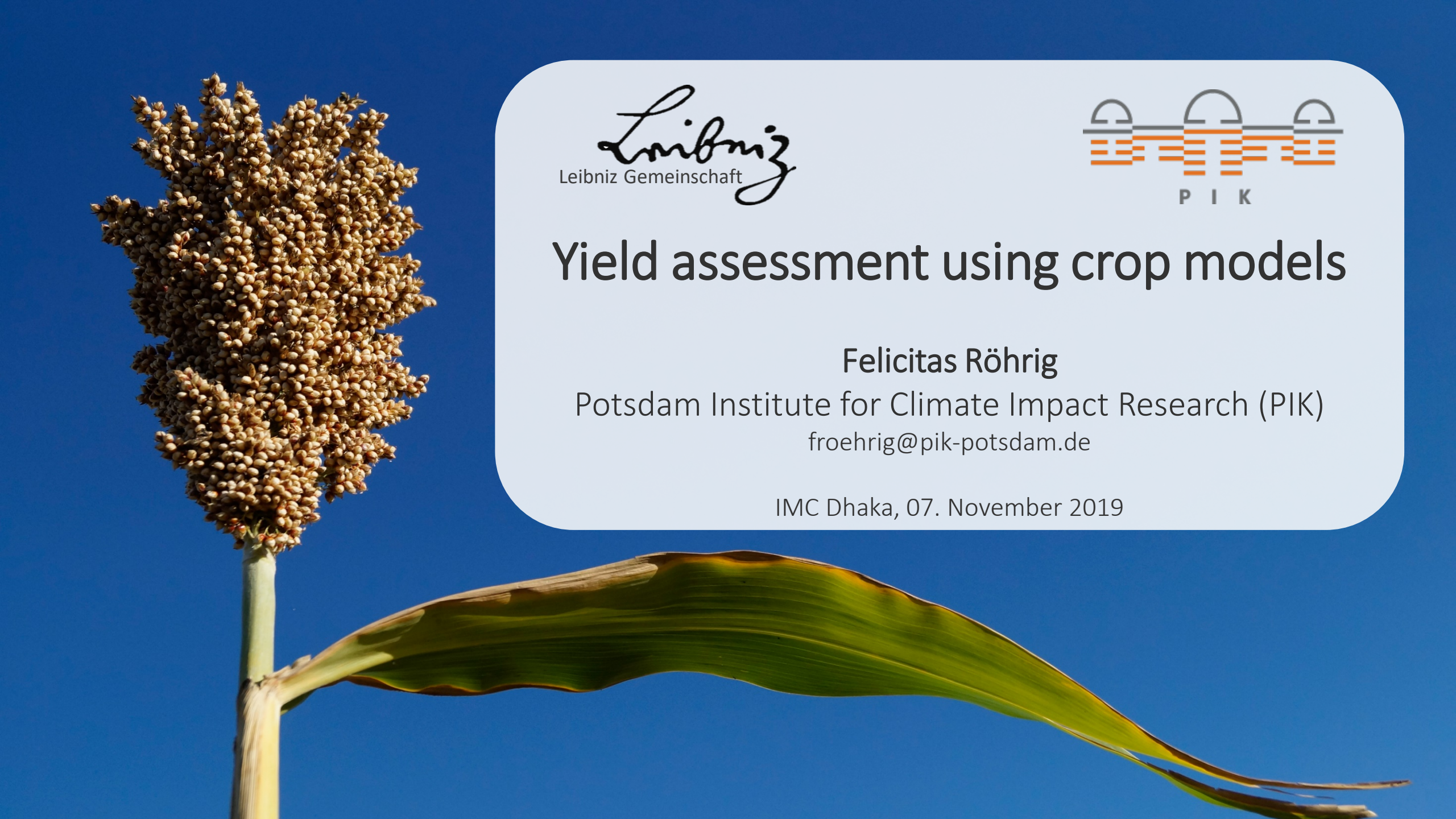

Yield assessment using crop models

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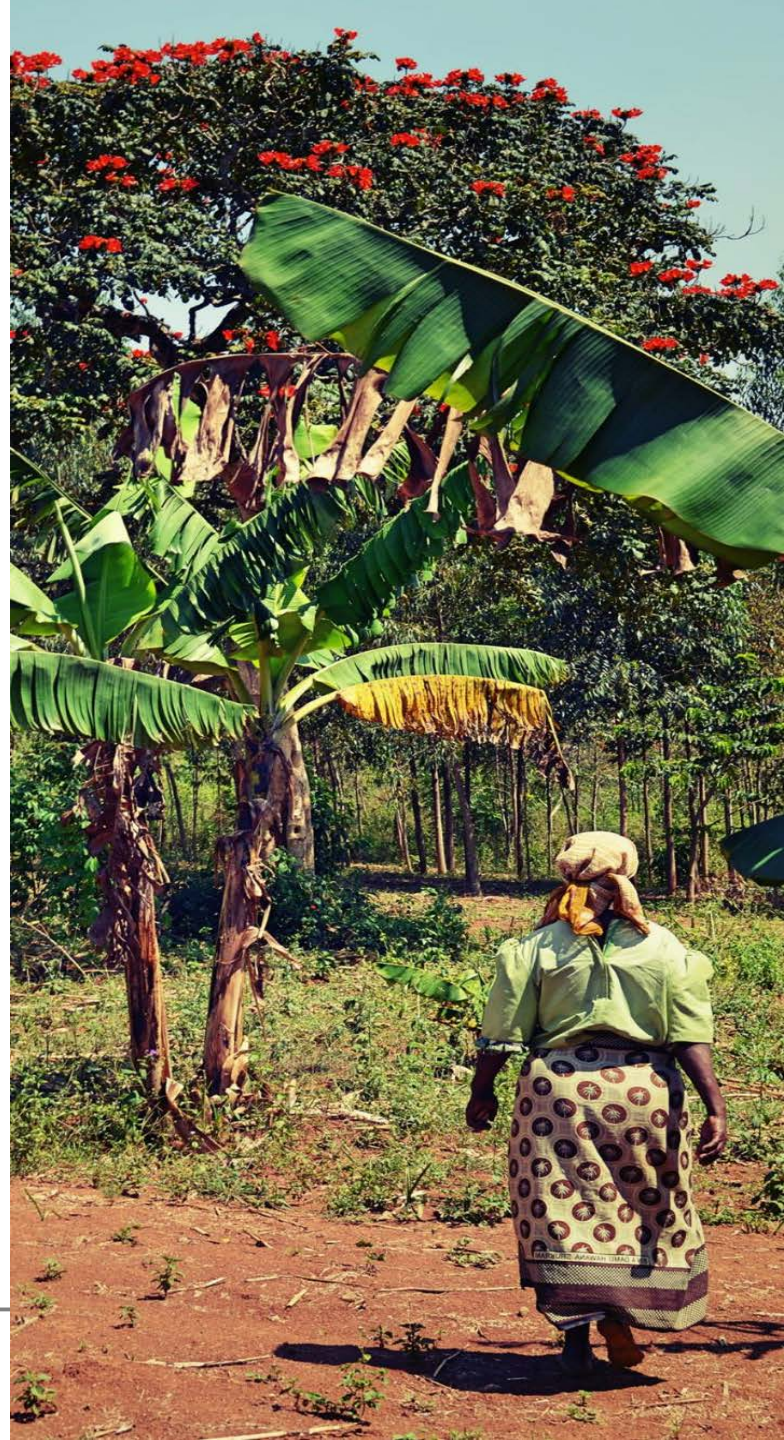
IMC Dhaka, 07. November 2019

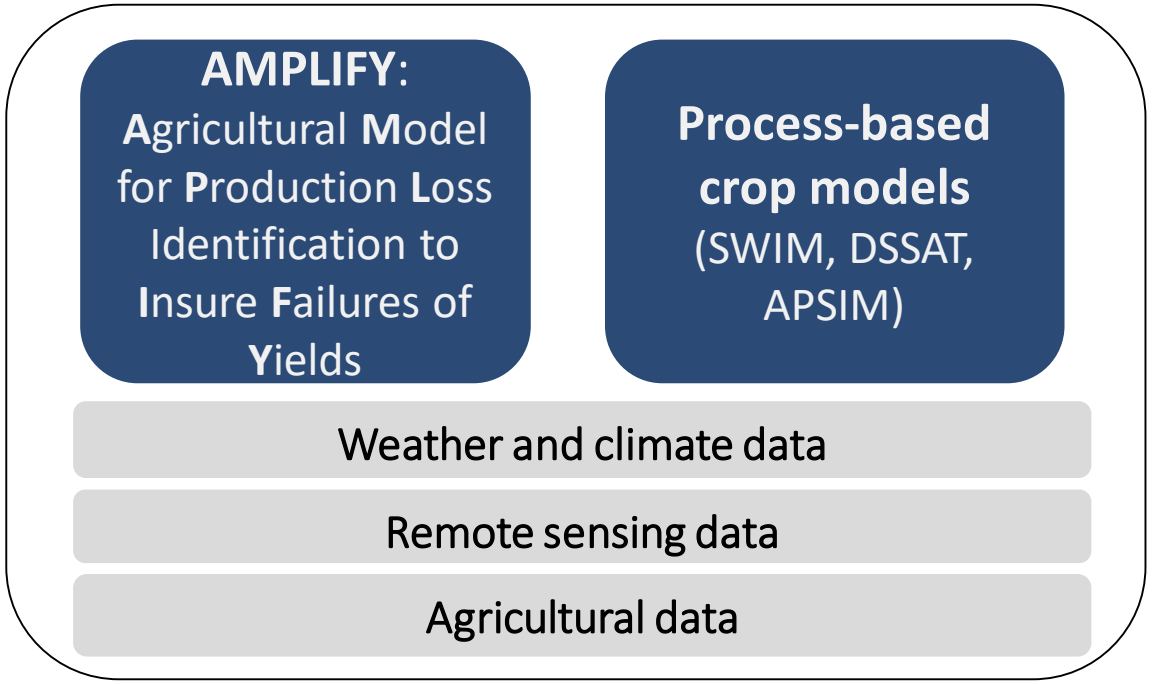
Outline

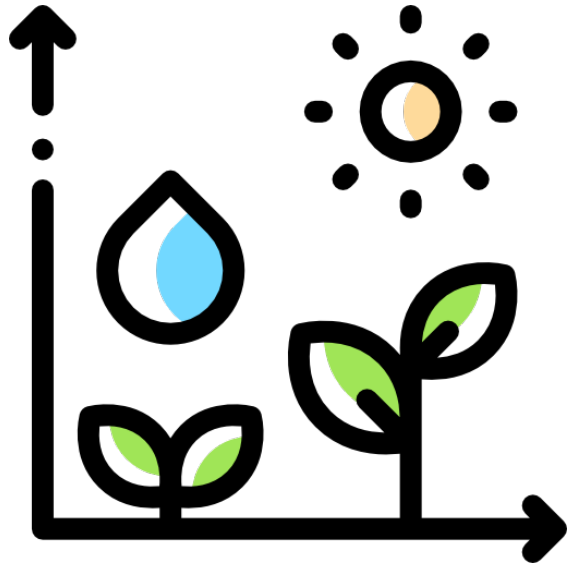
- Introduction: Yield loss assessment tool box
- Case study 1: India
- Caste study 2: Tanzania
- Summary and outlook



Yield loss assessment toolbox

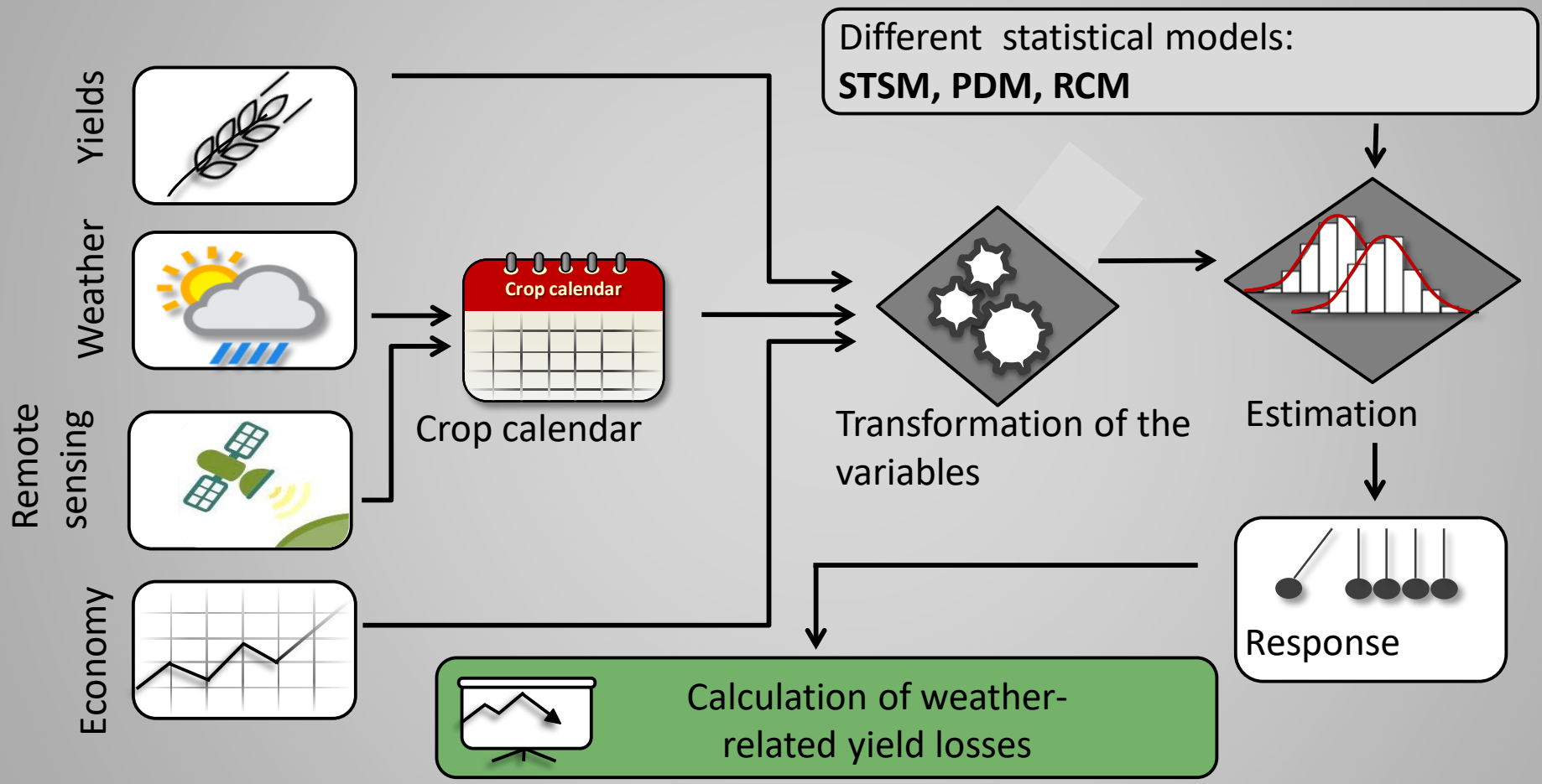
- ✓ Ensemble of **statistical and process-based** crop models
- ✓ **Integrate specific model strengths and different data types** for higher precision in loss assessment
- ✓ **Accurate yield estimation**, even prior to harvest
- ✓ Reliable detection of yield variation, **even under extreme events**





Statistical yield model

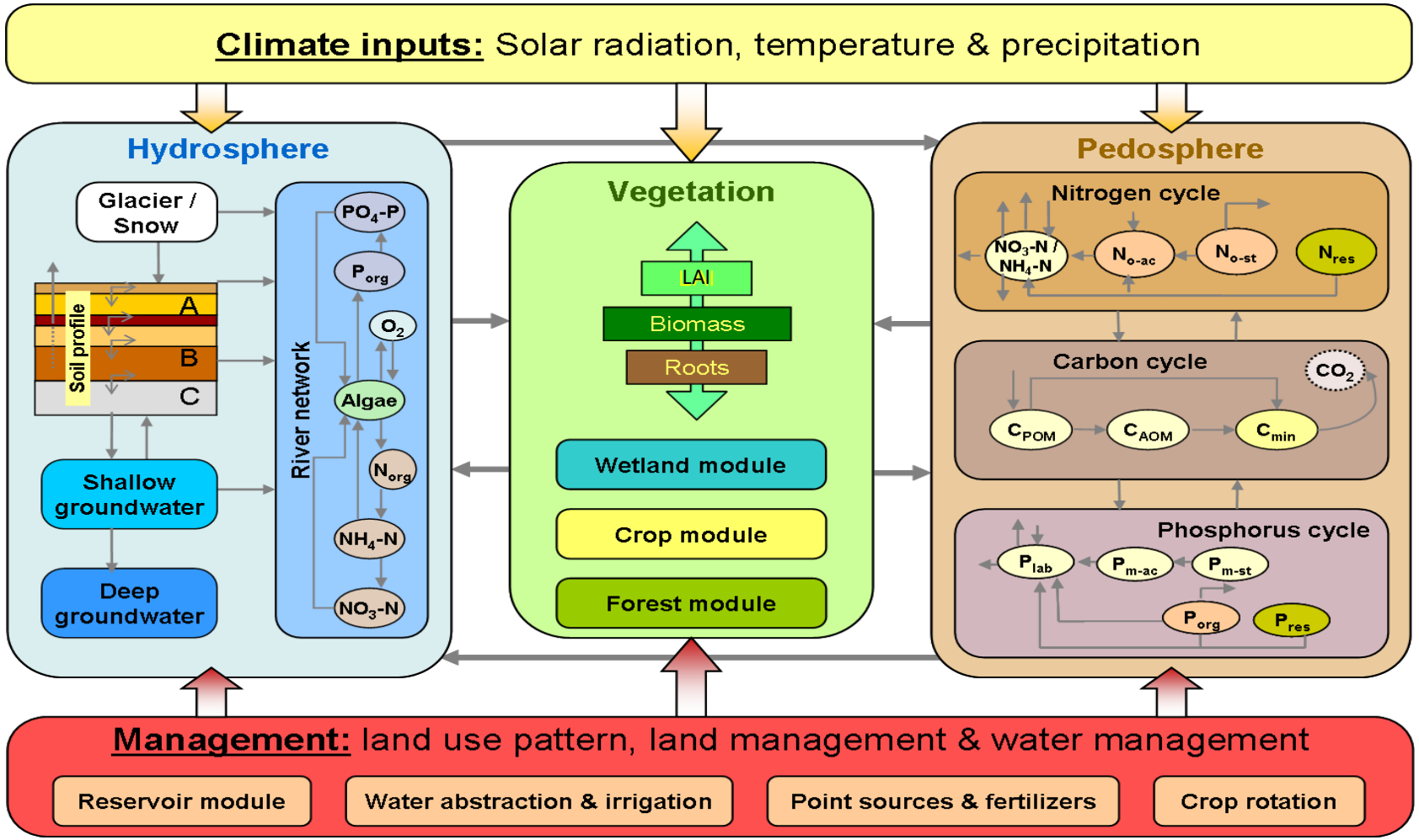
AMPLIFY – Agricultural Model for Production Loss Identification to Insure Failures of Yields



Gornott & Wechsung (2016), Agricultural and Forest Meteorology 217, 89 – 100.

Process-based eco-hydrological model

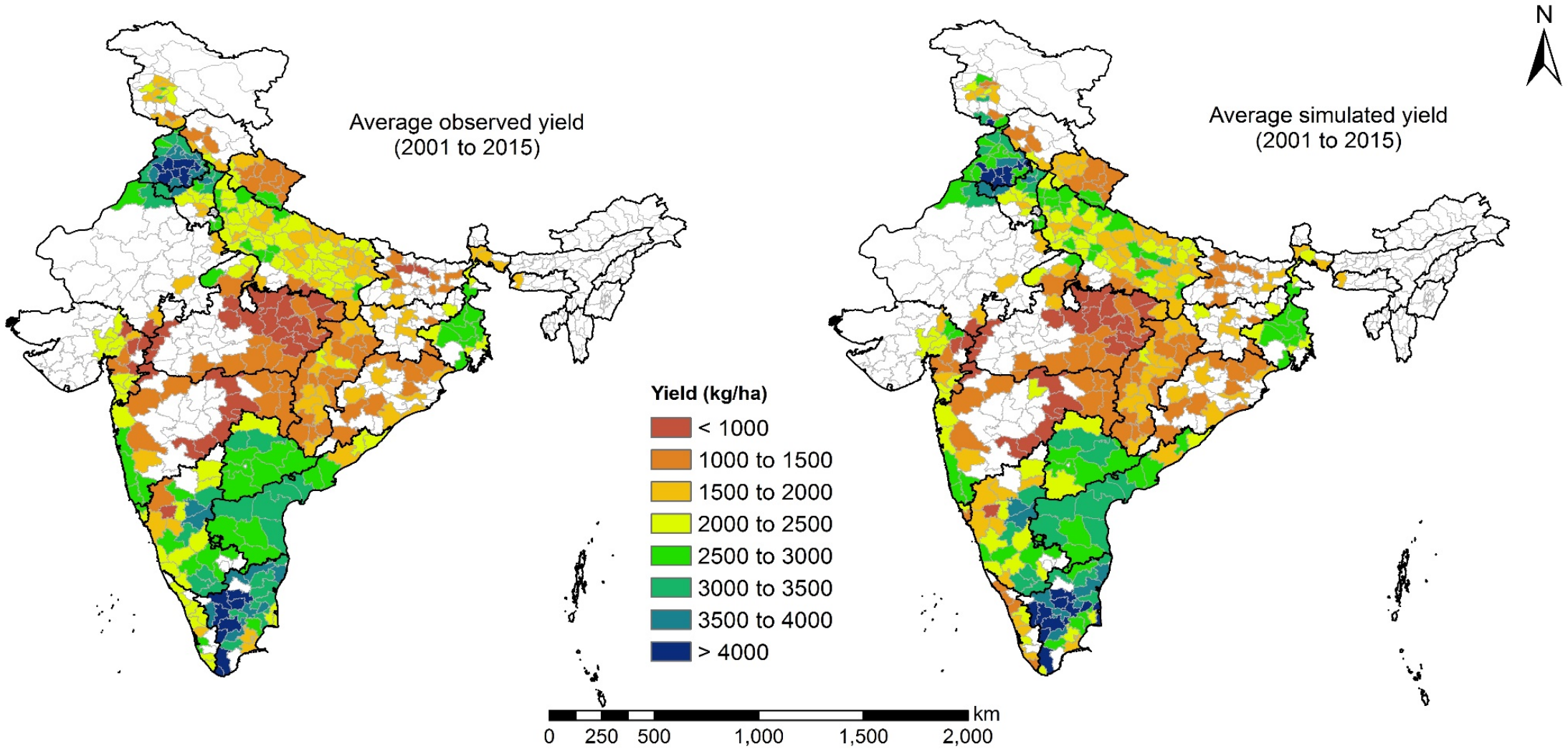
SWIM – Soil and Water Integrated Model



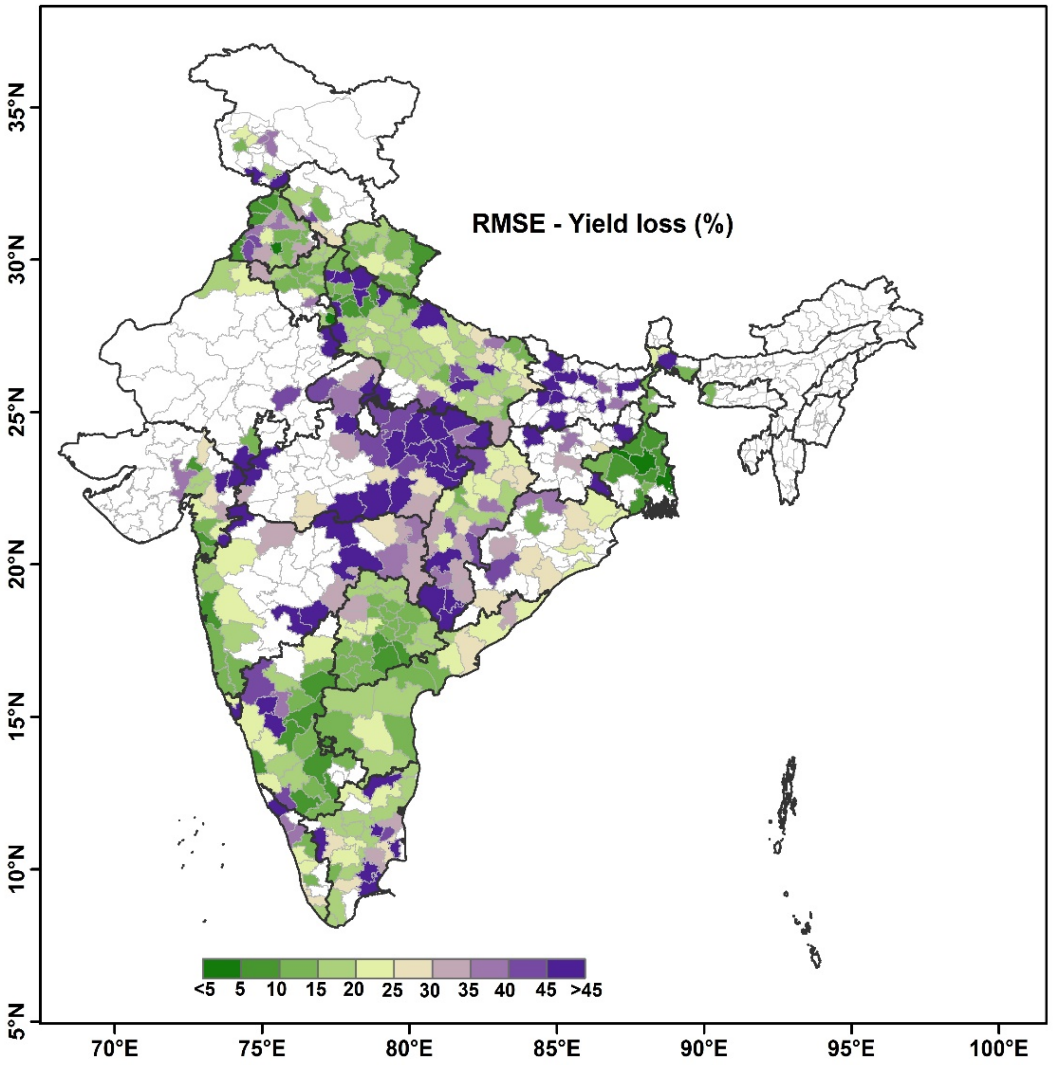
Case study 1: Rice in India

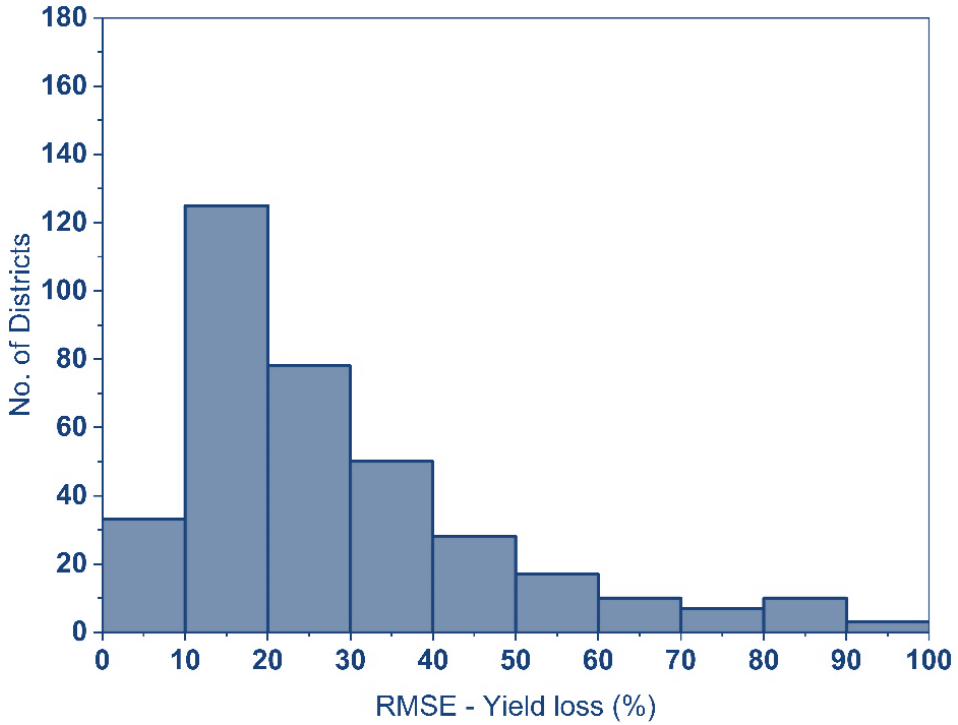
Photo: https://flic.kr/p/5reAkz

Model performance: spatial coverage of rice yields



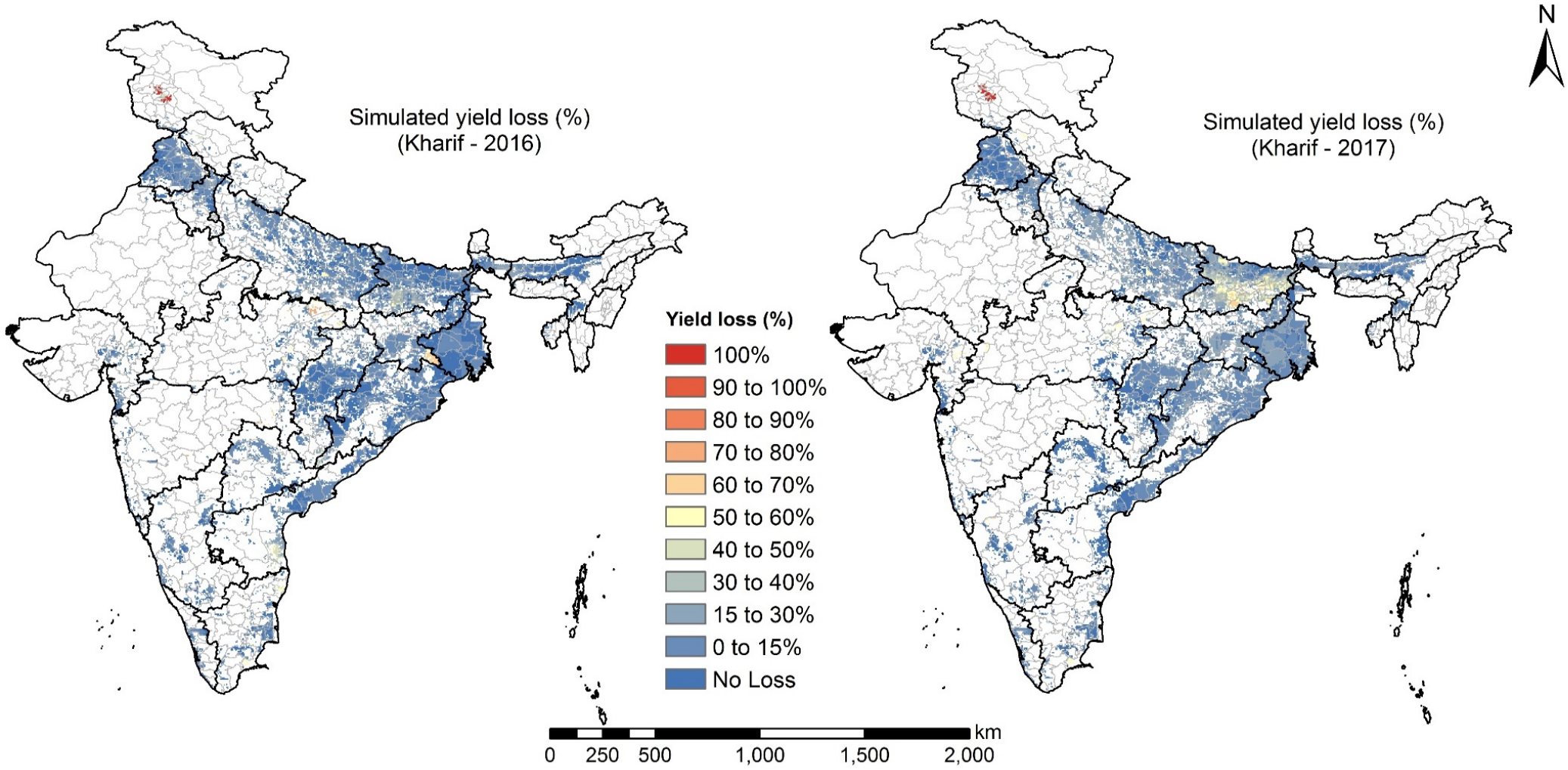
Model performance: spatial and temporal coverage





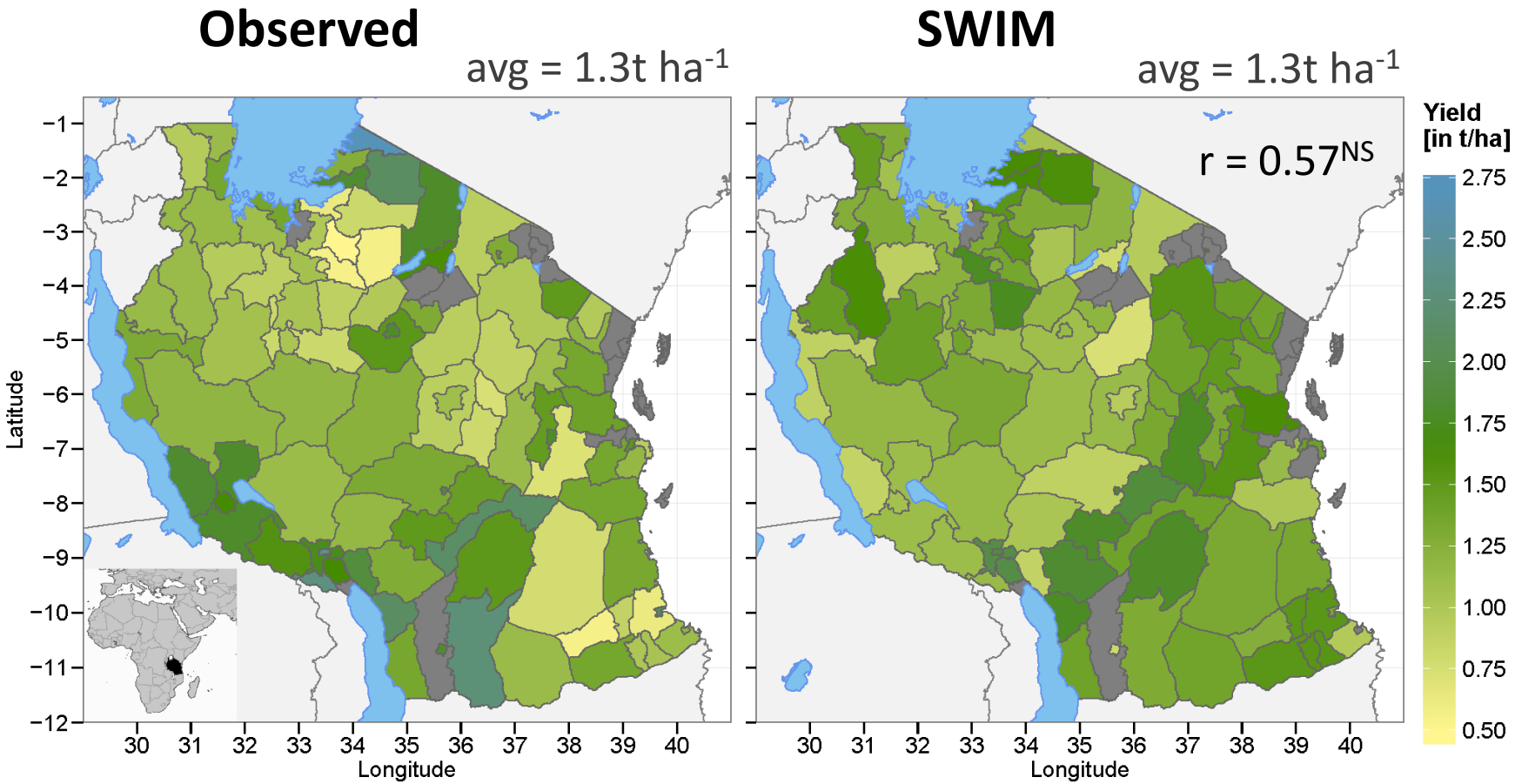
Around 60% (68%) of the districts obtained a rRMSE of less than 20% (25%) after calibration

Model results: Simulated yield loss in 2016 and 2017



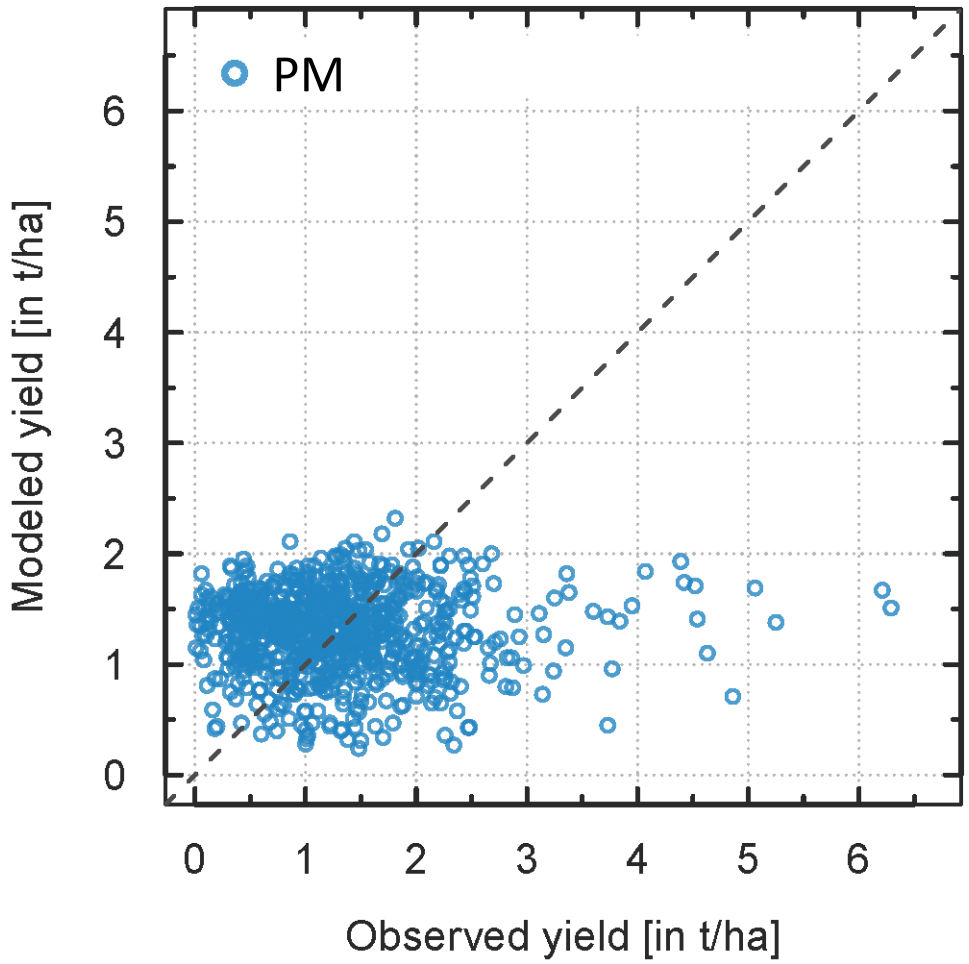
Case study 2: Maize in Tanzania

Spatial coverage of maize yields by SWIM



Time period 2003-2010

Explained spatial and temporal yield variability



$r = 0.05^{NS}$

Combined model approach to improve model performance

SWIM

(Soil and Water Integrated Model, process based)

✚

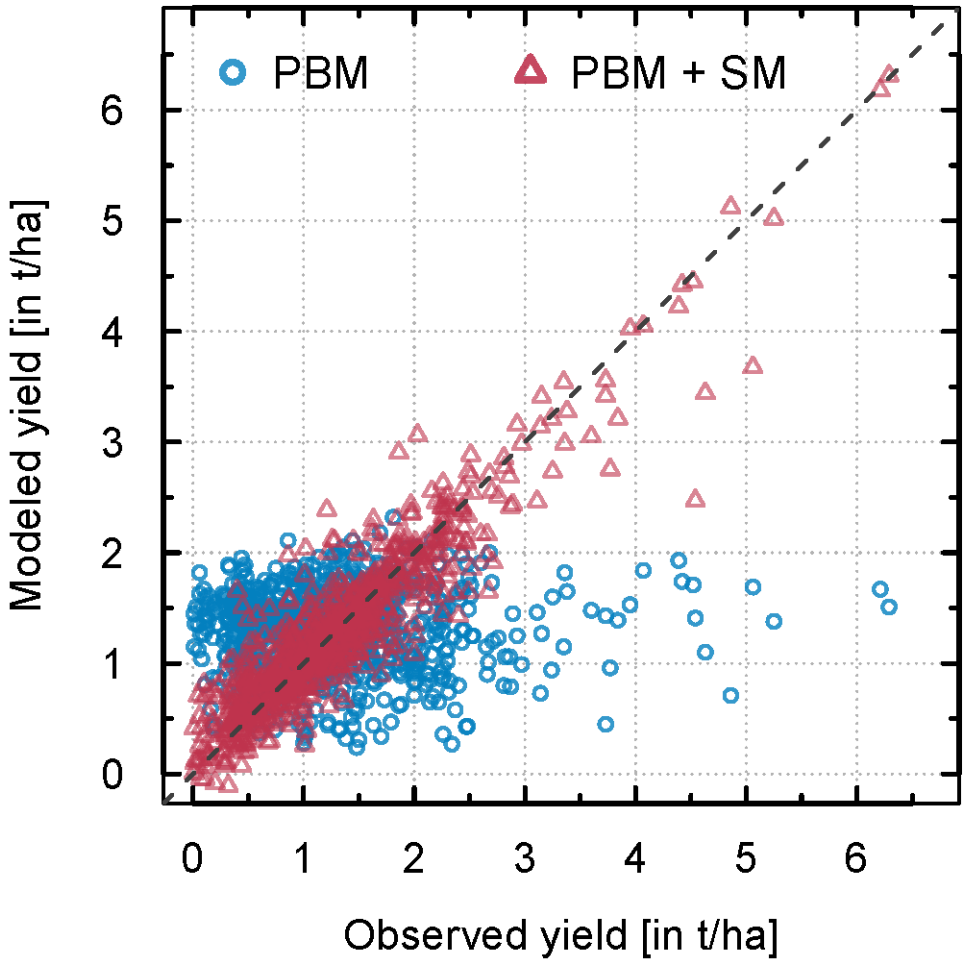
AMPLIFY

(Agricultural Model for Production Loss Identification to Insure Failures of Yields; semi-empirical, statistical model)

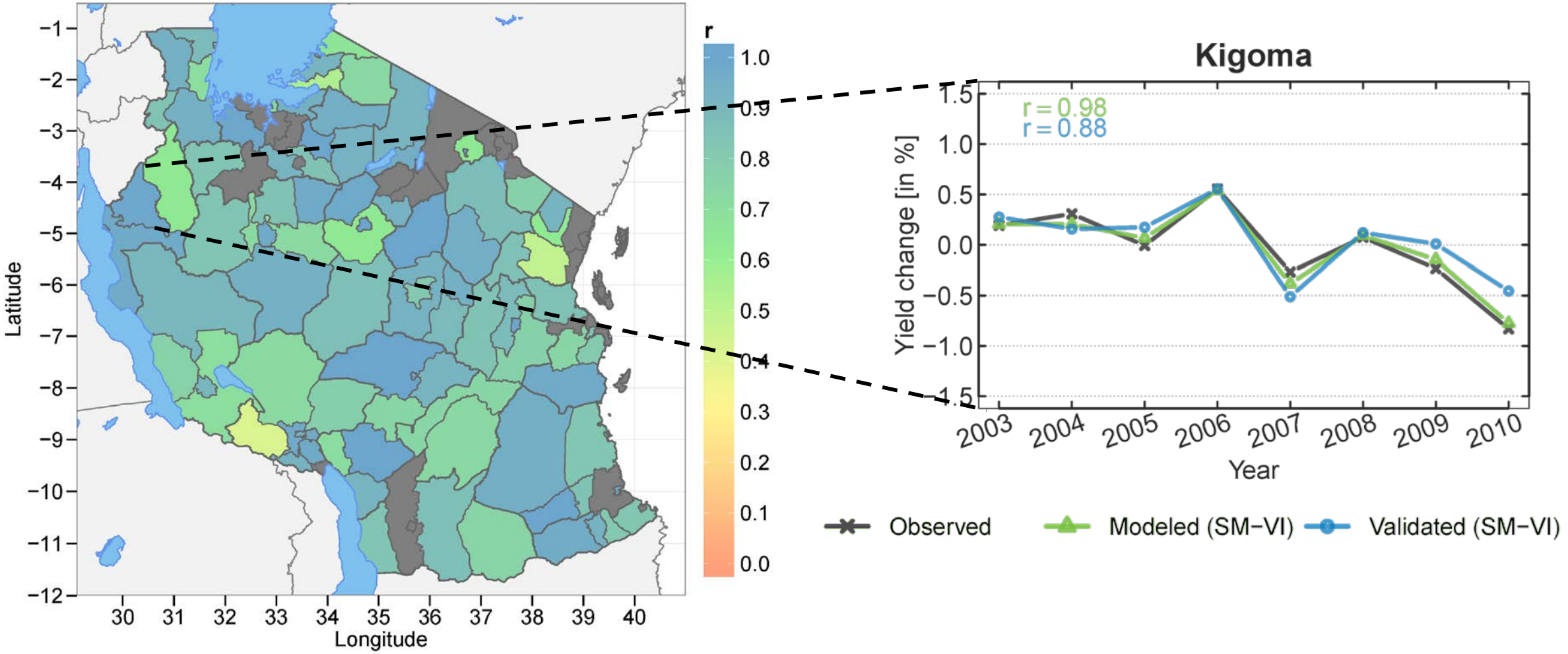
⇨ Combination improves yield assessment accuracy, models complement each other

⇨ Promising calibration and validation results for Tanzania

⇨ Extreme yield losses are captured by our crop model

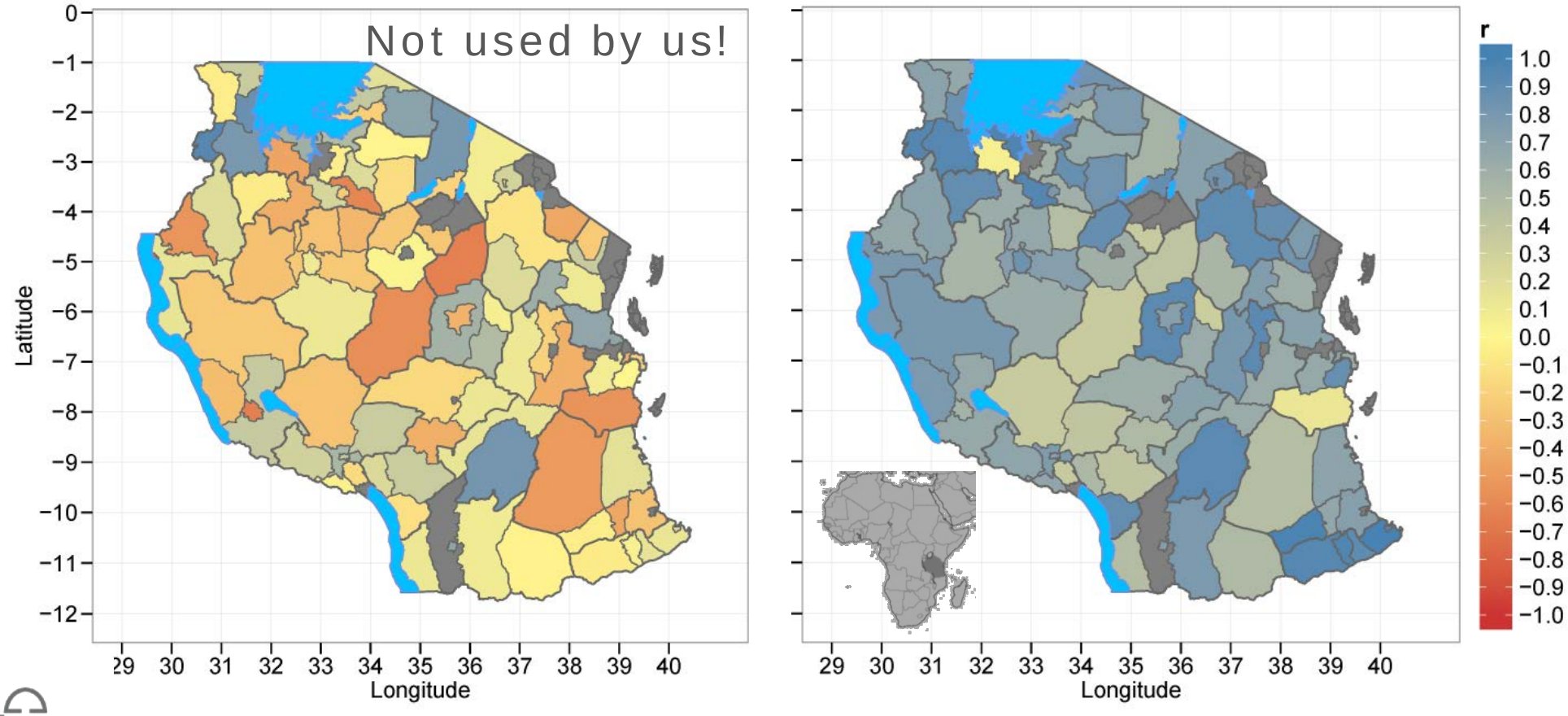


Correlation (r) of observed and modeled yields



Comparison between a precipitation index and combined model approach

Pearson's r of observed maize yields and combined model approach (right) or a precipitation index (left)

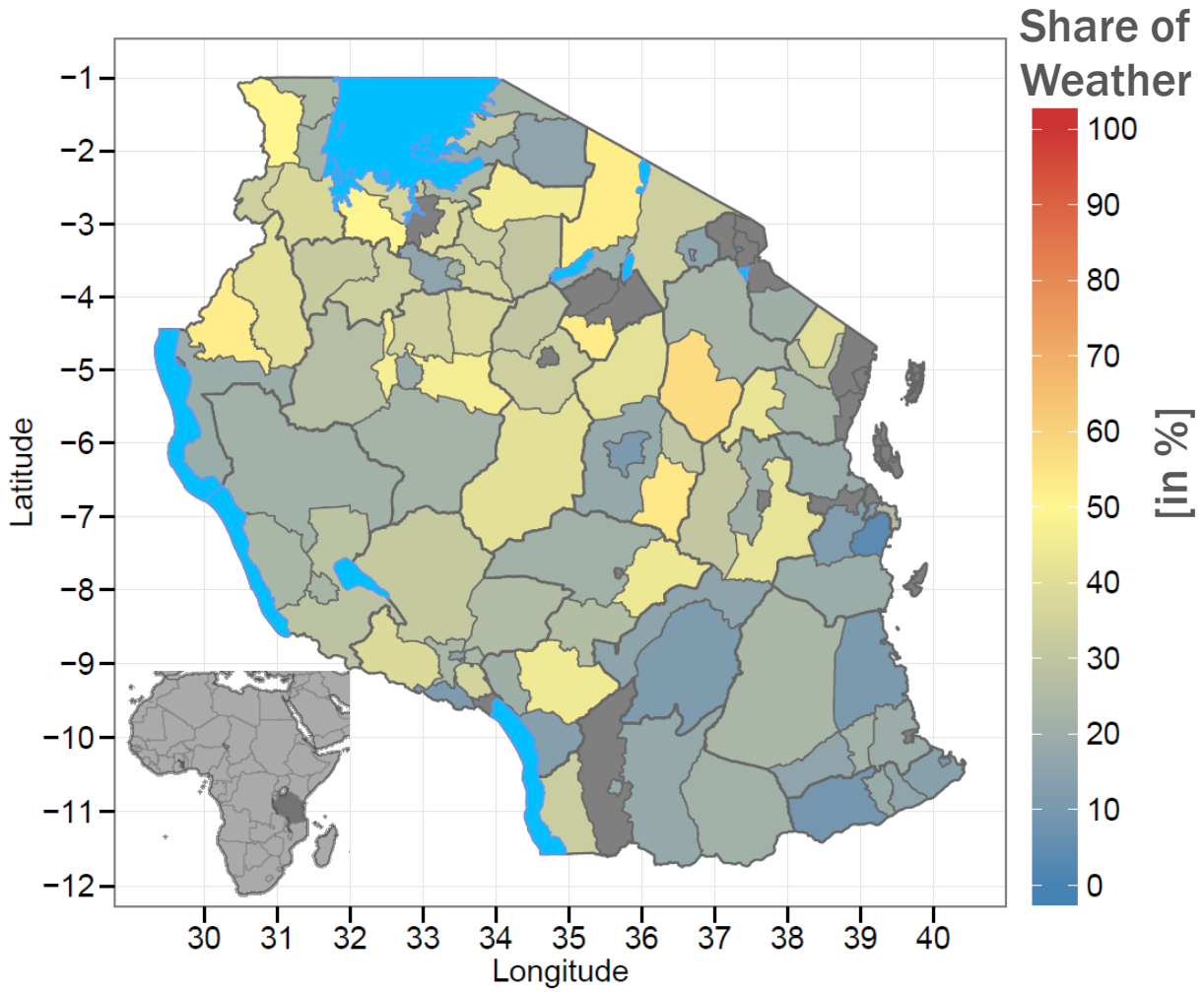


Share of Weather-Related Yield Losses

Ability to separate weather-related and non-weather related factors influencing yield loss

In Tanzania, only 27% of the yield variability is attributable to weather.

The range is 4 – 57%.



Summary

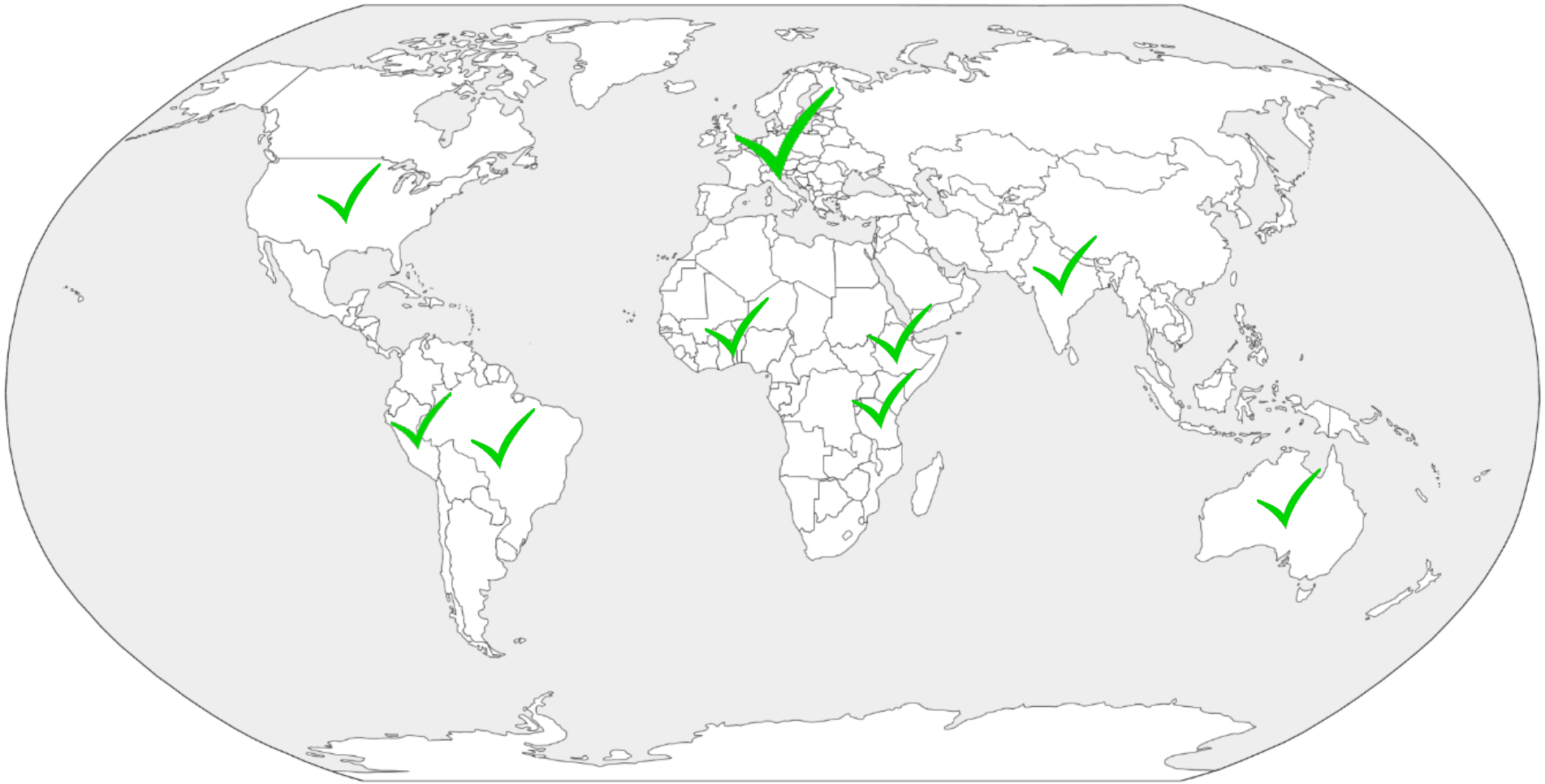
✓Our crop models are able to capture yield loss at time of harvest and at fine resolution over large geographic area

✓Reliable detection of yield variation, even under extreme events

✓Integration of process-based and statistical models allows accurate yield loss assessment even in context of data scarcity

✓Ability to separate weather- and management factors driving yield loss

Outlook: Global track record



In these regions, we have already successfully applied single and joint models for yield estimation and/or forecast.

PIK


Thank you!
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