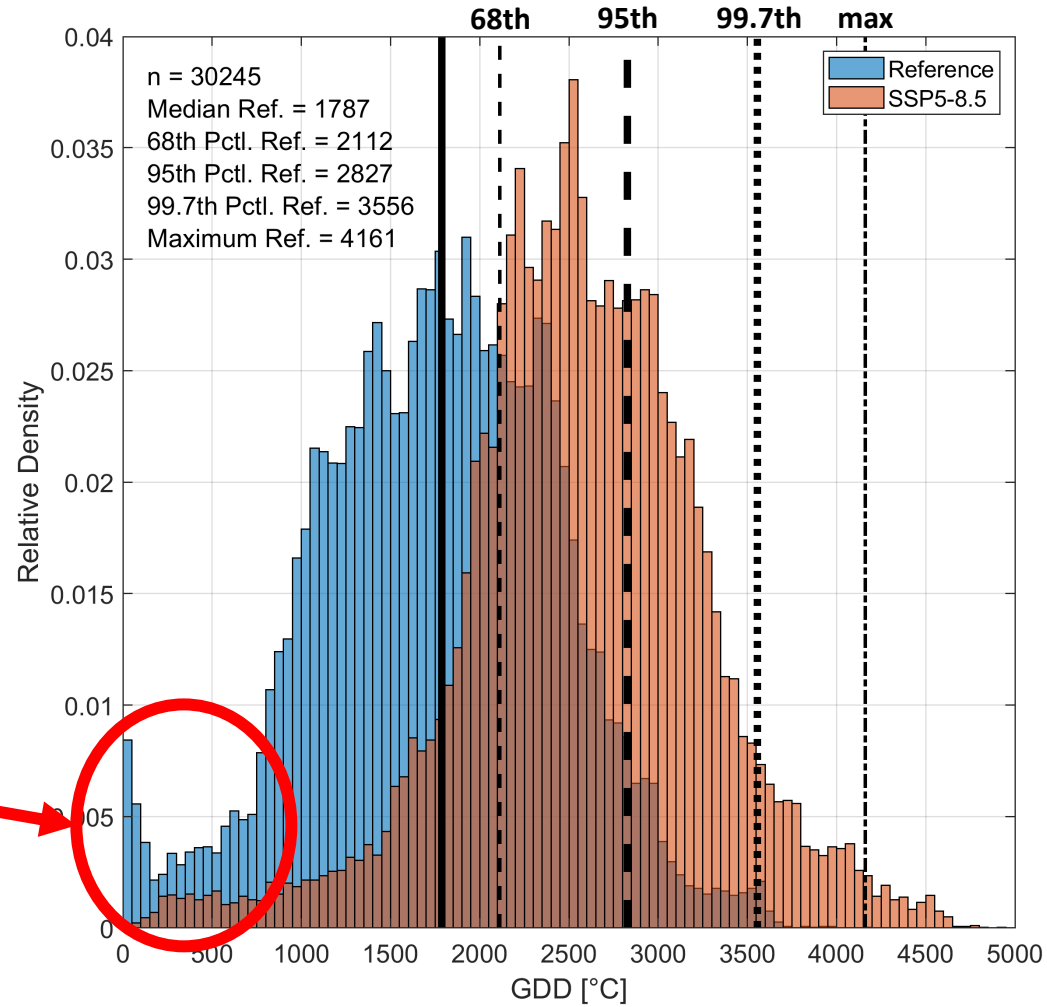
Source: Zabel et al. (2020)

Variety Adaptation & Climate Change

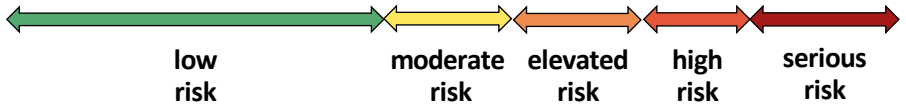
Are adapted varieties available?

Empirical histogram of maize GDDs on current harvested areas.
Daily data 1980-2010 vs. 2070-2100 (IPSL-CM6A-LR)

- Errors in crop-calendar (update in progress)
- Errors in harvested area dataset (Mirca)
- Scale-Issues (0.5°)



Risk assessment for unavailable adapted variety:



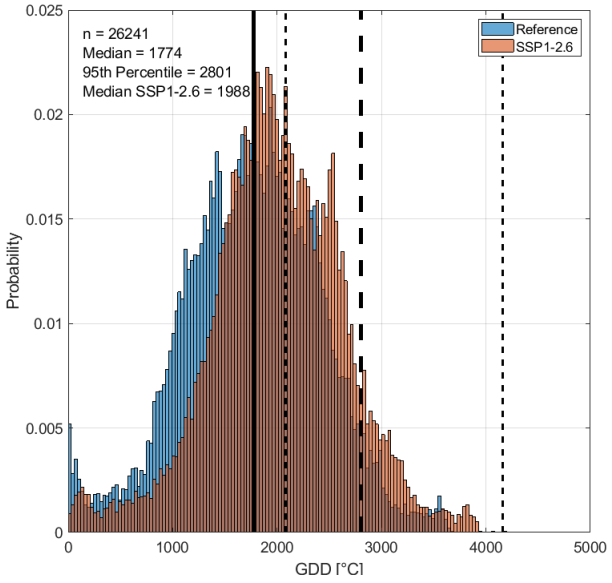
Source: Zabel et al. (2020)

Variety Adaptation & Climate Change

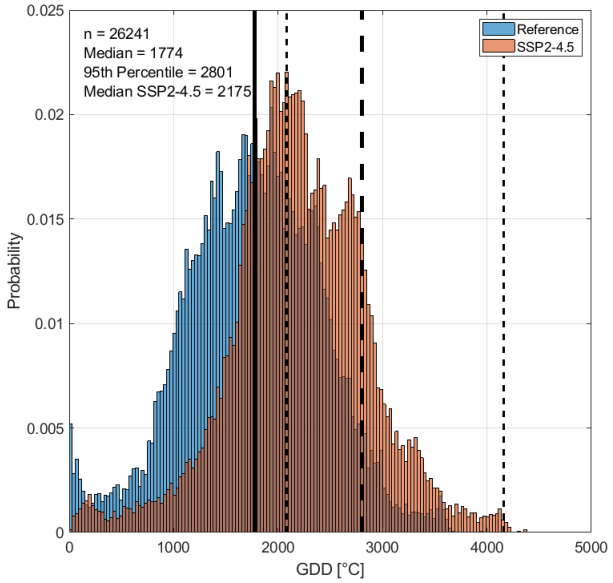
Are adapted varieties available?

Histogram of maize GDDs on harvested areas.
Daily data 1980-2010 vs. 2070-2100 (IPSL-CM6A-LR)

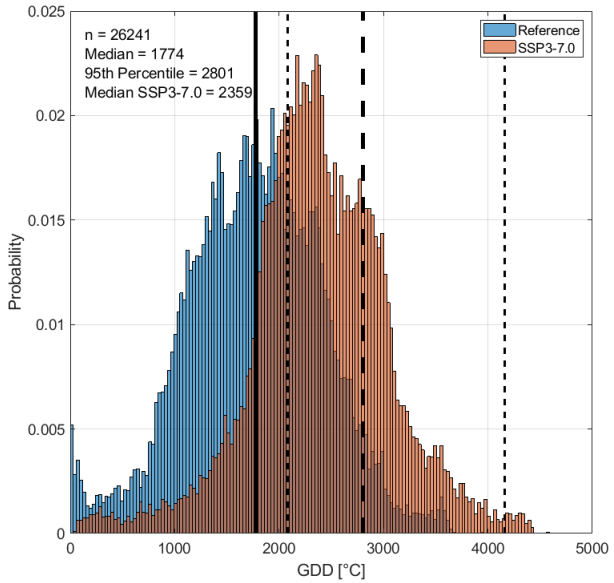
SSP1-2.6



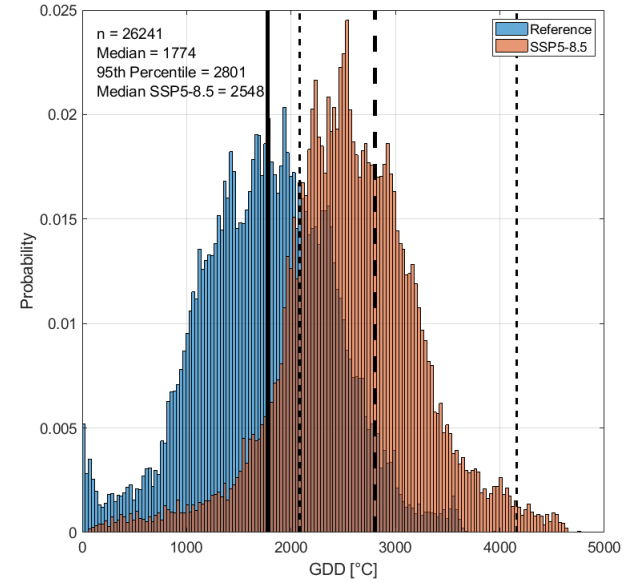
SSP2-4.56



SSP3-7.0



SSP5-8.5

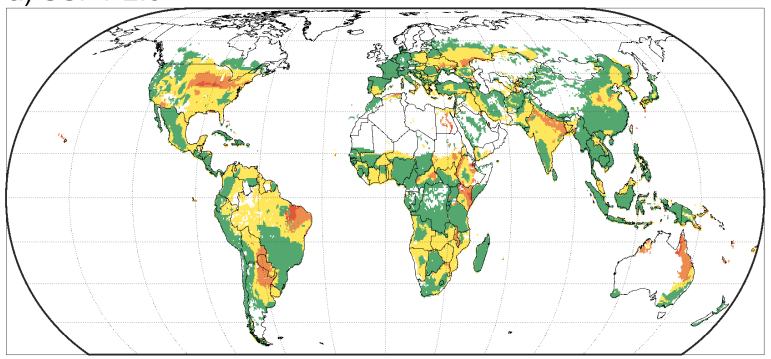


Source: Zabel et al. (2020)

Variety Adaptation & Climate Change

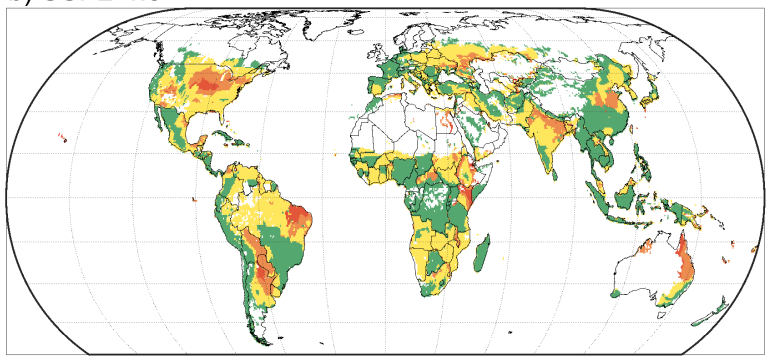
Risk assessment for available adapted varieties (2070-2100): Model median 7 GGMs x 5 GCM

a) SSP1-2.6



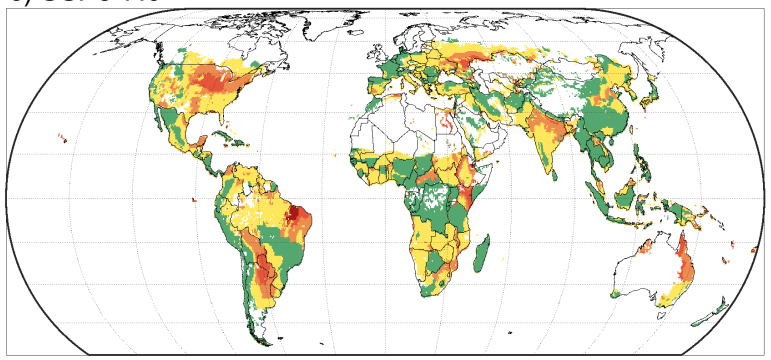
low risk	moderate risk	elevated risk	high risk	serious risk
42.0%	37.3%	17.3%	3.4%	0.0%

b) SSP2-4.5



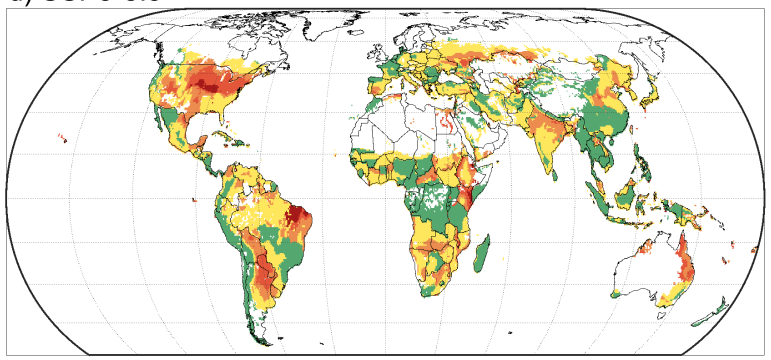
low risk	moderate risk	elevated risk	high risk	serious risk
34.5%	36.2%	22.7%	6.6%	0.0%

c) SSP3-7.0

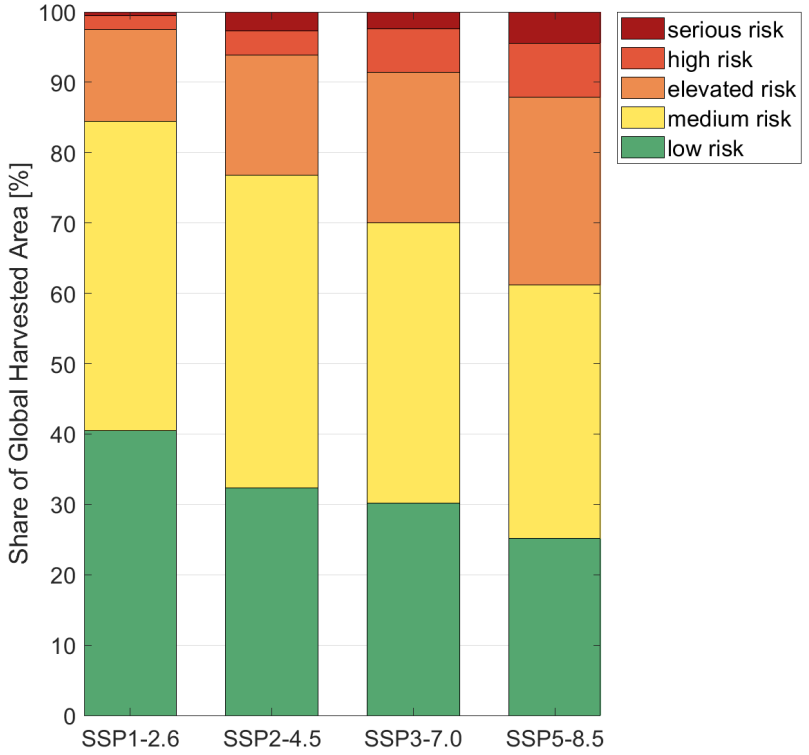


low risk	moderate risk	elevated risk	high risk	serious risk
29.9%	38.5%	16.8%	14.6%	0.3%

d) SSP5-8.5



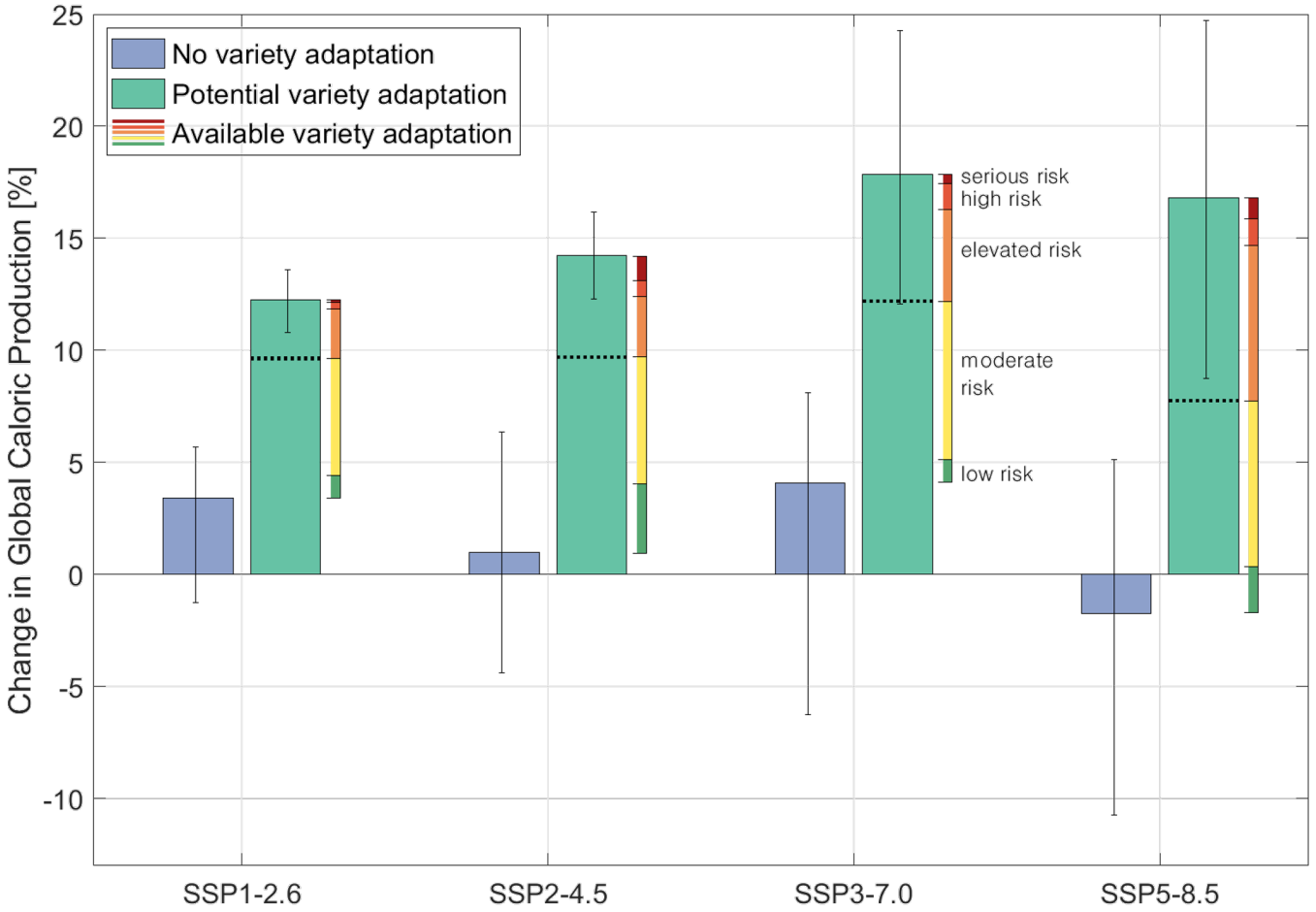
low risk	moderate risk	elevated risk	high risk	serious risk
23.7%	37.1%	18.5%	15.4%	5.3%



Source: Zabel et al. (2020)

Variety Adaptation & Climate Change

Average 2070-2100 change in global caloric production (maize, wheat, rice, soy) compared to baseline (1980-2010):
Model median 7 GGMs x 5 GCM



Source: Zabel et al. (2020)

Thank you for your attention!

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