



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



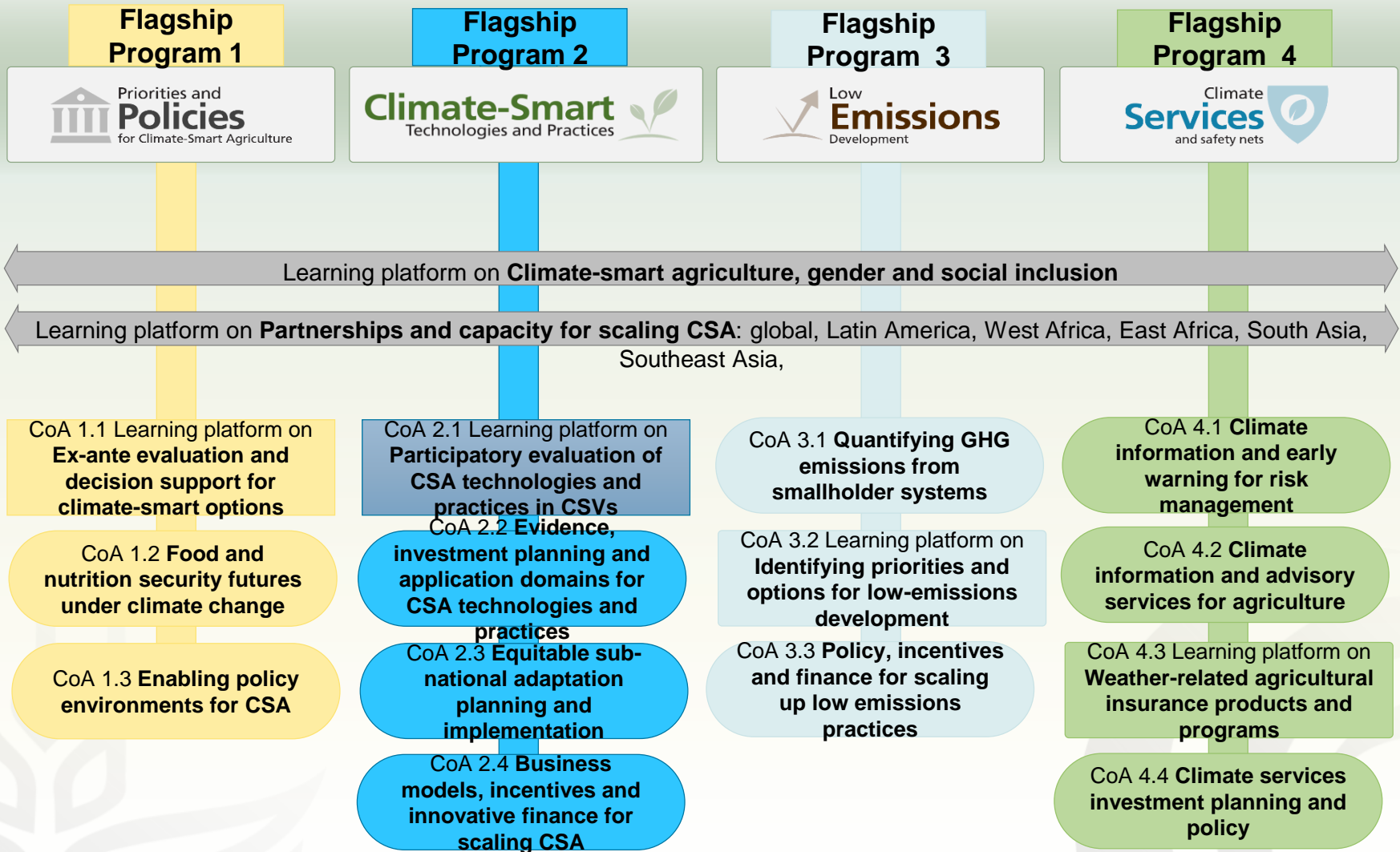
How can models inform policies and programs in South Asia? CCAFS's works

Arun Khatri-Chhetri, Paresh Shirsath and Pramod Aggarwal

**CGIAR Research Program on Climate Change, Agriculture and Food Security
South Asia Regional Program**

Borlaug Institute for South Asia-CIMMYT

CCAFS core research on CSA



CCAFS Goal: Improve food security & smallholder livelihoods under climate change

From Research to R4D

Integration of Different Modeling Approaches

1. Climate Models (e.g. future scenarios)
2. Bio-physical Models (e.g. crop modelling)
3. Economic Optimization (e.g. GAMS, Spreadsheet based optimization)

Foresight Analysis

Models and Data

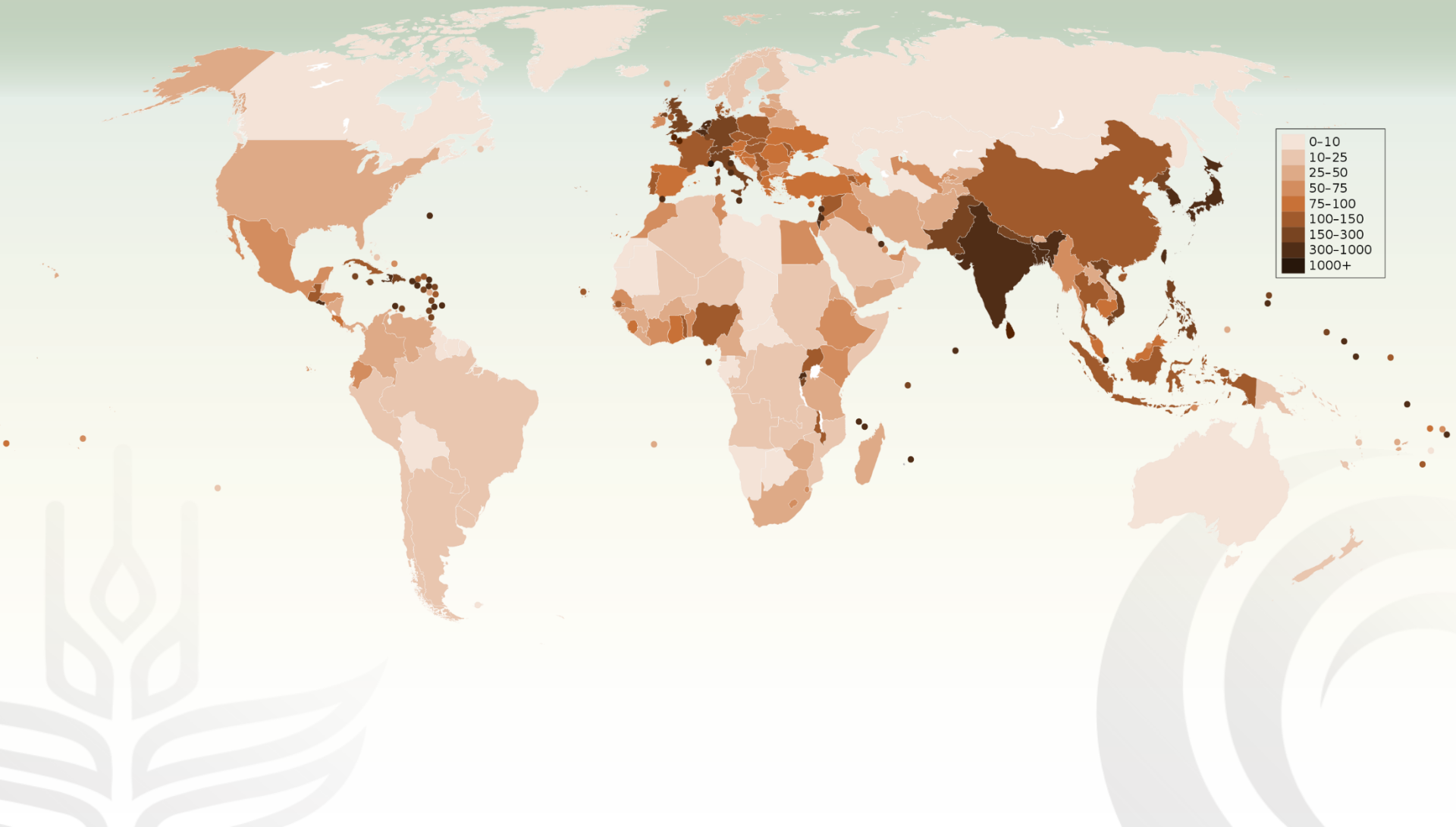
- Climate risk analogues
- Data on adaptation & mitigation techniques
- Climate scenarios
- Land use modeling
- Yield forecasting



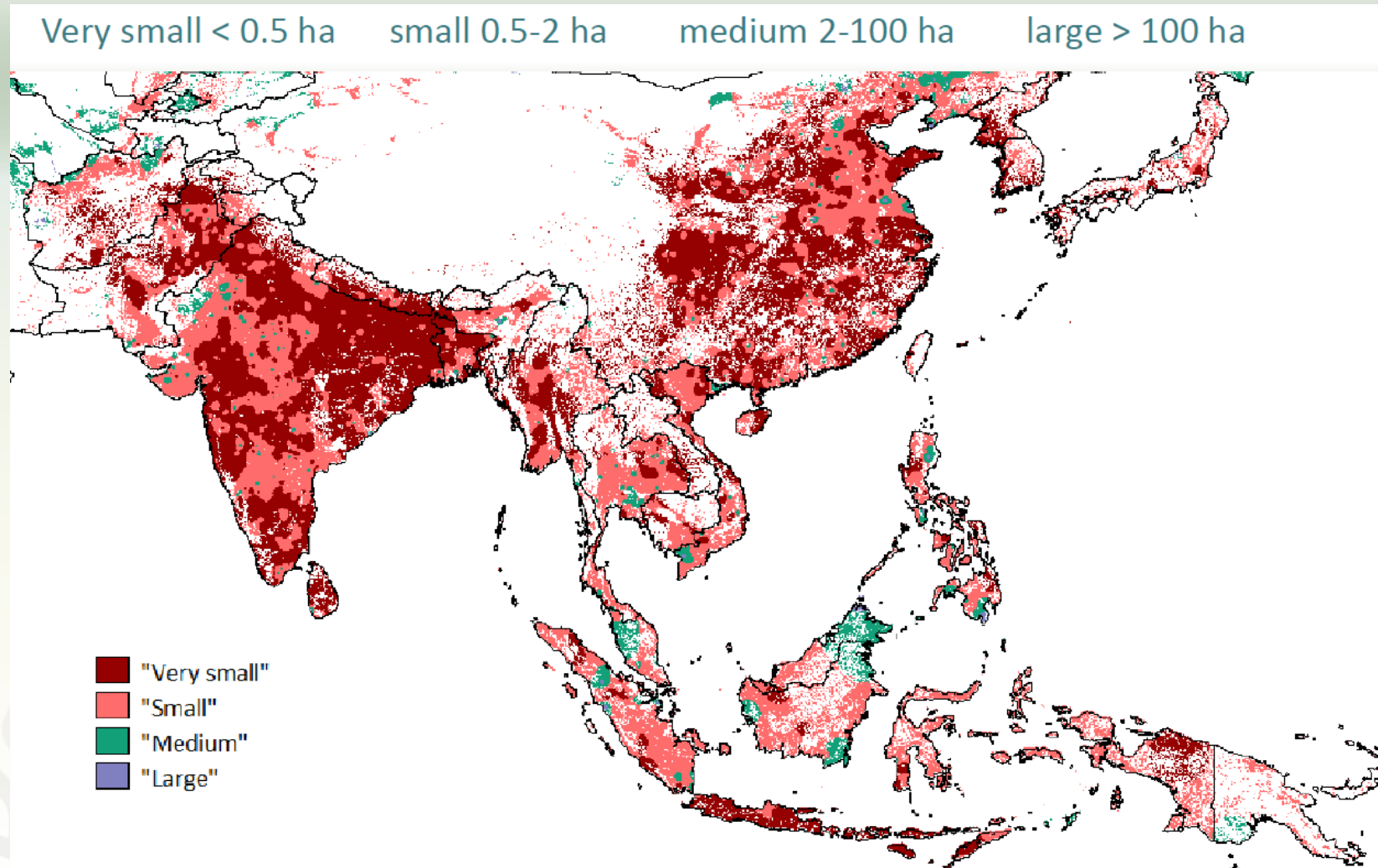
Policy Analysis & Communications

- Prioritized adaptation options and their costs
- Identification of low-carbon development pathways
- Assessments of regionally differentiated vulnerabilities and opportunities
- Climate smart agriculture learning platform

South Asia is population rich



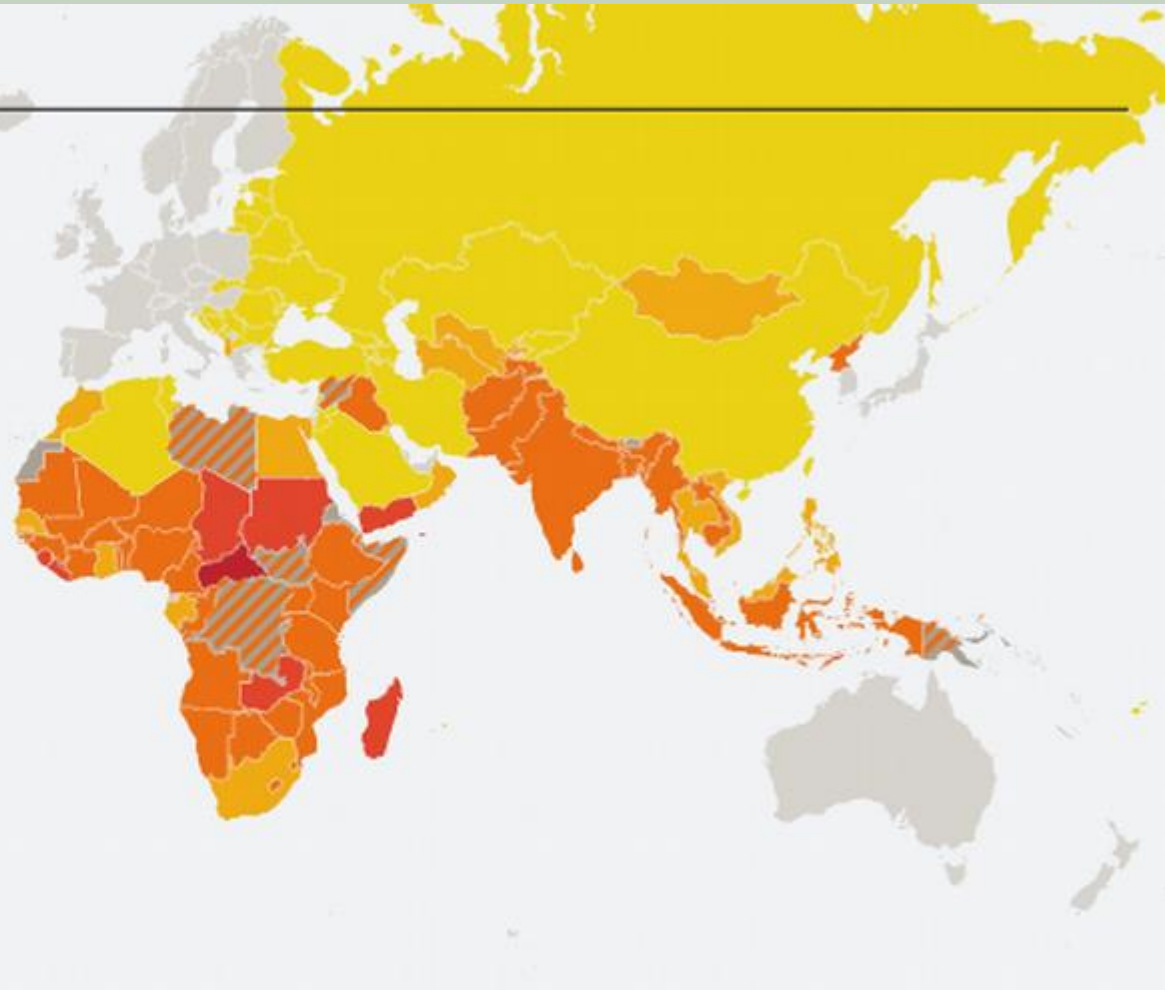
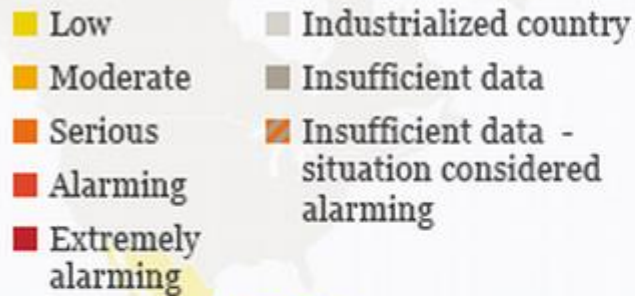
Landholdings are small in South Asia



Fritz et al. (2015), GCB

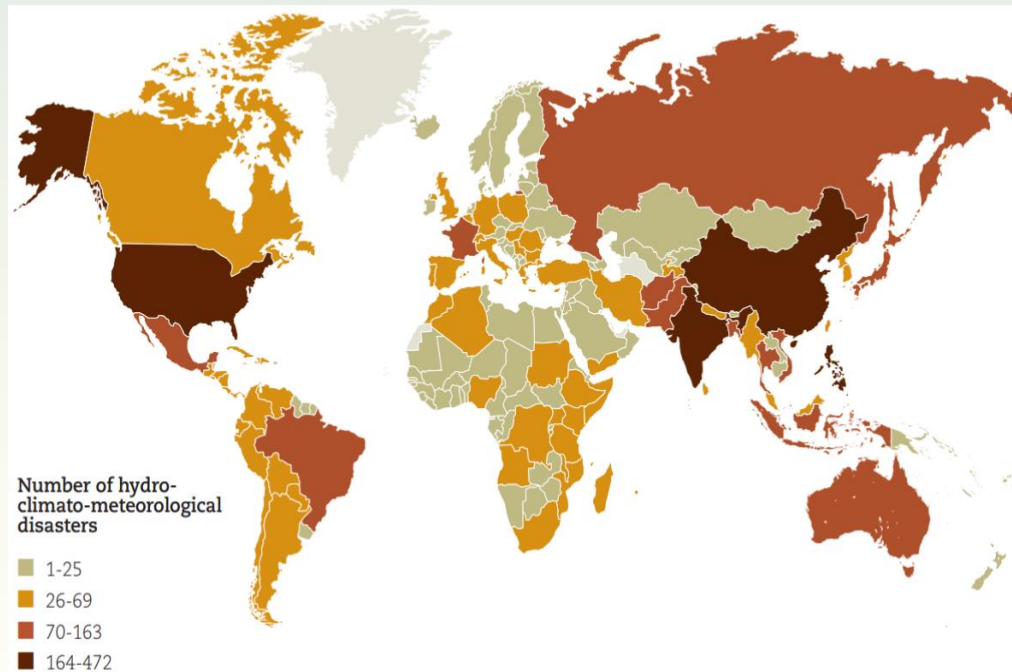
Despite progress hunger is still widespread

2017 Global Hunger Index

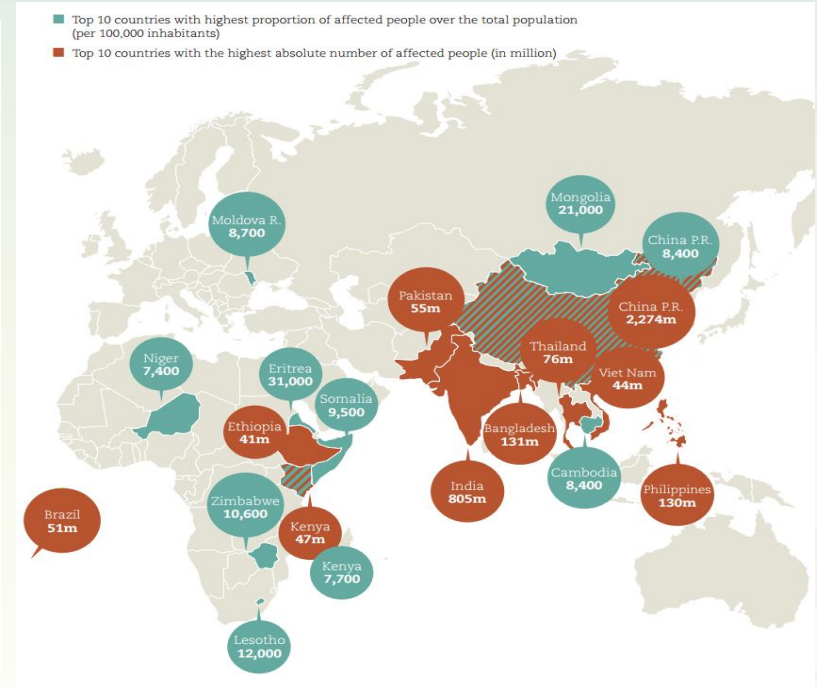


Weather-related disasters reported per country (1905-2015)

Number of disasters



Top Countries Affected



Source: The human cost of weather-related disasters:1995-2015. CRED and UNISDR, 2016

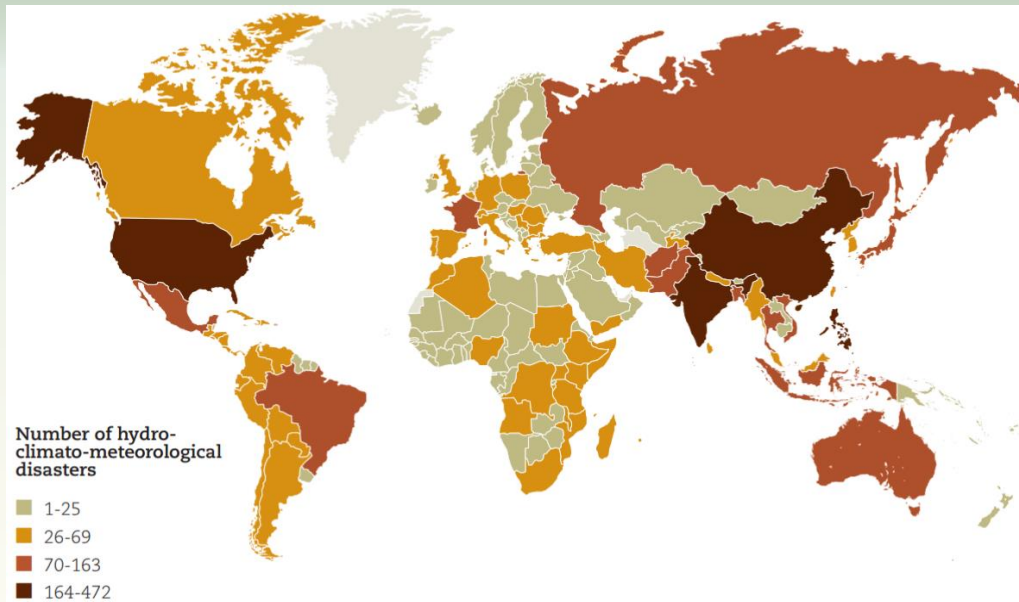
Climatic risks are increasing with time



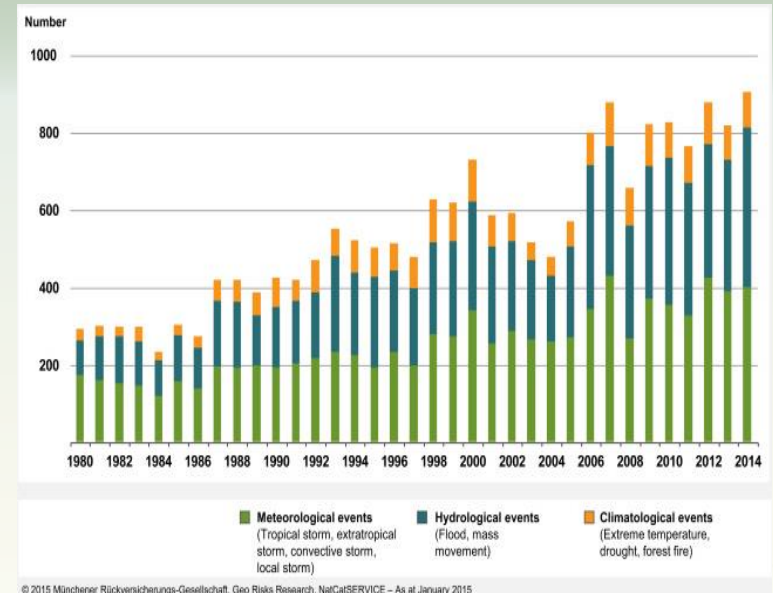
RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



Number of weather-related disasters (1905-2015)



Climatic risks are increasing with time



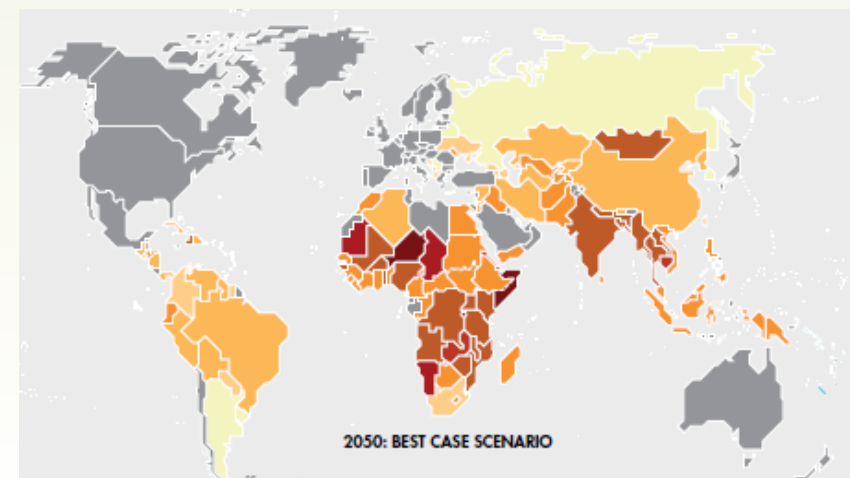
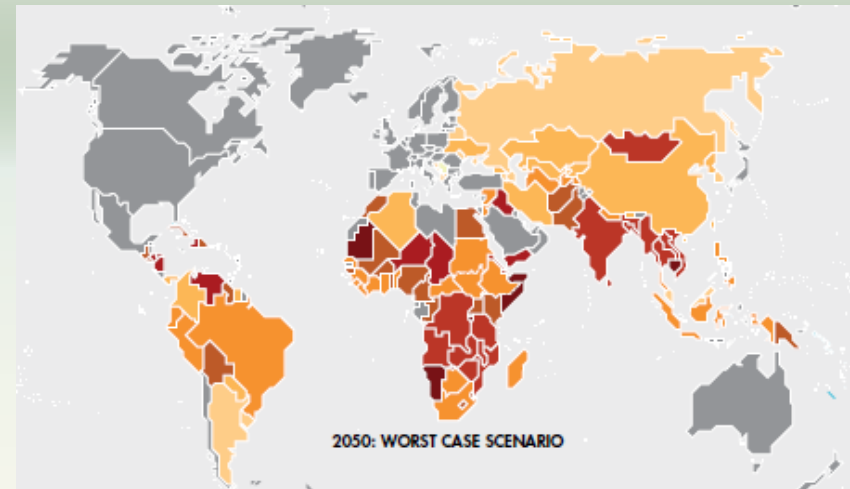
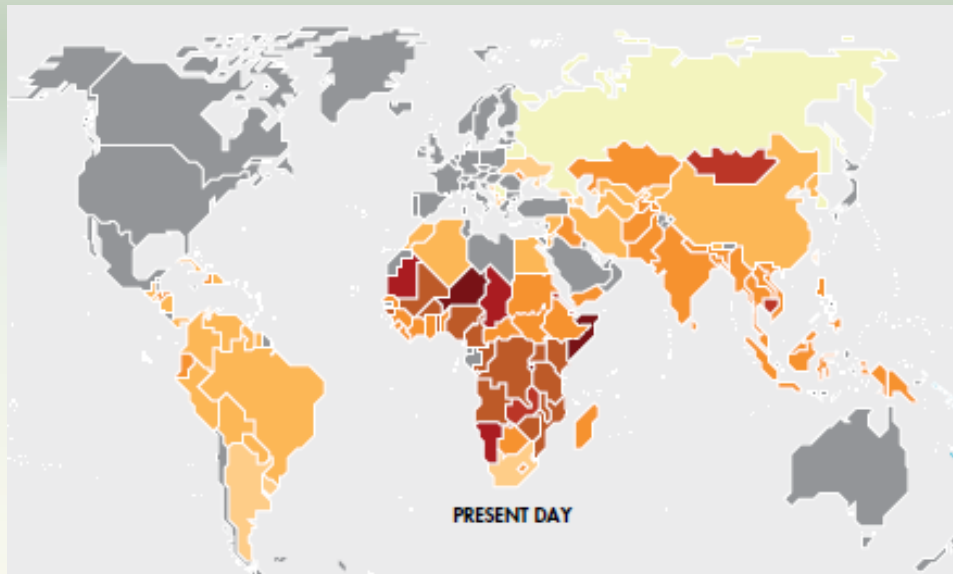
© 2015 Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE – As at January 2015

Source: The human cost of weather-related disasters:1995-2015. CRED and UNISDR, 2016

Food security and climate change; Present case, worst case and best case scenario



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



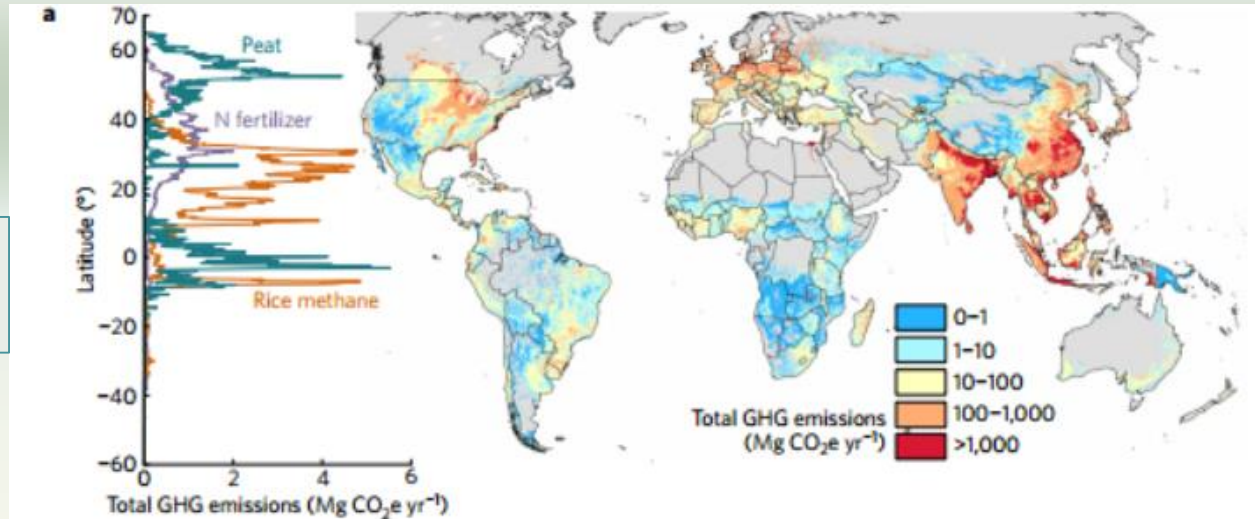
Vulnerability to food insecurity

Low  High

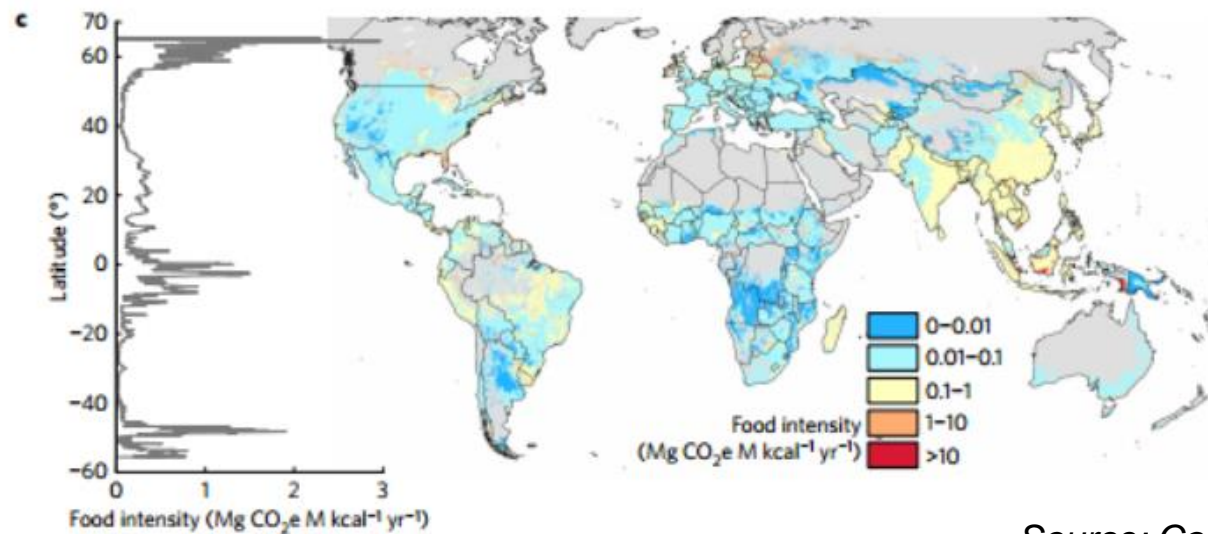
SOURCE: Met Office Hadley Centre and WFP, 2015.

Need for Climate-smart agriculture: Asia a hotspot

GHG emissions
from agriculture



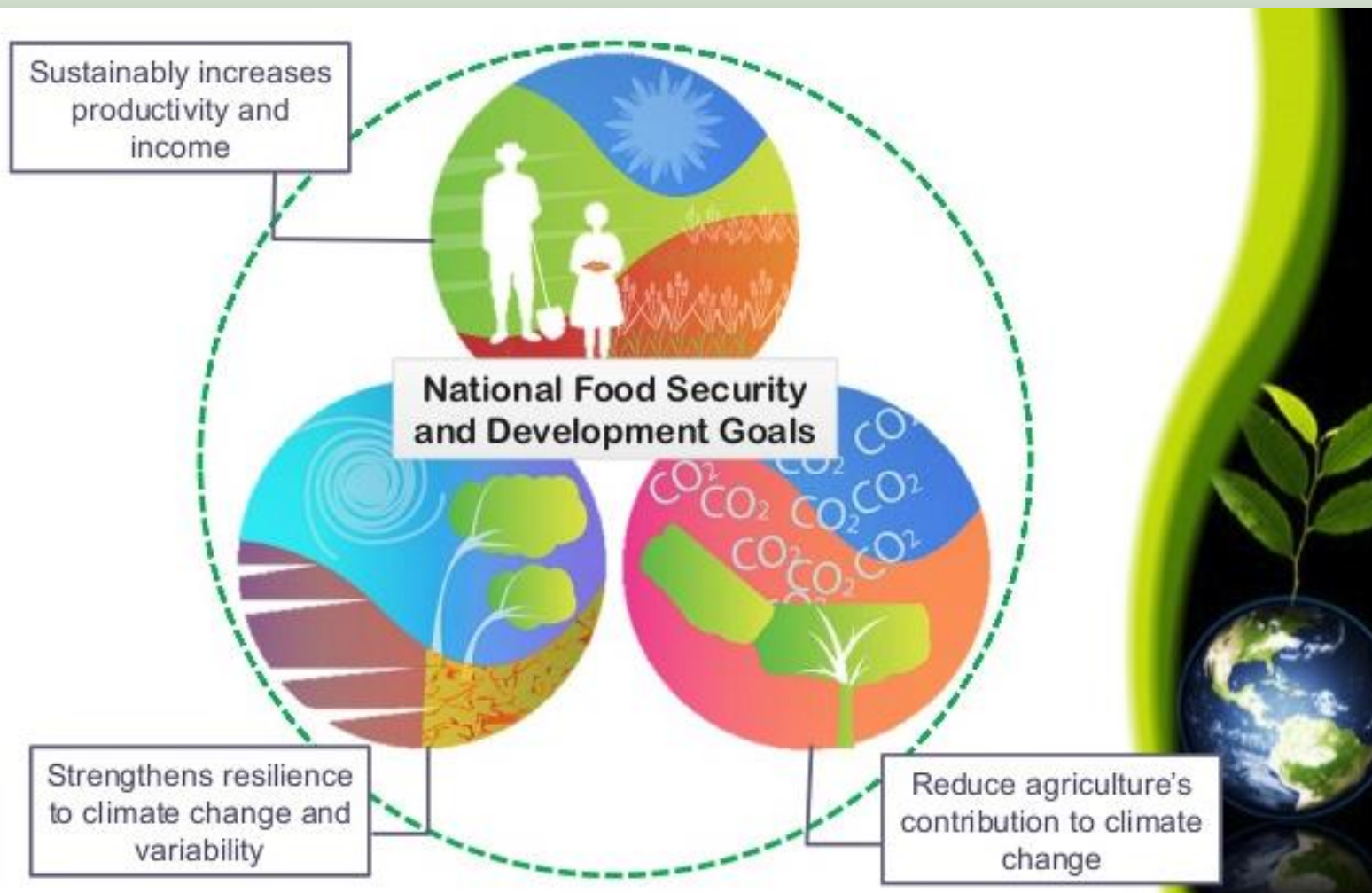
Food intensity



What is Climate-Smart Agriculture ?

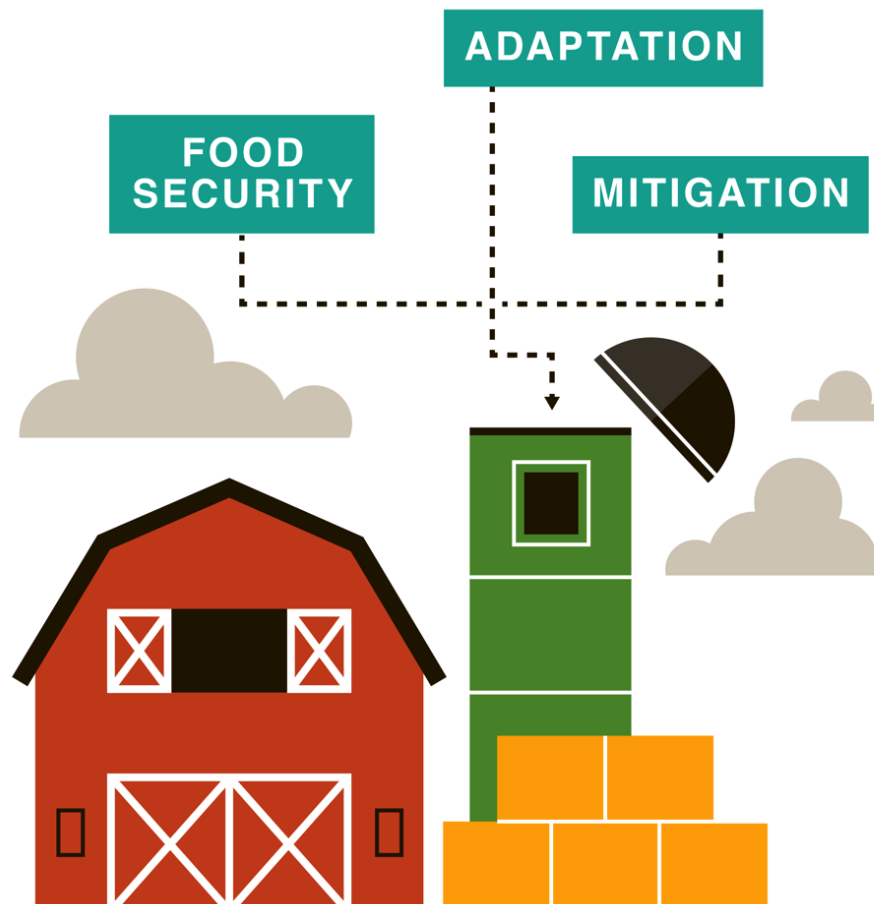


RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



The Three Pillars of Climate-Smart Agriculture

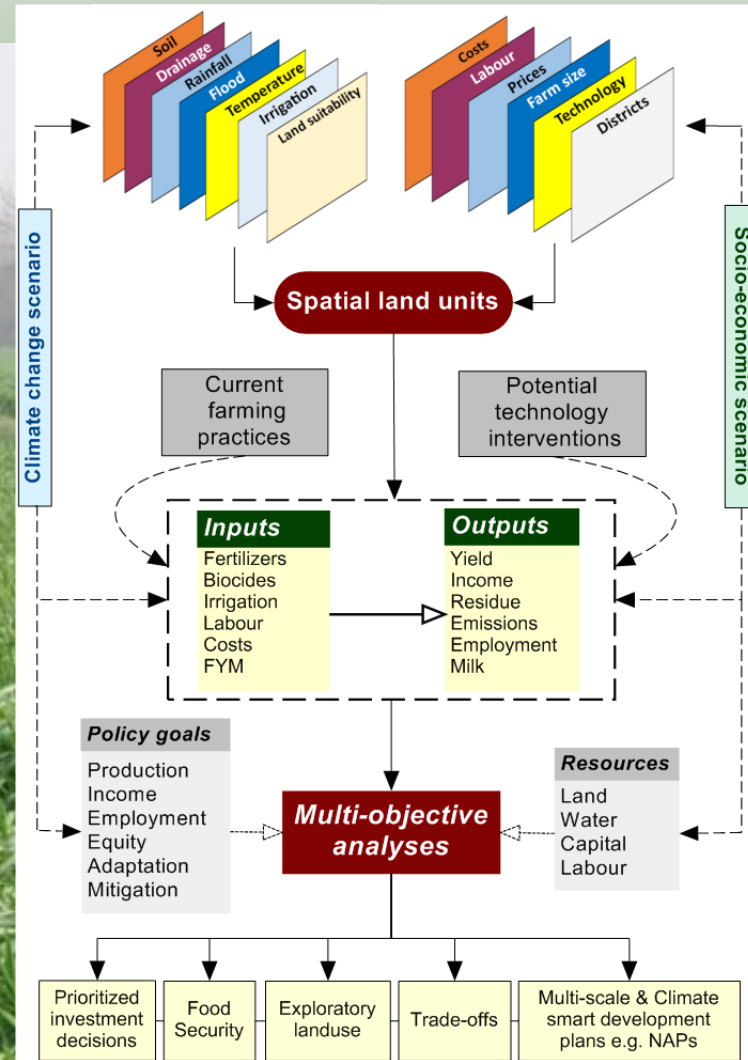
Climate-smart agriculture
combines policies on:



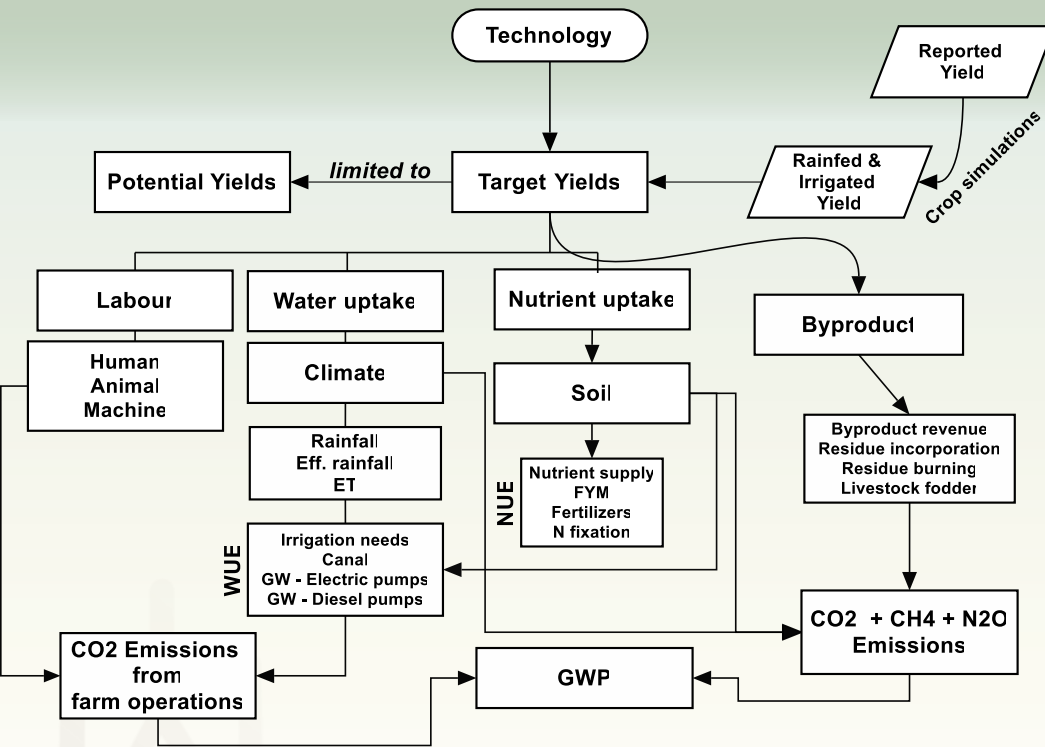
CCAFS in Modeling: Developing Decision Support System

Prioritizing CSA interventions: CSAP toolkit

- Builds from bottom-up biophysical and socio-economic datasets
- Spatially explicit, integrated modeling framework
- Addresses climatic and socio-economic scenarios
- Supports multi-objective trade-off analyses
- Supports more informed decision making
 - What crops to cultivate;
 - Which CSA technologies and practices to invest in;
 - Where to target that investment, and
 - When those investments should be made.
- NAPAs/ NAPs/NAMAs



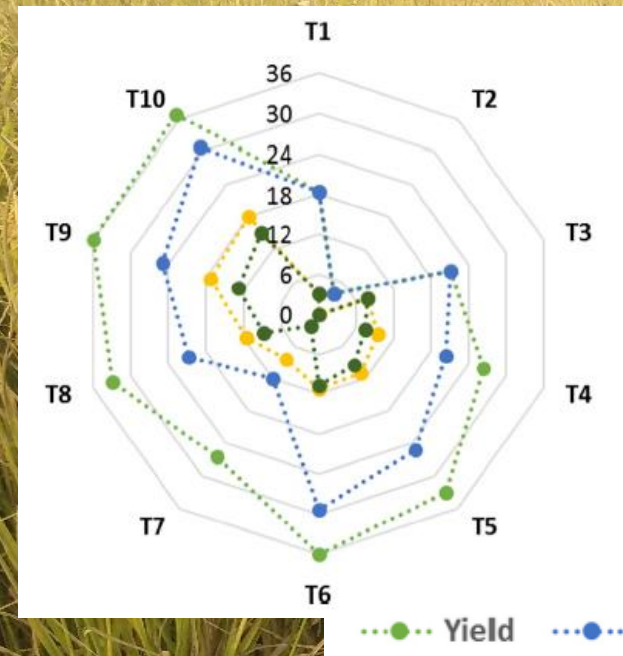
Prioritizing CSA interventions: CSAP toolkit



Technology characteristics	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Traditional cultivars	✓	✓								
Fertilizer application required to realize target yields	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water conservation practices			✓							
Index based insurance			✓						✓	✓
Improved cultivars			✓							
Seed replacement			✓	✓	✓✓	✓✓✓	✓	✓✓	✓✓✓	✓✓✓
Biocide application	✓		✓	✓	✓	✓	✓	✓	✓	✓
Additional secondary tillage				✓	✓					
Leaf colour charts rice, wheat and maize)							✓	✓	✓	✓
Laser levelling and water management							✓	✓	✓	✓
Residue incorporation							✓	✓	✓	
Reduced tillage							✓	✓	✓	
Alternate wetting drying (rice)								✓	✓	
Site specific nitrogen management										✓
Improved irrigation pump efficiency										✓
Farmer trainings										✓
Average yield gap closure, %	-	-	15	15	30	50	15	30	50	75

Prioritizing CSA options: A Case Study for Bihar, India

Prioritized Technology Options



Prioritized Crop Options

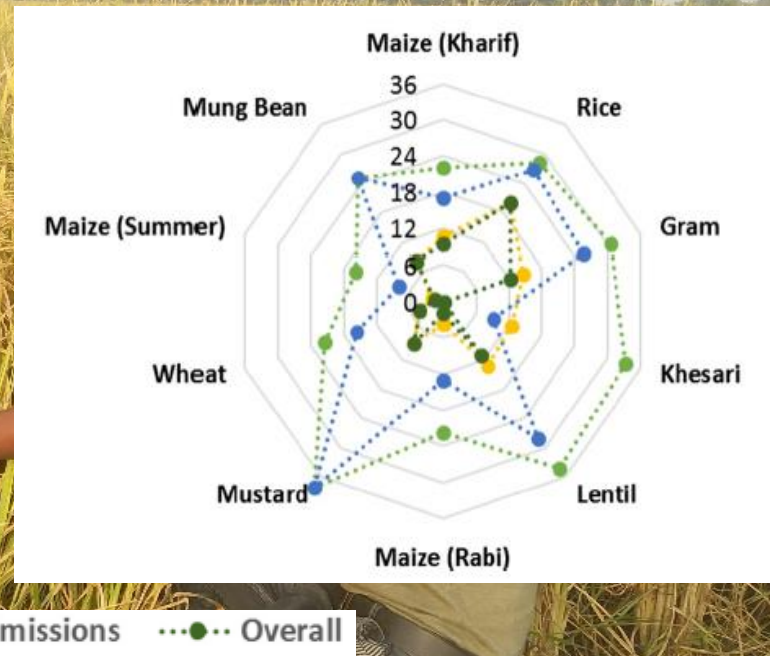
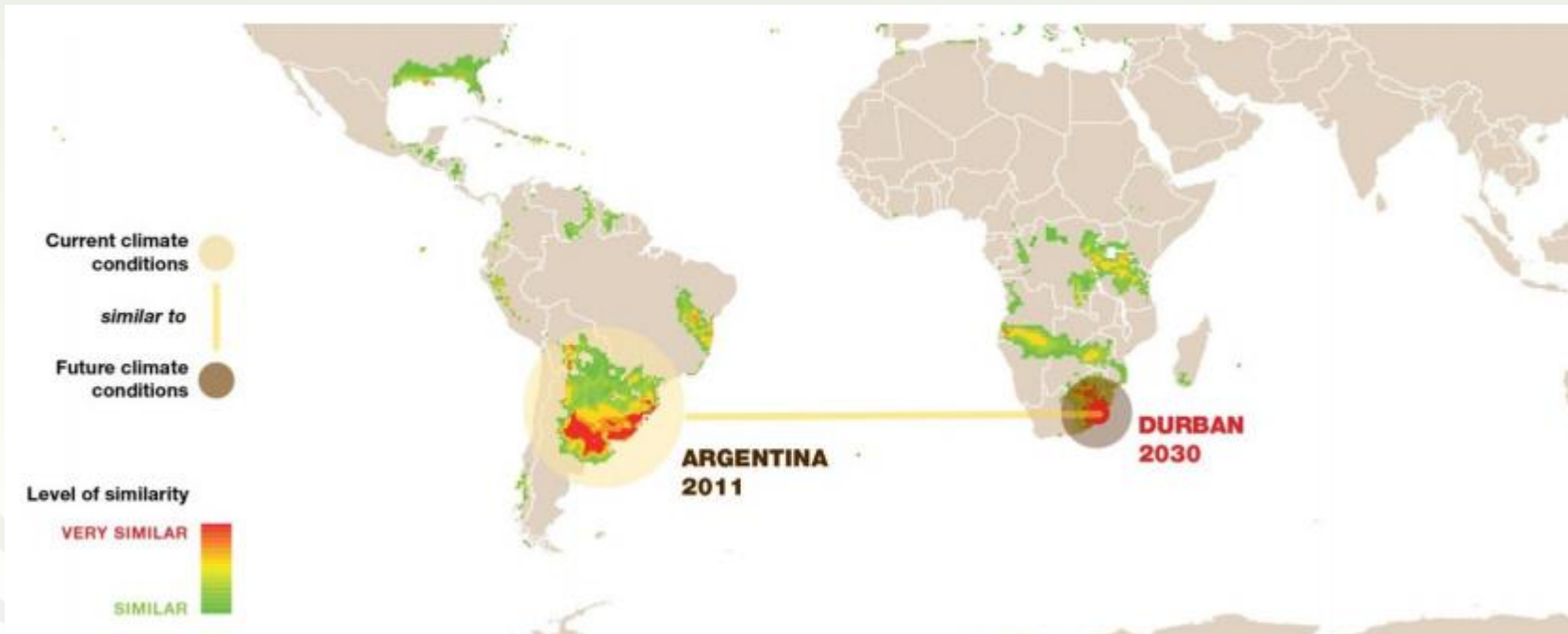


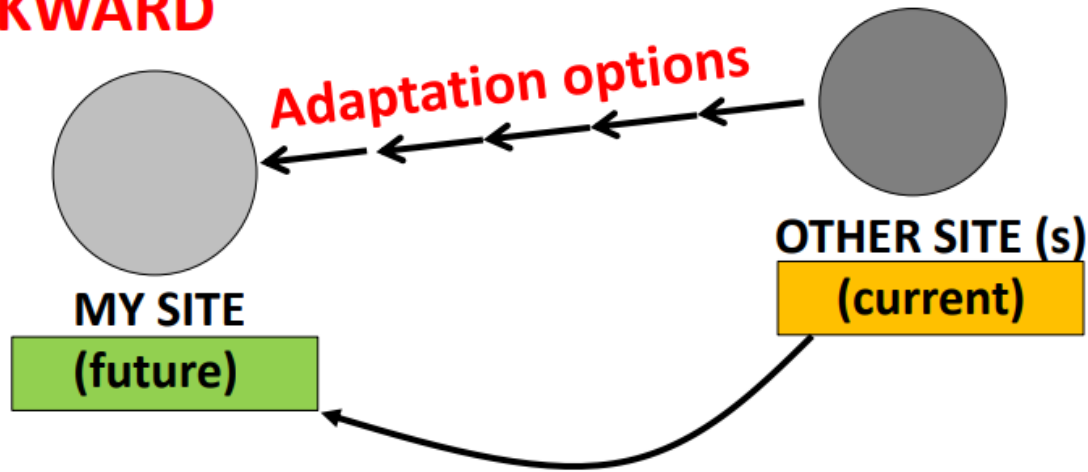
Figure shows number of districts where CSA indicators (yield, income, emission and all three together) are improved over the baseline across all RCPs

The CCAFS Climate Analogues Tool

Comparing present-day farming systems to their future analogues can facilitate the exchange of knowledge between farmers in different locations who share common climate interests and allows adaptation strategies and technologies to be tested and validated

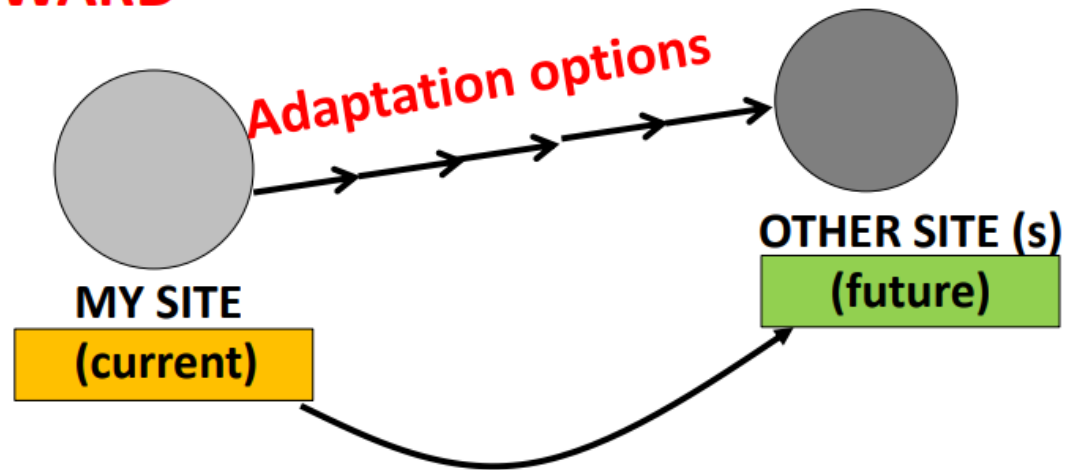


BACKWARD



Where can I find the **future** climate of my site **today**?

FORWARD

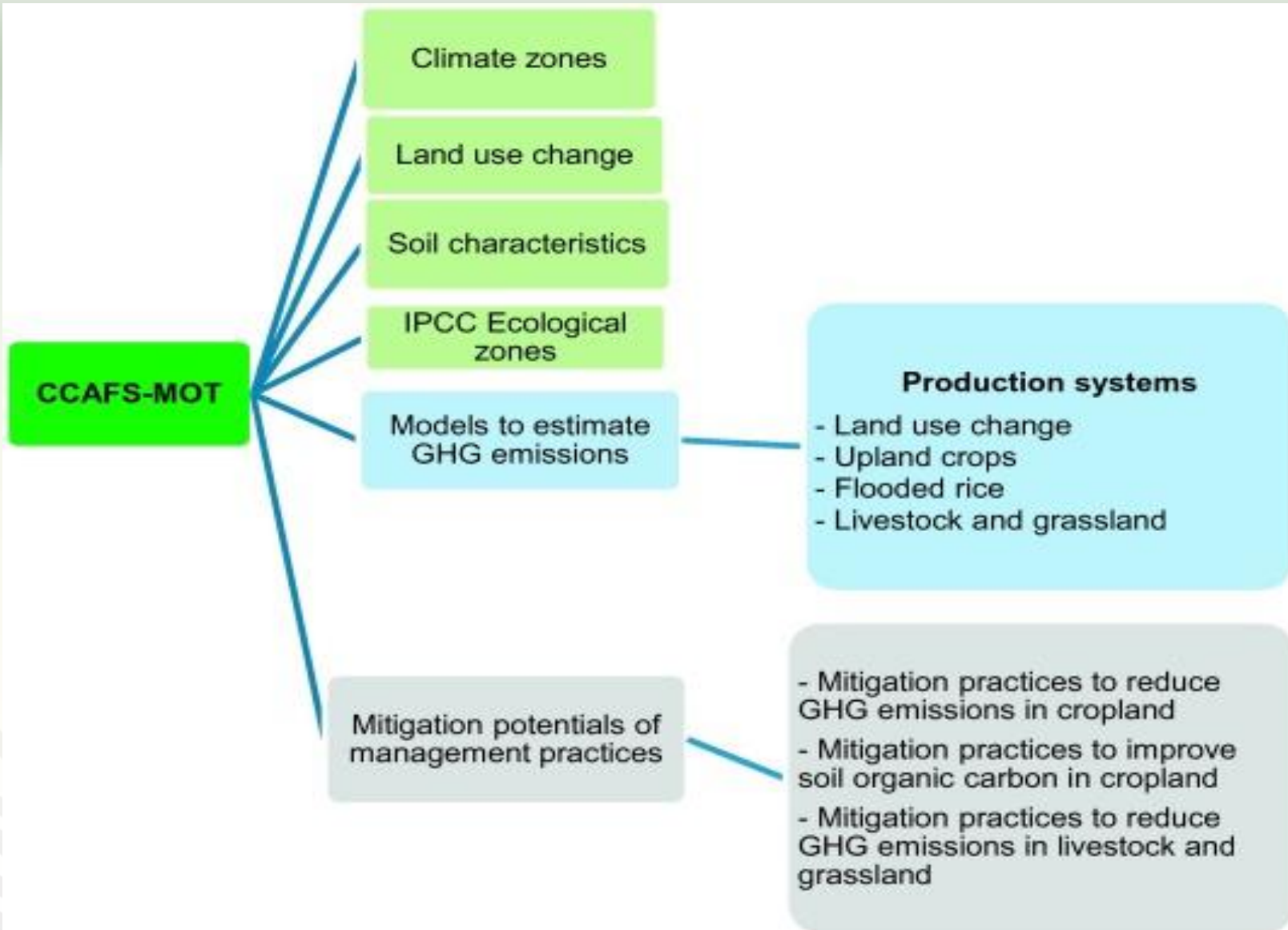


Where can I find the **present** climate of my site **in the future**?

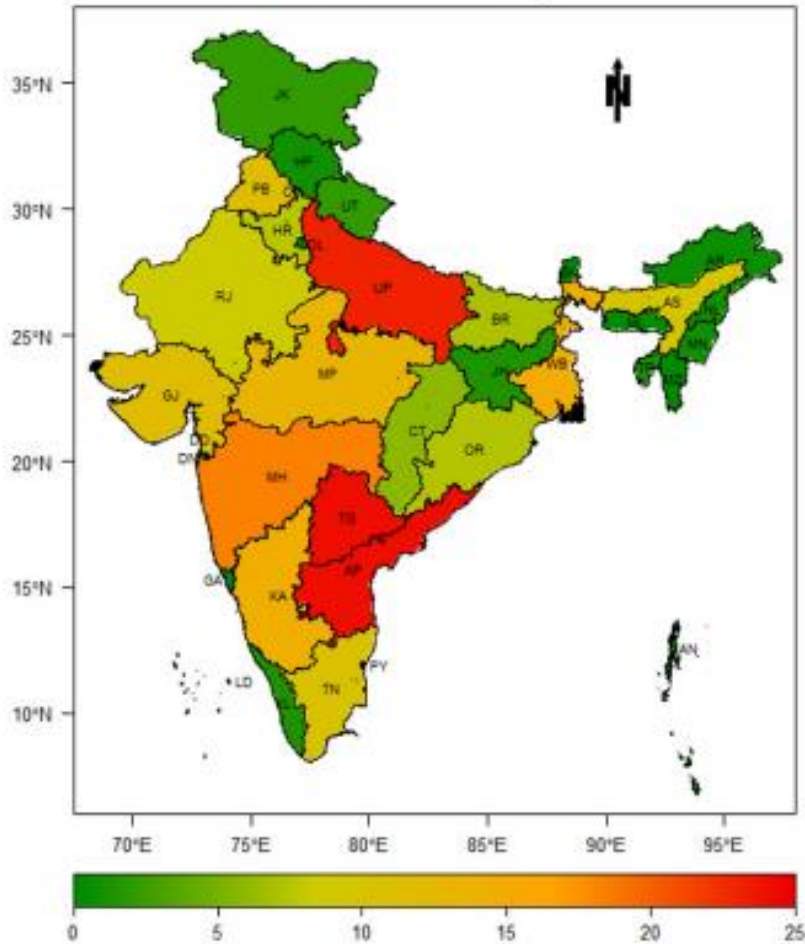
Farms
of the
Future



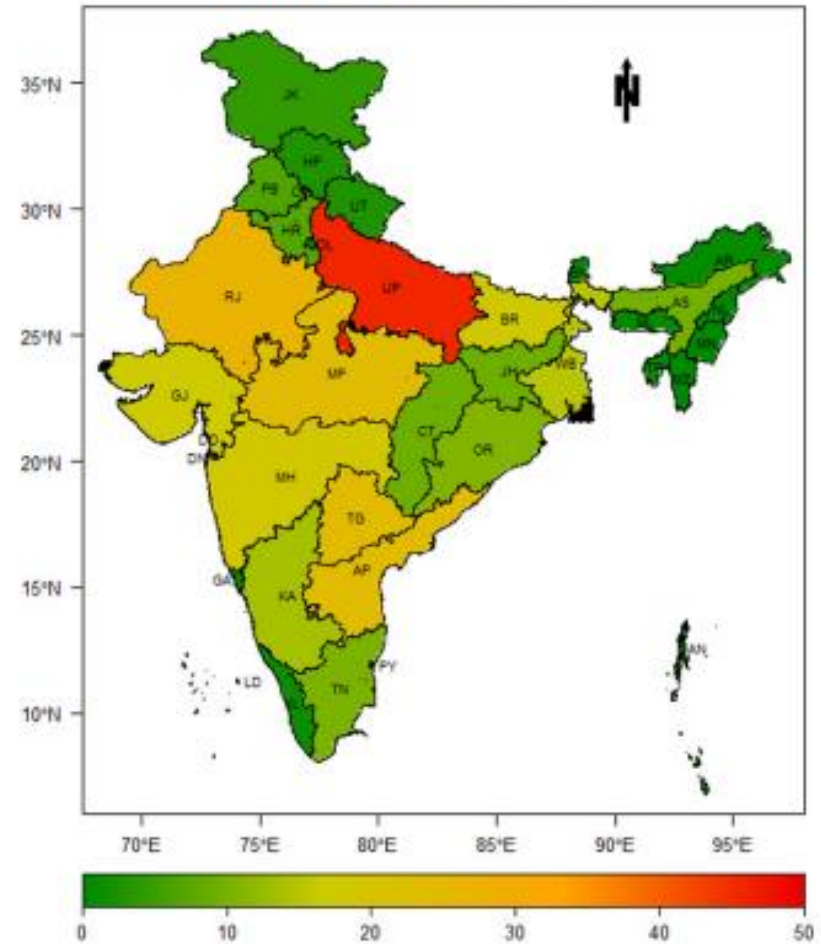
Mitigation Options Tool for Agriculture (CCAFS-MOT)



Total Emission from Crops



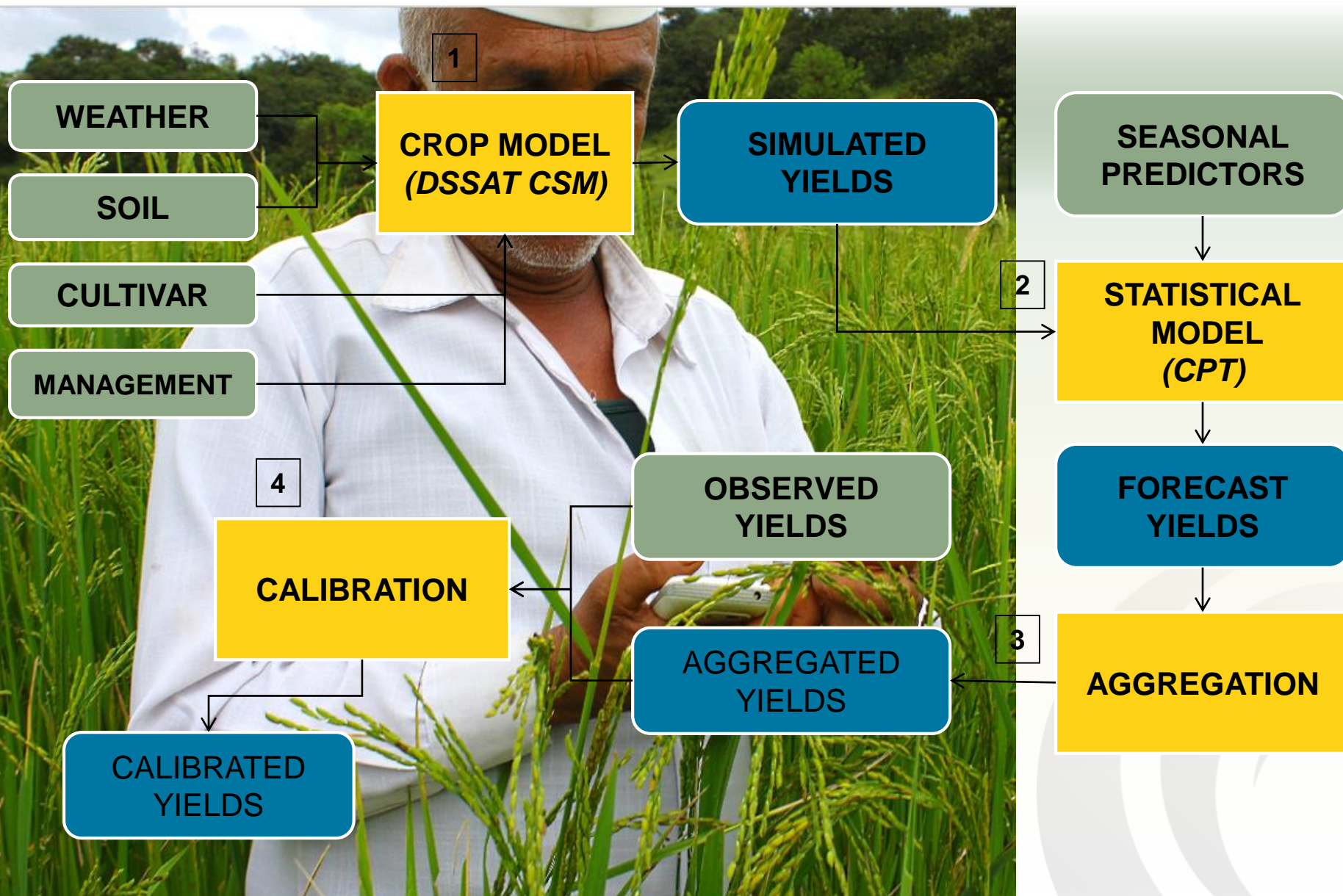
Total Emission from Livestock



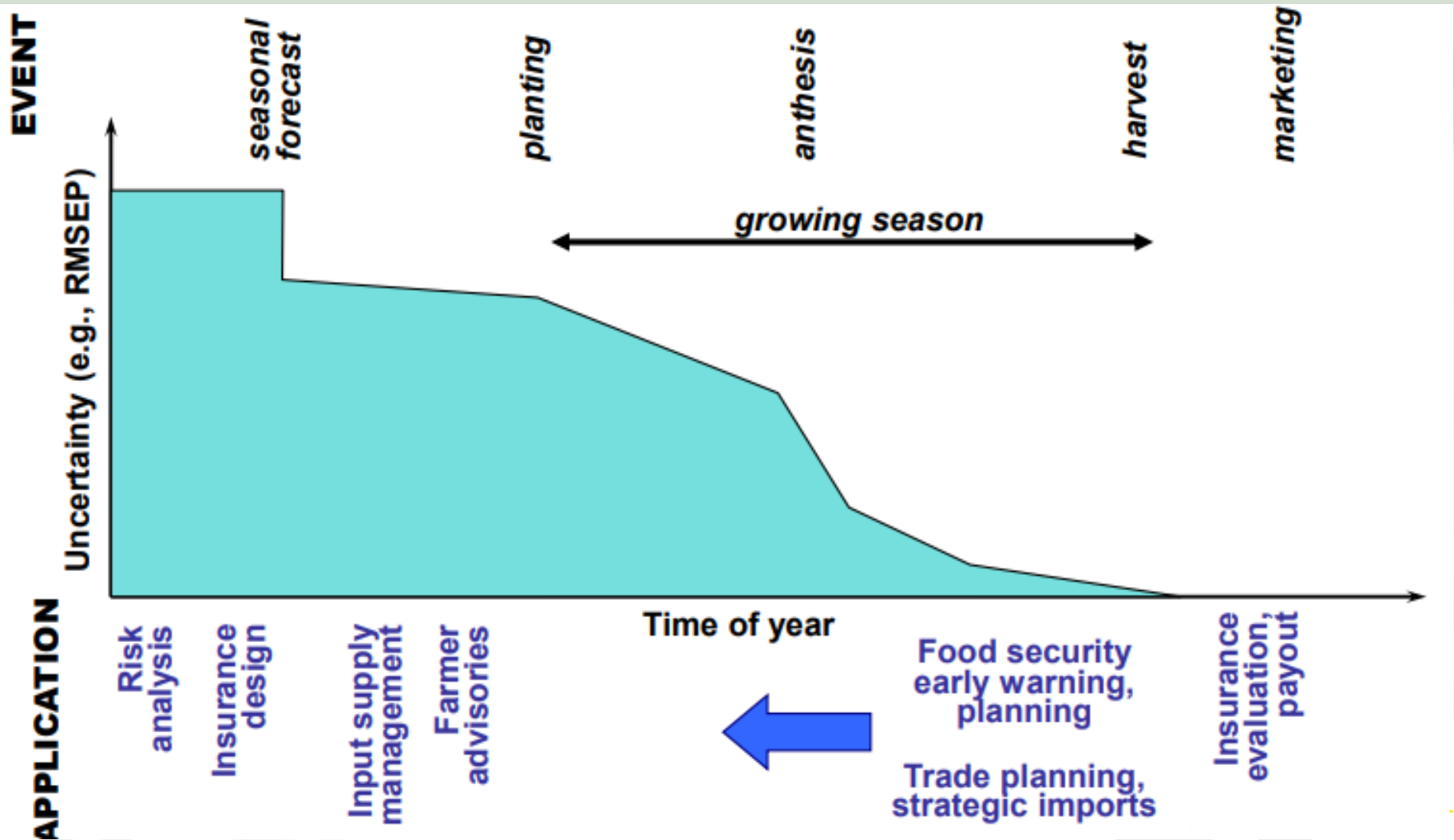
CCAFS Regional Agriculture Forecasting Tool (CRAFT)



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



Why CRAFT? Support Adaptation Opportunities



Advance Estimate of 2018 Paddy Production in Nepal using the CCAFS Regional Agricultural Forecasting Toolbox (CRAFT)



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security

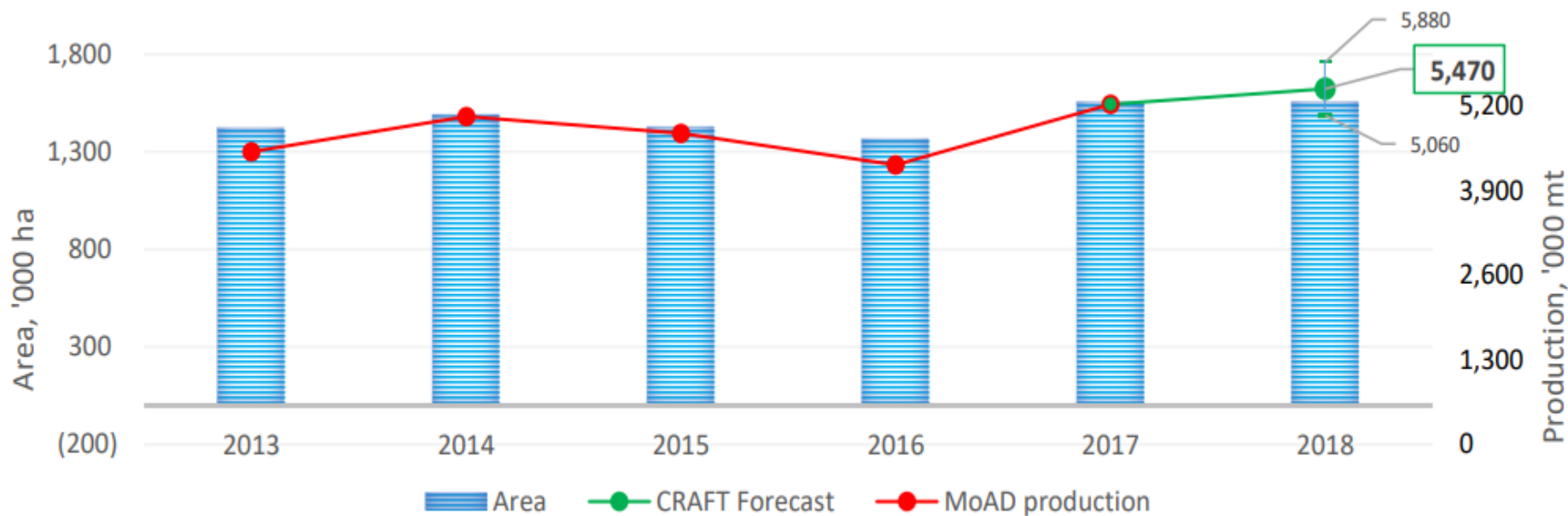


Figure 1: Paddy area, paddy production and CRAFT paddy production forecast, 2013-2018 (Source: MoALD; CRAFT)

Developing Smart Insurance Solutions



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



Rationalization of
Number of Crop
Cut Experiments
for Ag. Insurance

Loss
Assessment for
Yield Index
Insurance

Bundling
Insurance with
CSA

Reducing Basis
Risk in Weather
Based Crop
Insurance



Millions of insurance records

CCEs data, Market arrivals data

Satellite data sets

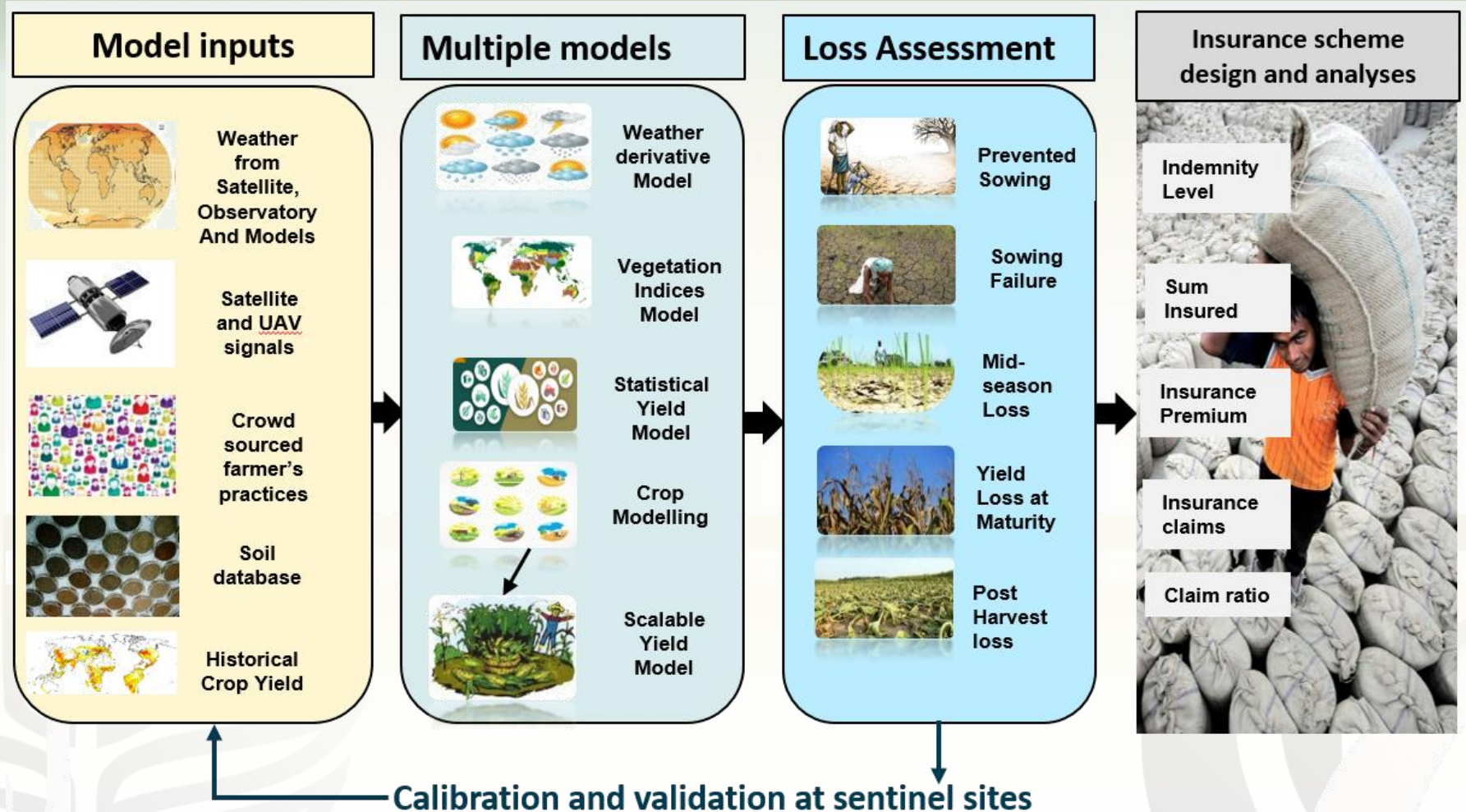
Weather data

Photographs

News Mining for Ag. insurance

Near real time loss assessment tools

Crop Loss Assessment for Yield Index Insurance



Crop Loss Assessment for Yield Index Insurance



CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

Crop-loss Assessment Monitor (CAM)

A tool to monitor losses at different plant growth stages and facilitate real time assessment of prevented sowing, sowing failure, mid-season adversity, post-harvest losses and final yield losses due to climatic risks

Login

EMAIL ADDRESS

PASSWORD

Log In

not a member?
[Sign Up here](#)

MODEL INPUTS MULTIPLE MODELS LOSS ASSESSMENT INSURANCE SCHEME

© 2018 All rights reserved CGIAR. [Help](#) [Disclaimer](#)

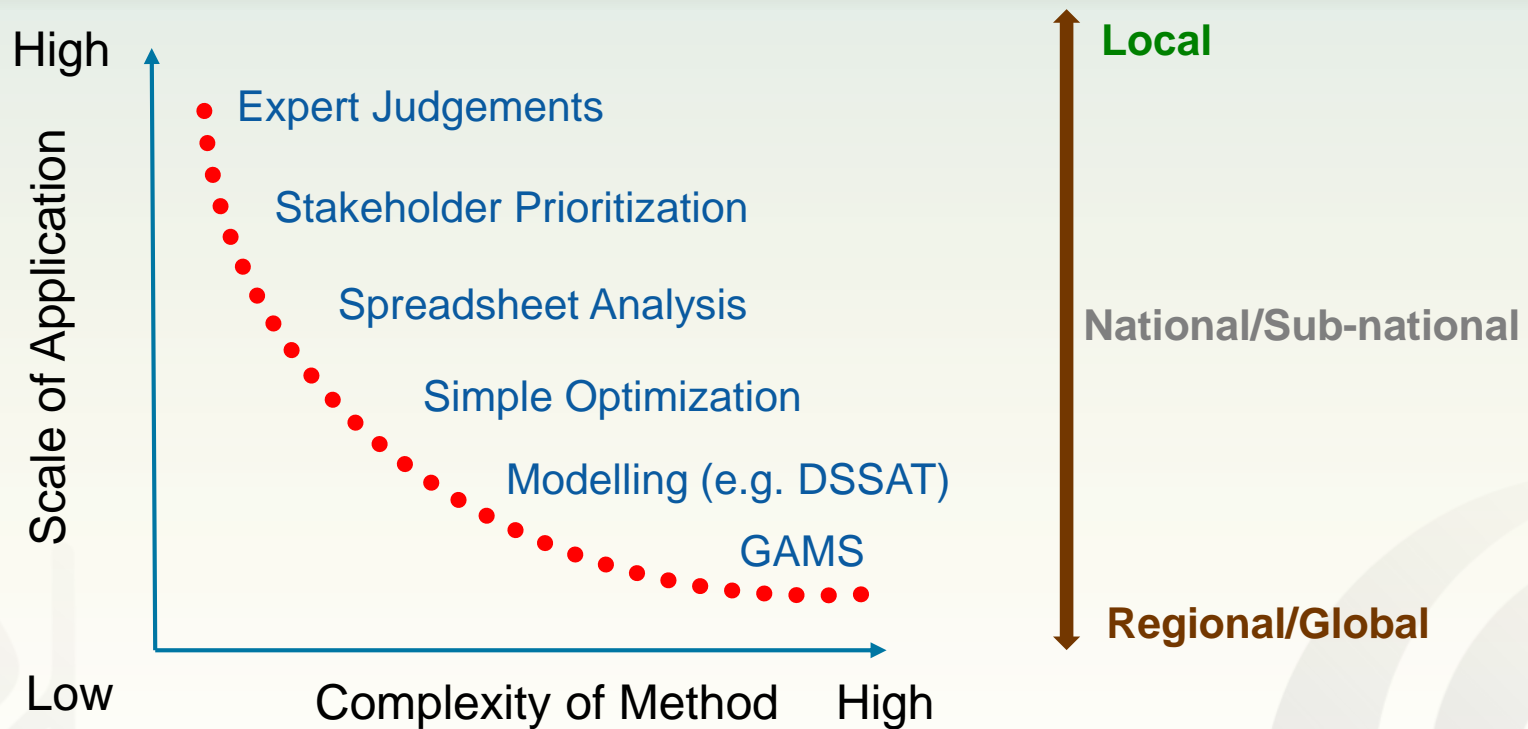


CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

CROP-LOSS ASSESSMENT MONITOR

A report on weather deviations and crop loss assessment for insurance

Modelling Methods and Applications



CSA prioritization methods: scale of application, complexity and use

Applications for Policy and Programs

- **CSA Prioritization and Investment Planning for Adaptation and Mitigation to Climate Change and Variability**
- **Food Security Monitoring and Early Warning Systems**
- **Crop Loss Assessment and Insurance Program Design**