Are Sub-Saharan Africa's agricultural systems too heterogeneous for Climate Smart Agriculture?

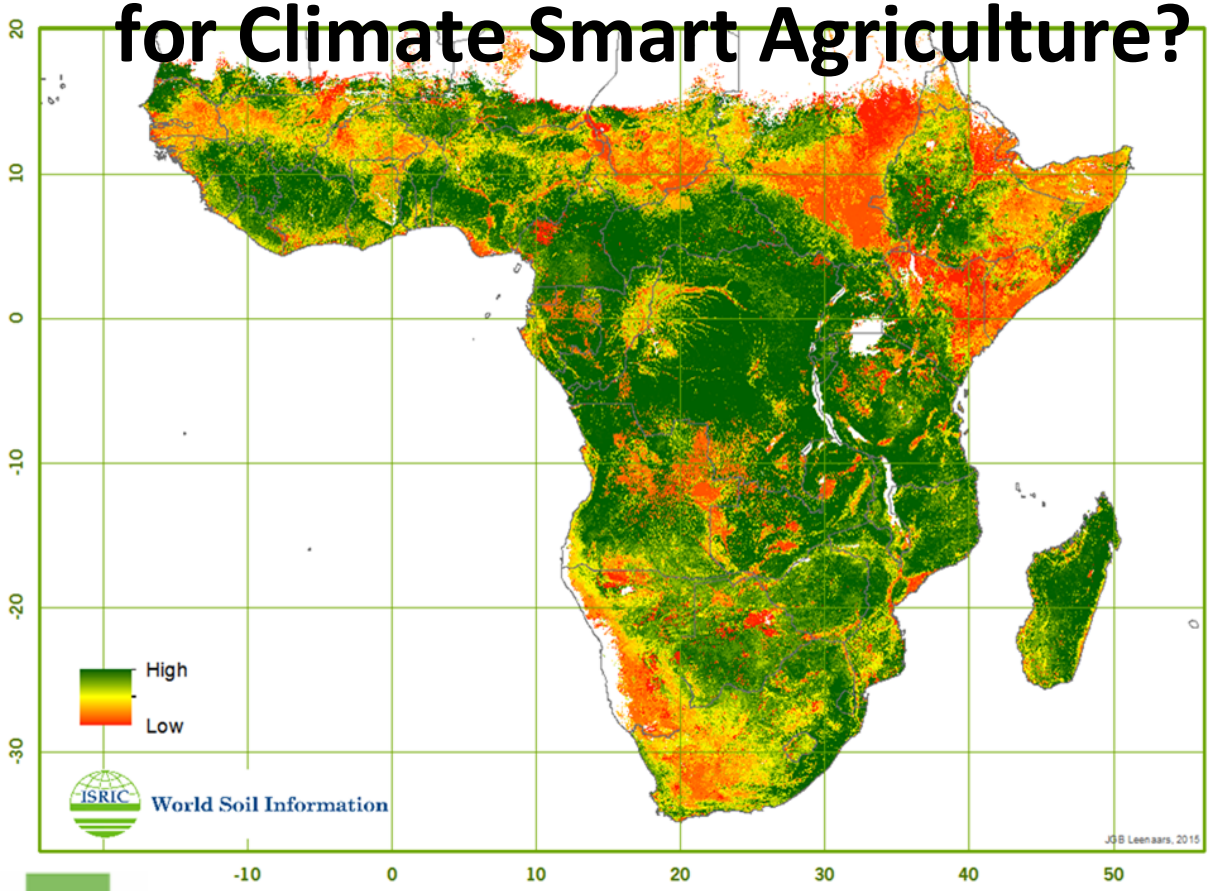


Photo caption

Anthony Oyoo, Sep 6th 2016.

Africa's Food Sovereignty Working Group meeting – HAAS Institute

WAGENINGEN UR

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

Are Sub-Saharan Africa's agricultural systems too heterogeneous for Climate Smart Agriculture?

Outline

1. SSA's agriculture and the role of CSA in global food security
2. Yield gaps in SSA in comparison to the World
3. Landscape-level adoption of CSA in heterogeneous landscapes
4. Effect of spatial and temporal heterogeneity on CSA adoption
5. Empirical modelling to relate biophysical and socio-economic variables to aerial imagery
6. Conclusions on meeting Adaptation and mitigation goals in SSA

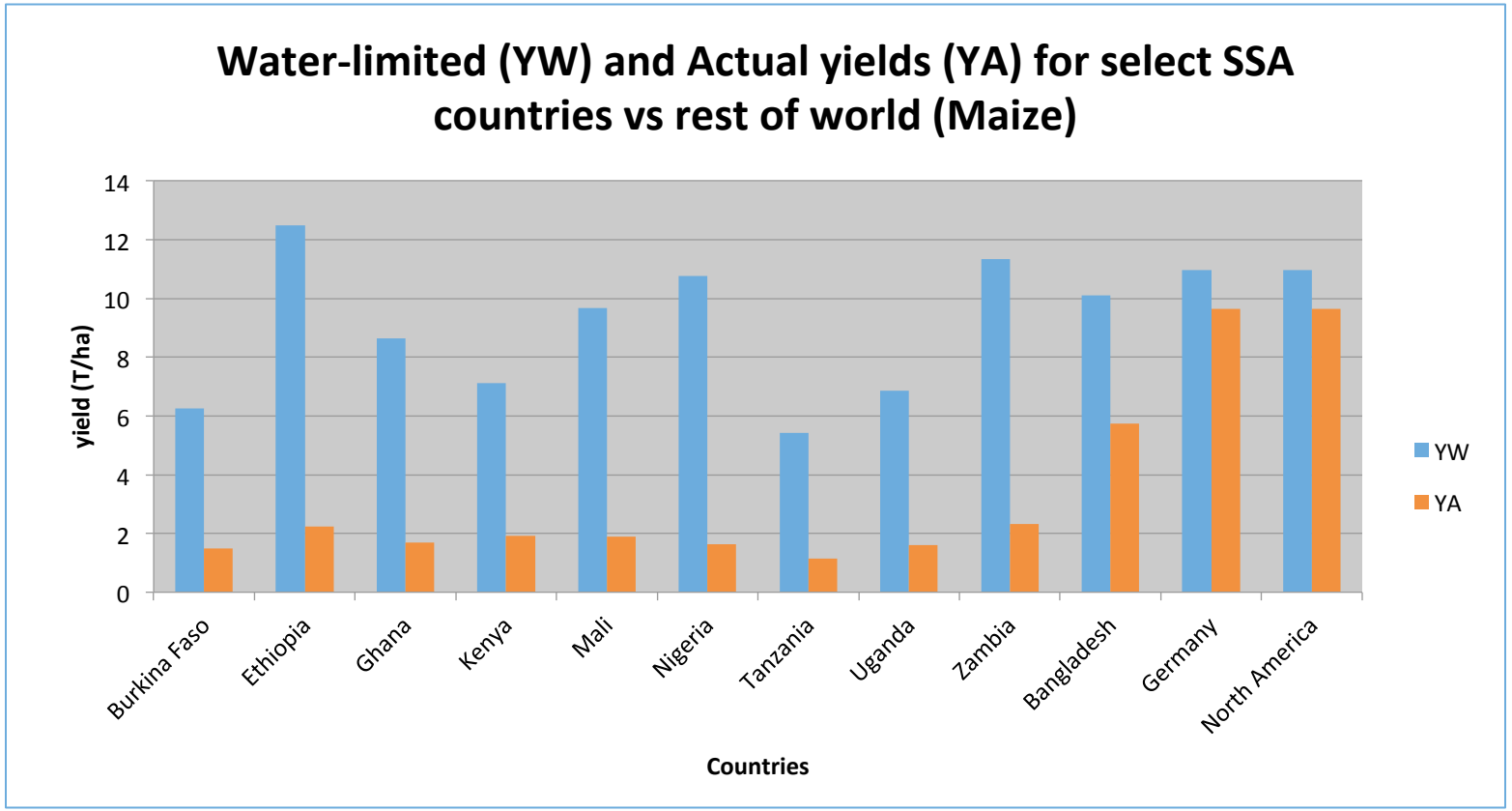
WAGENINGEN UR

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

SSA's agriculture and it's role in global food security

SSA can make largest contribution to future food demands due to technological potential – productivity and mitigation

SSA's Yield Gaps

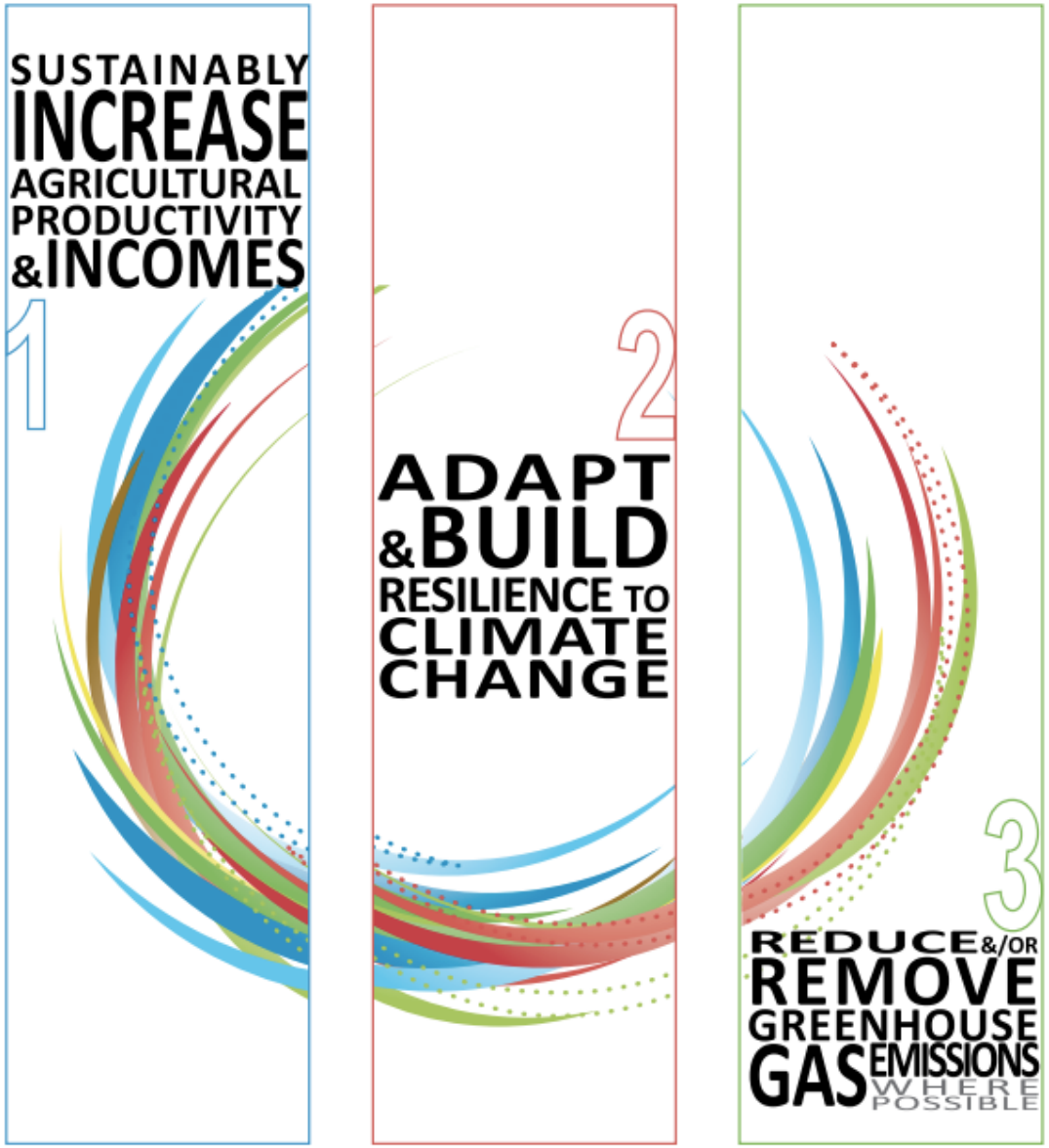


Source: GYGA (2016)

WAGENINGEN UR

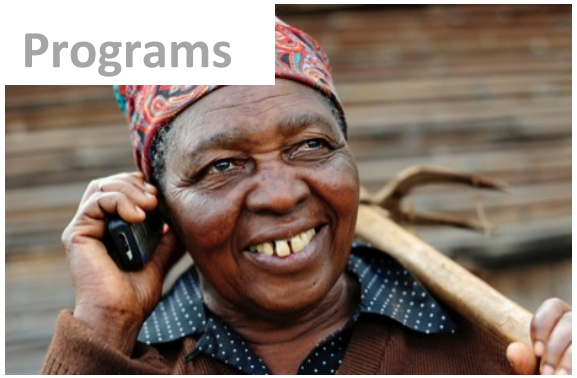
ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

What is CSA and how does it fit in SSA's agricultural goals?



Practices

Programs

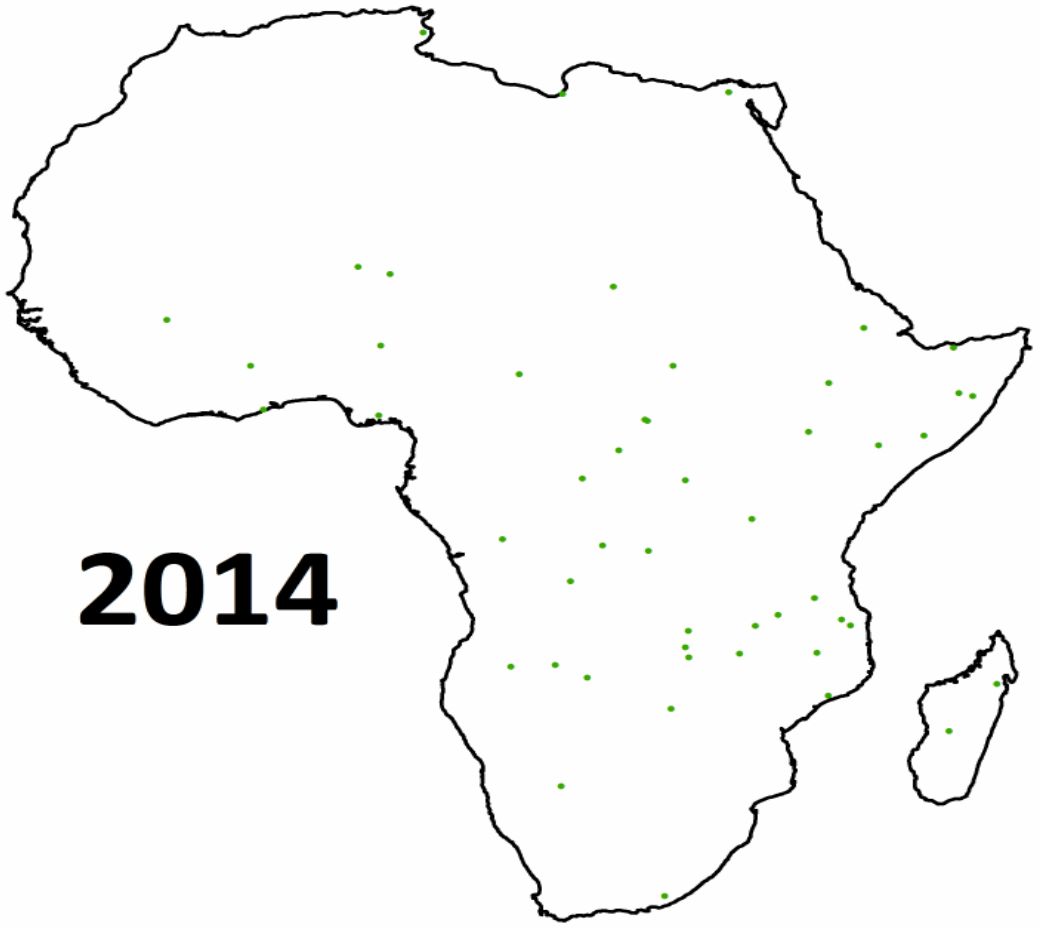


Policies & Institutions

WAGENINGEN UR

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

Goal: Climate Smart landscapes in SSA



Girvetz

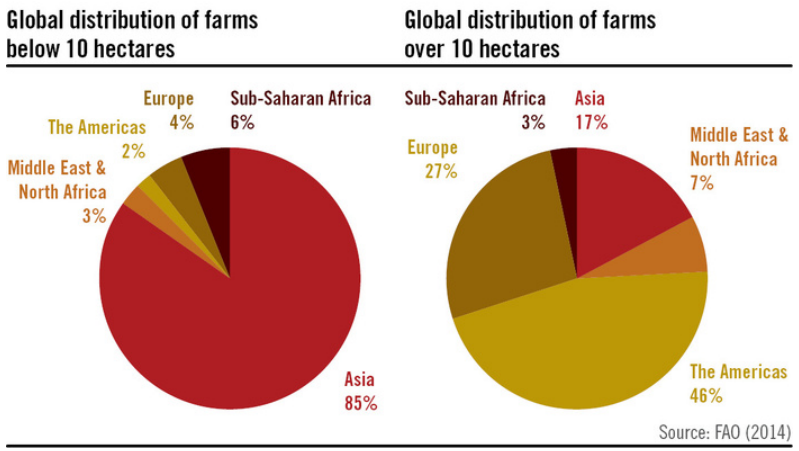
SSA's agricultural system's spatial and temporal heterogeneity

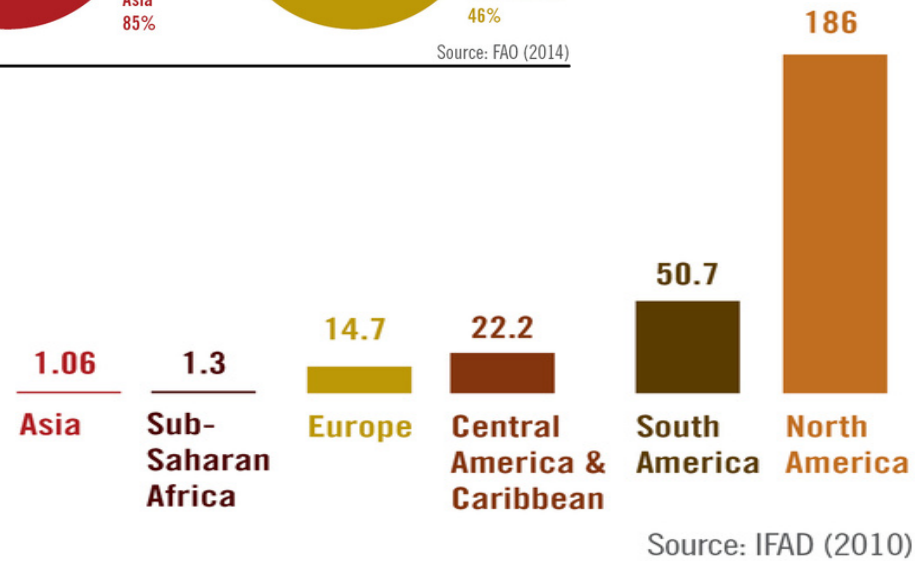
80% farm land in SSA under smallholding

1. Diverse crops, farm-management activities within farm

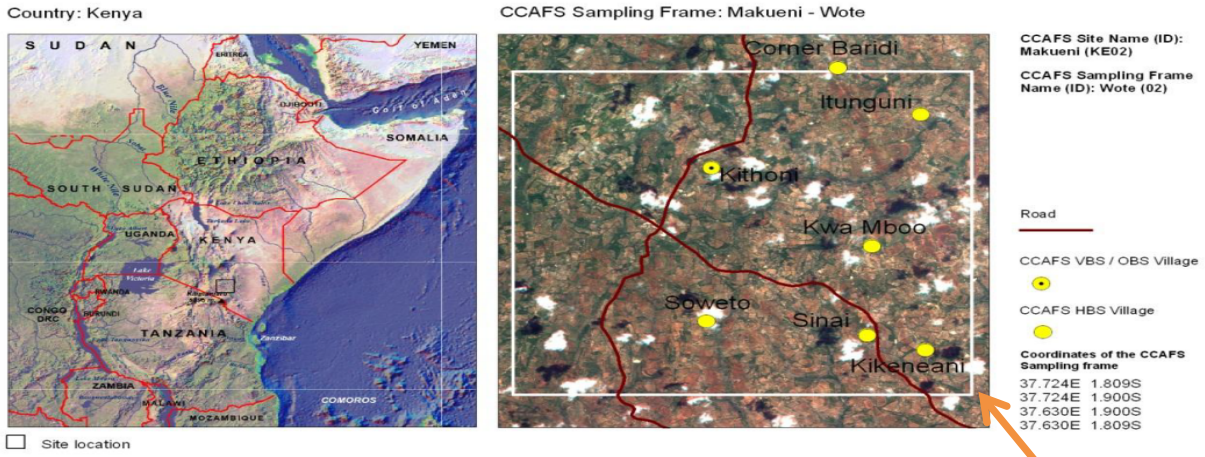
2. Diverse production systems from farm to farm

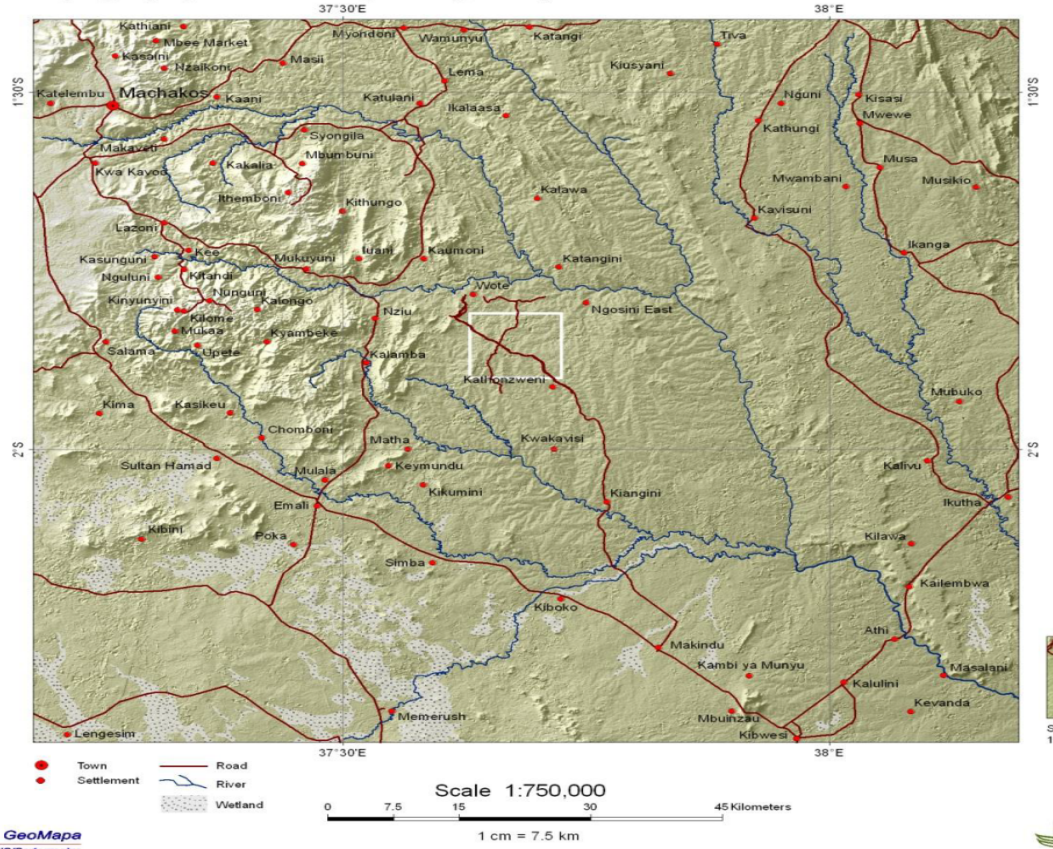
3. Diverse timing of decision-making (adoption)





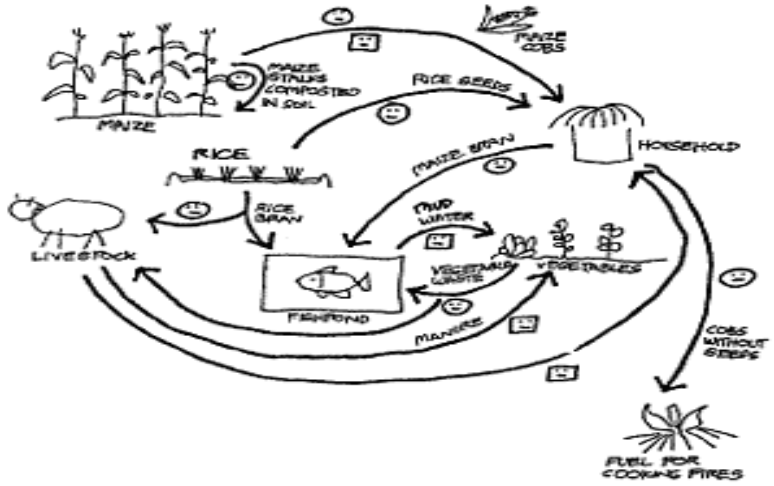
Average farm size (ha)





Spatial farm-type distribution

Simulation of large-scale adoption of CSA technologies in farm populations and multi-dimensional impacts on social, ecological and economic factors



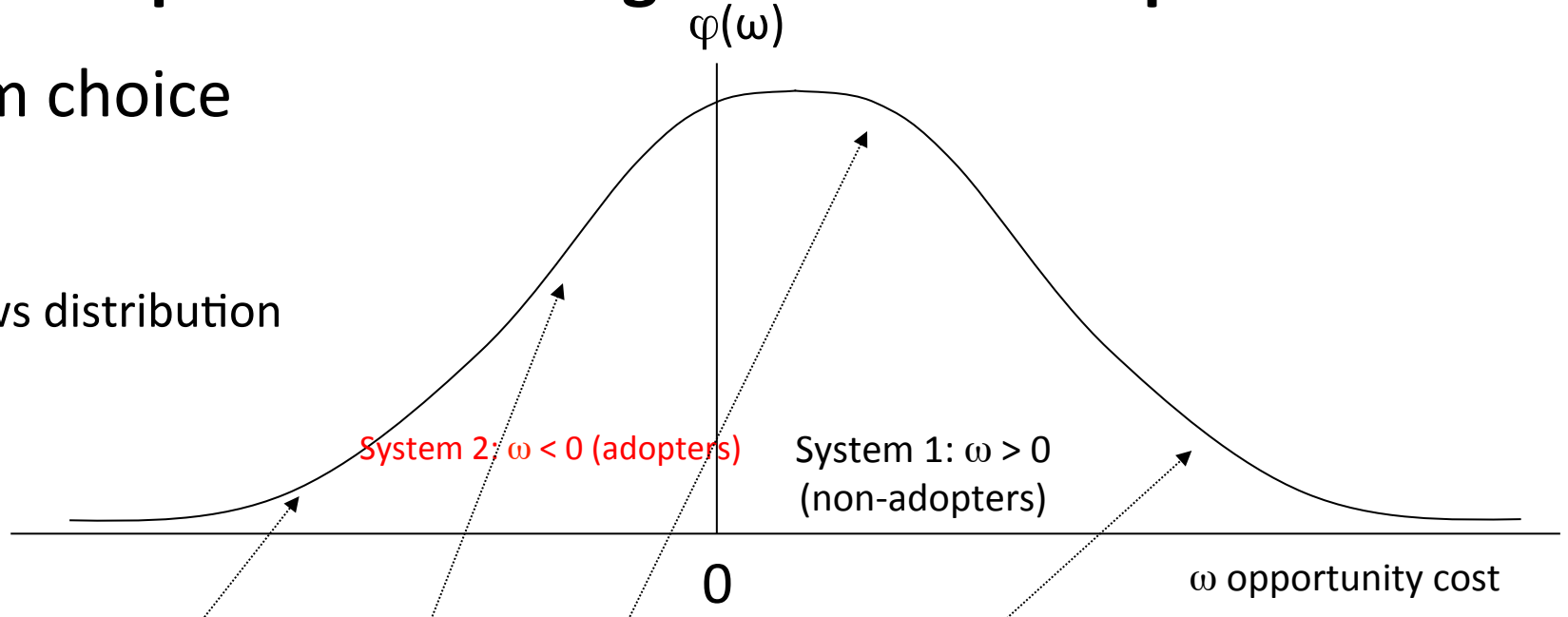
GeoMapa GIS/Cartography

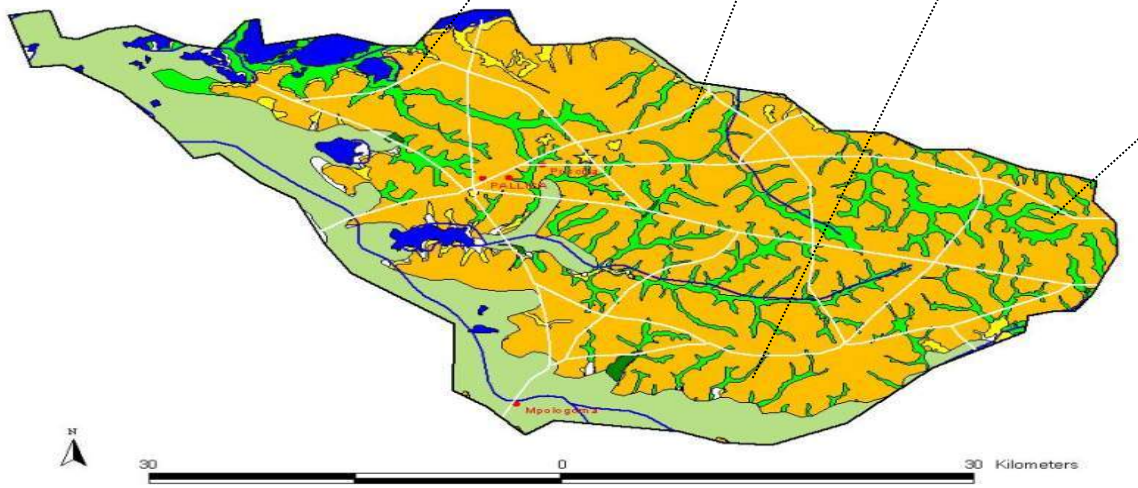
CGIAR Research Program on Climate Change, Agriculture and Food Security CCAFS

Modelling CSA adoption in heterogeneous landscapes

Opportunity cost, system choice and adoption

Opportunity cost $\omega = v_1 - v_2$ follows distribution $\varphi(\omega)$

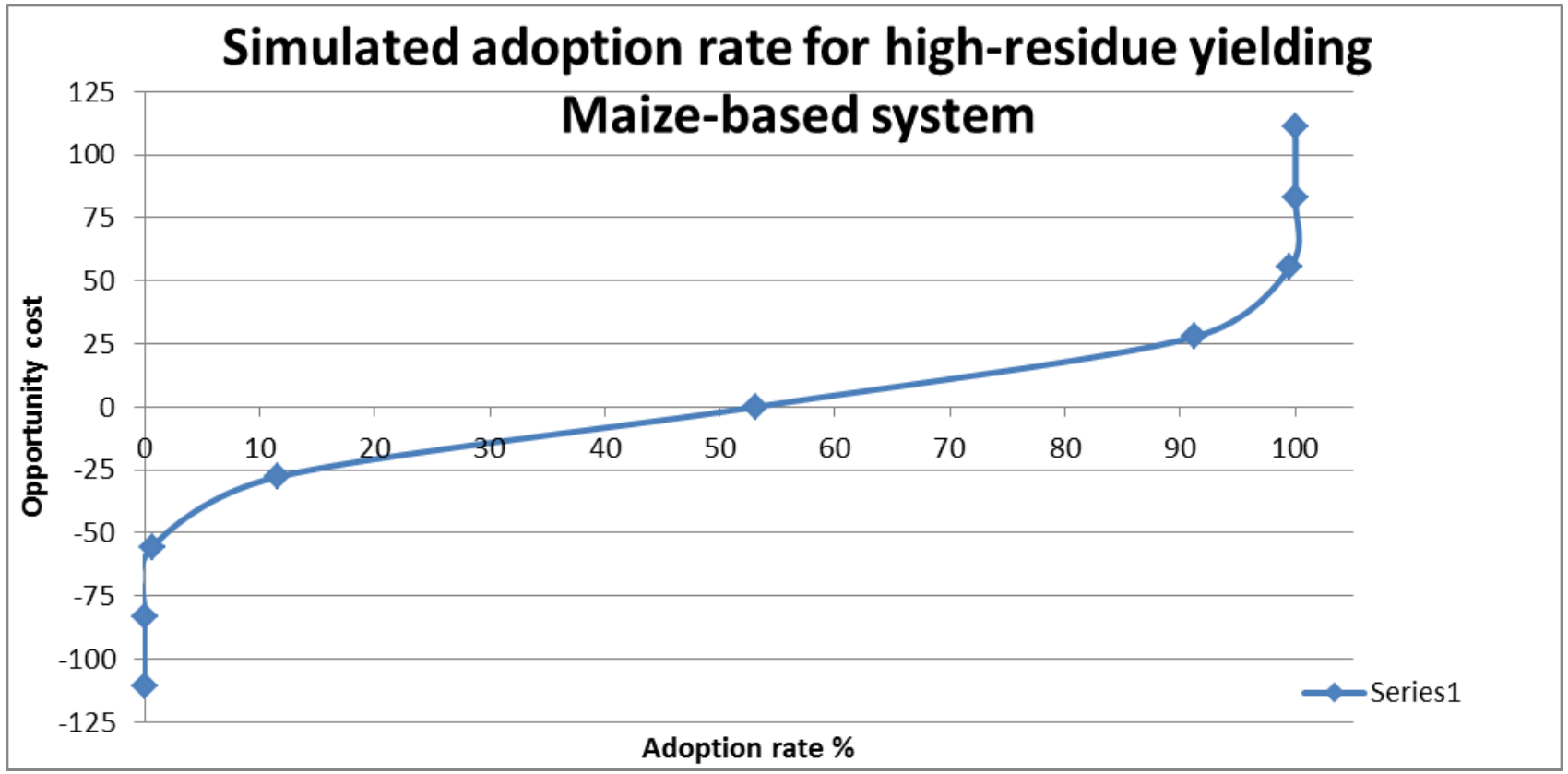




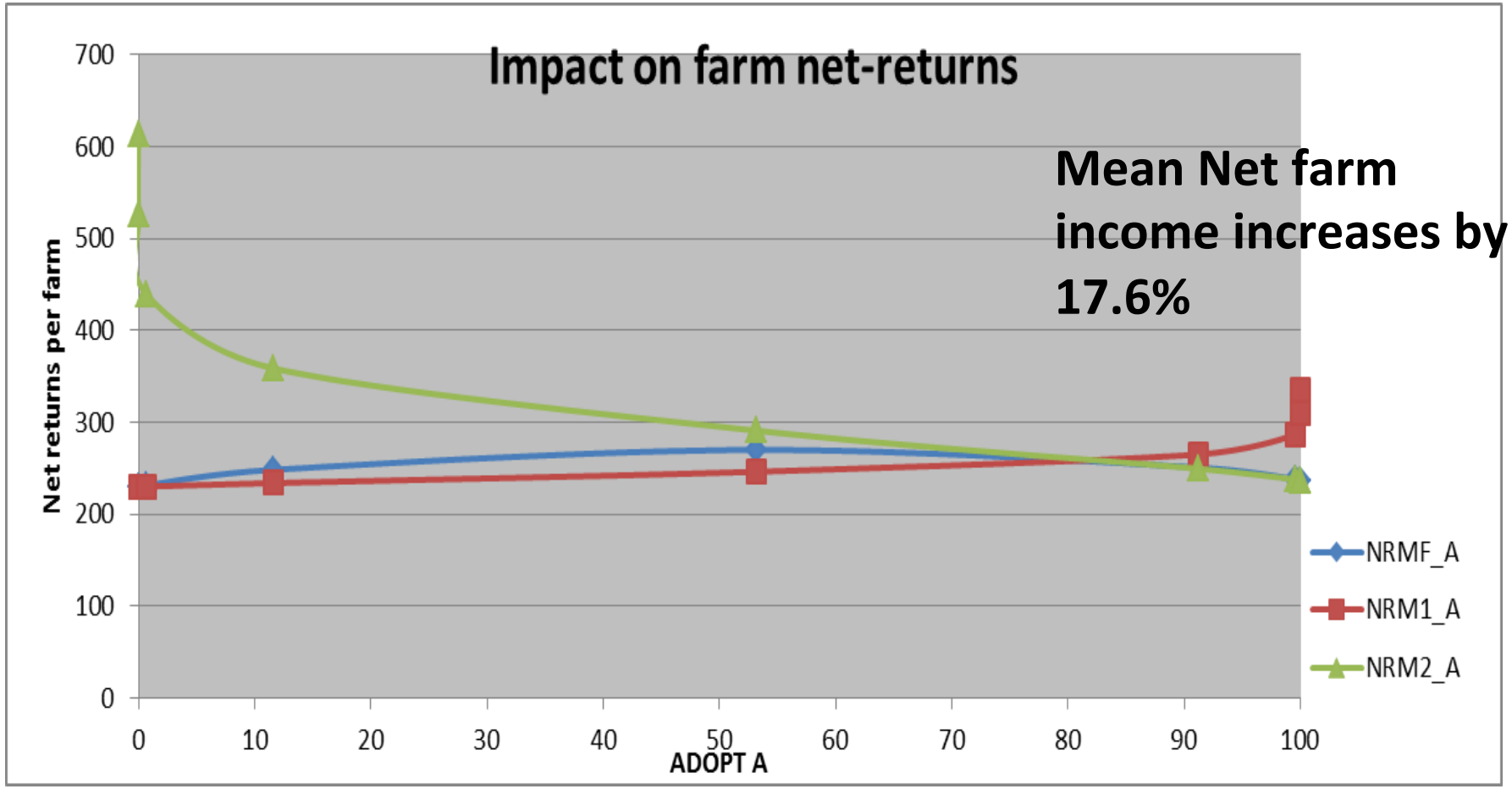
Map of a heterogeneous region

Oregon State OSU UNIVERSITY

What is the adoption rate of the technology?



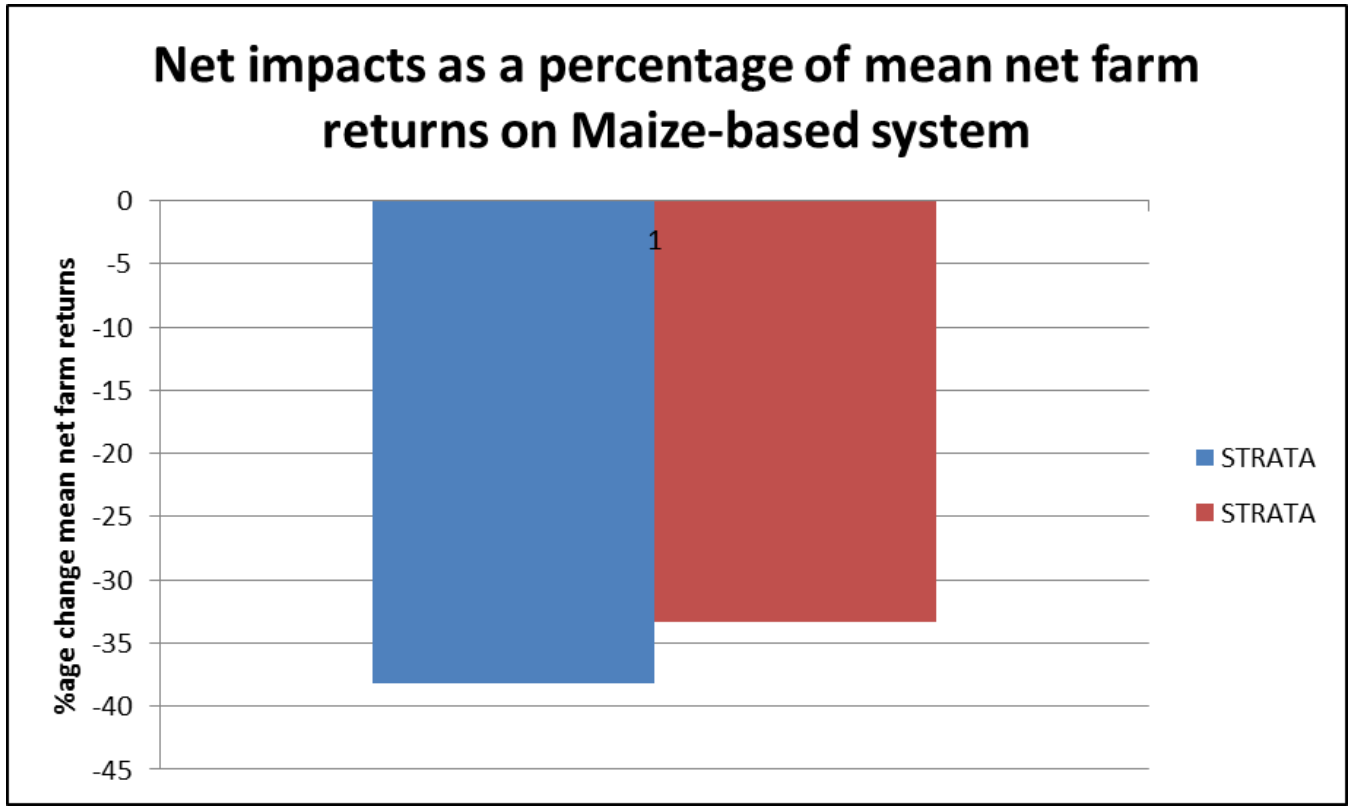
Impacts of adoption of CSA



ADOPT_A	NRMF_A
2.49921E-05	229.8200649
0.008841248	229.8529674
0.668695705	231.5873693
11.55959077	248.5520236
53.1509606	270.20549
91.23588682	251.0676262
99.57531123	238.1987083
99.99534961	237.0989046
99.99998917	237.0816207

$ 40+ net return per farm

When do farmers make the decision to adopt? – temporal heterogeneity



80.46 % of the entire population vulnerable to CC

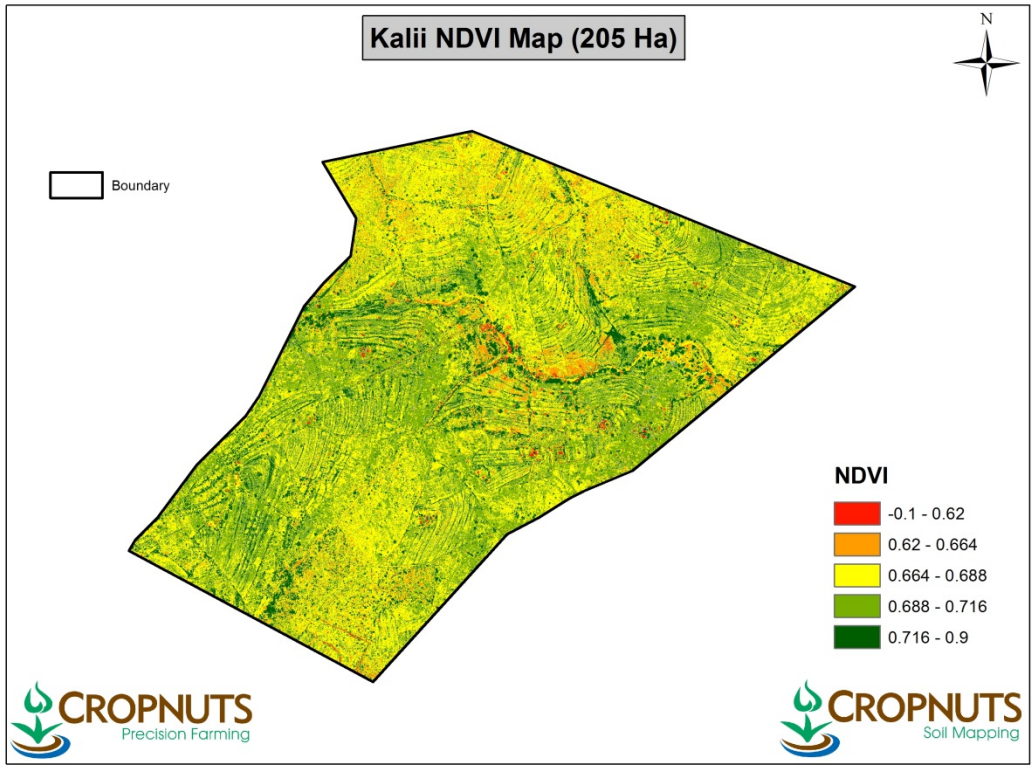
Vulnerability different for farm types (strata)
Red: tightened N cycle
Blue: low integration of production elements

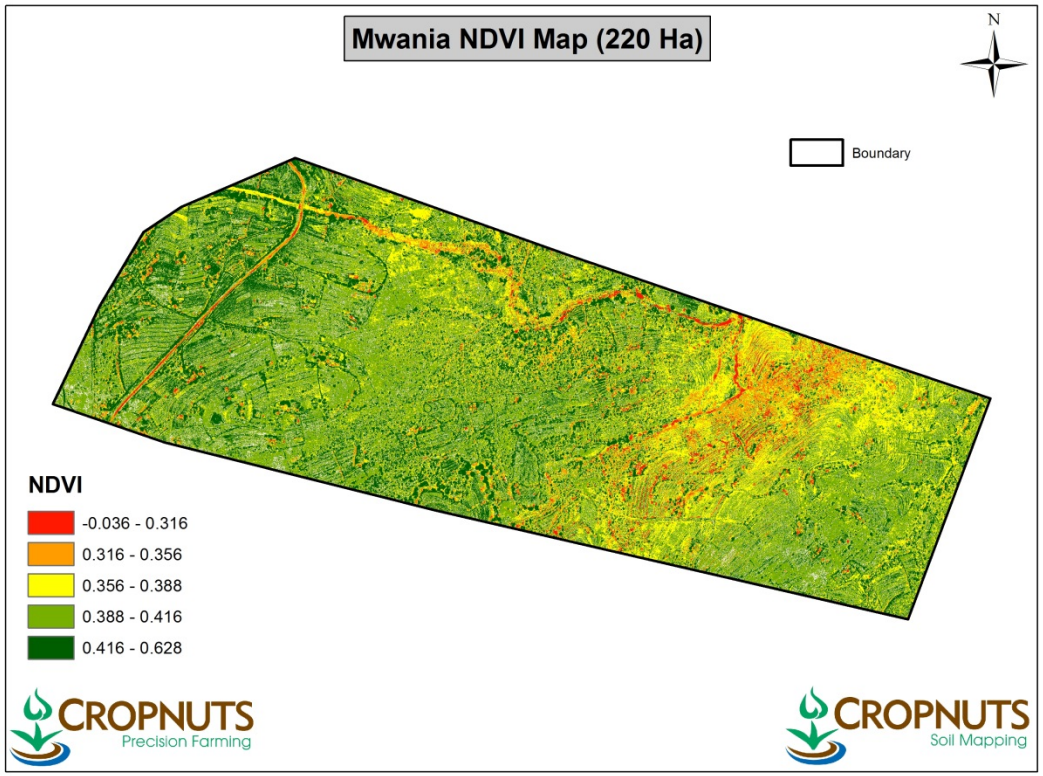
Driven by both bio-physical and socio-economic factors: farm size, hhld size, off-farm income, farm soil OM, land tenure, farm distance to hhld

WAGENINGEN UR

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

Relating aerial imagery to heterogeneous household and farm characteristics



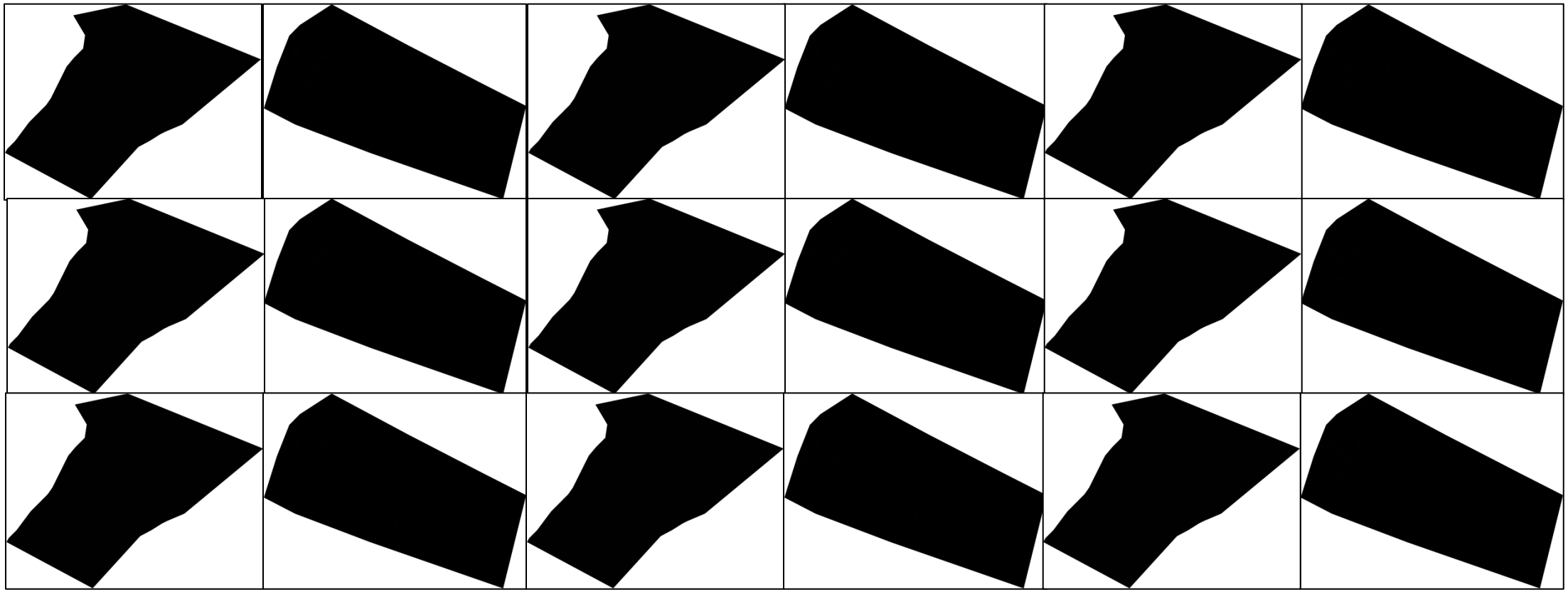


Climate analogues sites with i) similar rainfall variability, and ii) different temperature regimes

WAGENINGEN UR

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

Training landscape model for spatial and temporal correlation



‘Representative groups’ of farmers correlated statistically

Re-distribution of where CSA practices are adopted

Timing of when CSA practices are adopted re-distributed for the groups

Preliminary conclusions

Based on household and farm characteristics, CSA can be targeted spatially for small landscapes

SSA's farmers inadvertently mitigate only when critical thresholds are reached (bio-physical and socio-economic interactions)

WAGENINGEN UR

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

Thank You

WAGENINGEN UR

ICRISAT

INTERNATIONAL CROPS RESEARCH
INSTITUTE FOR THE SEMI-ARID TROPICS

CGIAR

ICRISAT is a member of the
CGIAR System Organization