Examples of the WOCAT database applications in sustainable land and water resources research

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WOCAT database: Key information

- Inventary of practices (technologies) and approaches
- Location (LAT LON) of many practices across the world
- Pre-Post implementation assessment
- Detialed technical and socio-econmic account of practices implementations

Article 1

Article 2

Article 1

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Estimating the global potential of water harvesting from successful case studies

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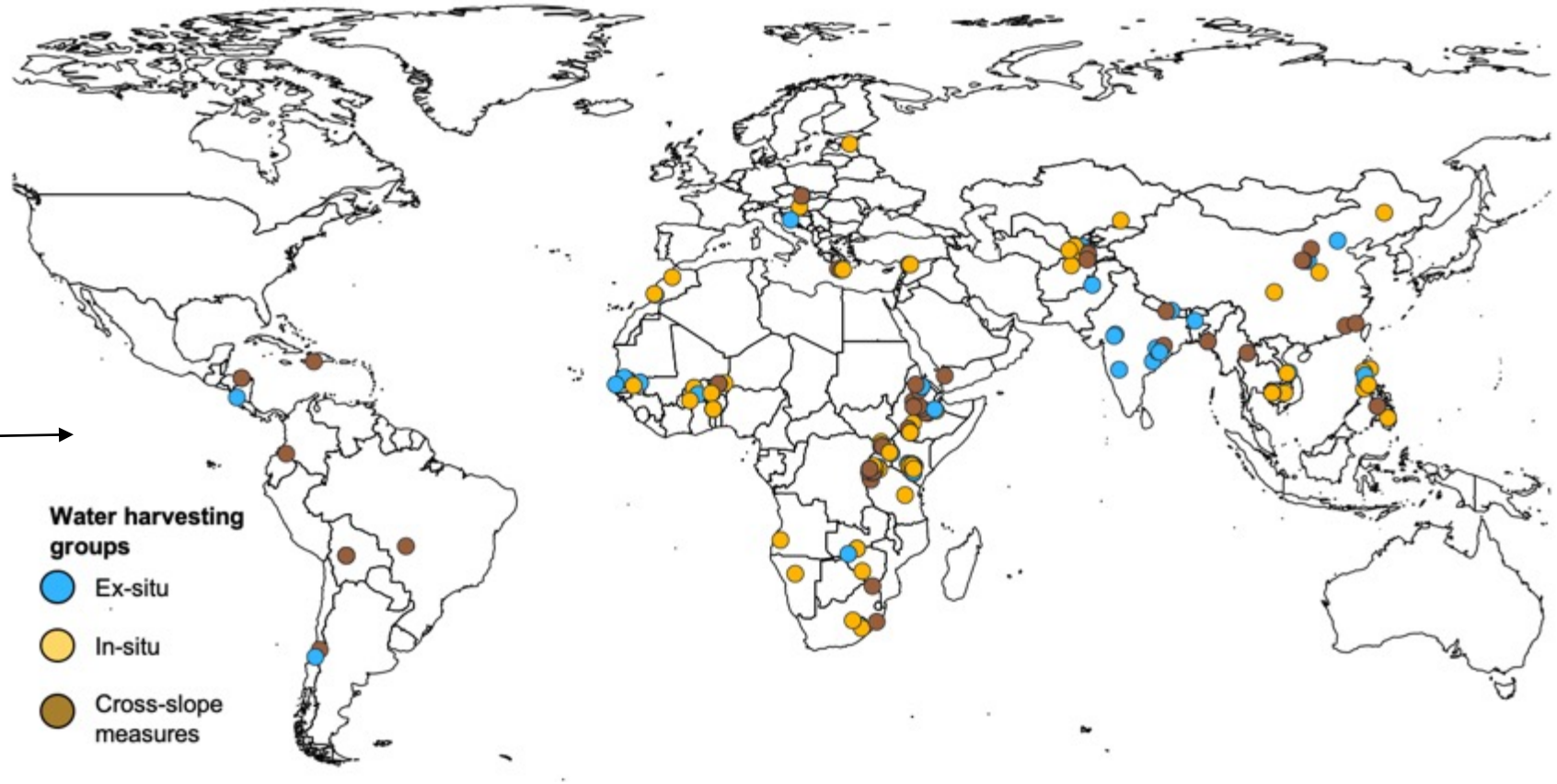
Evidence-based

WOCAT

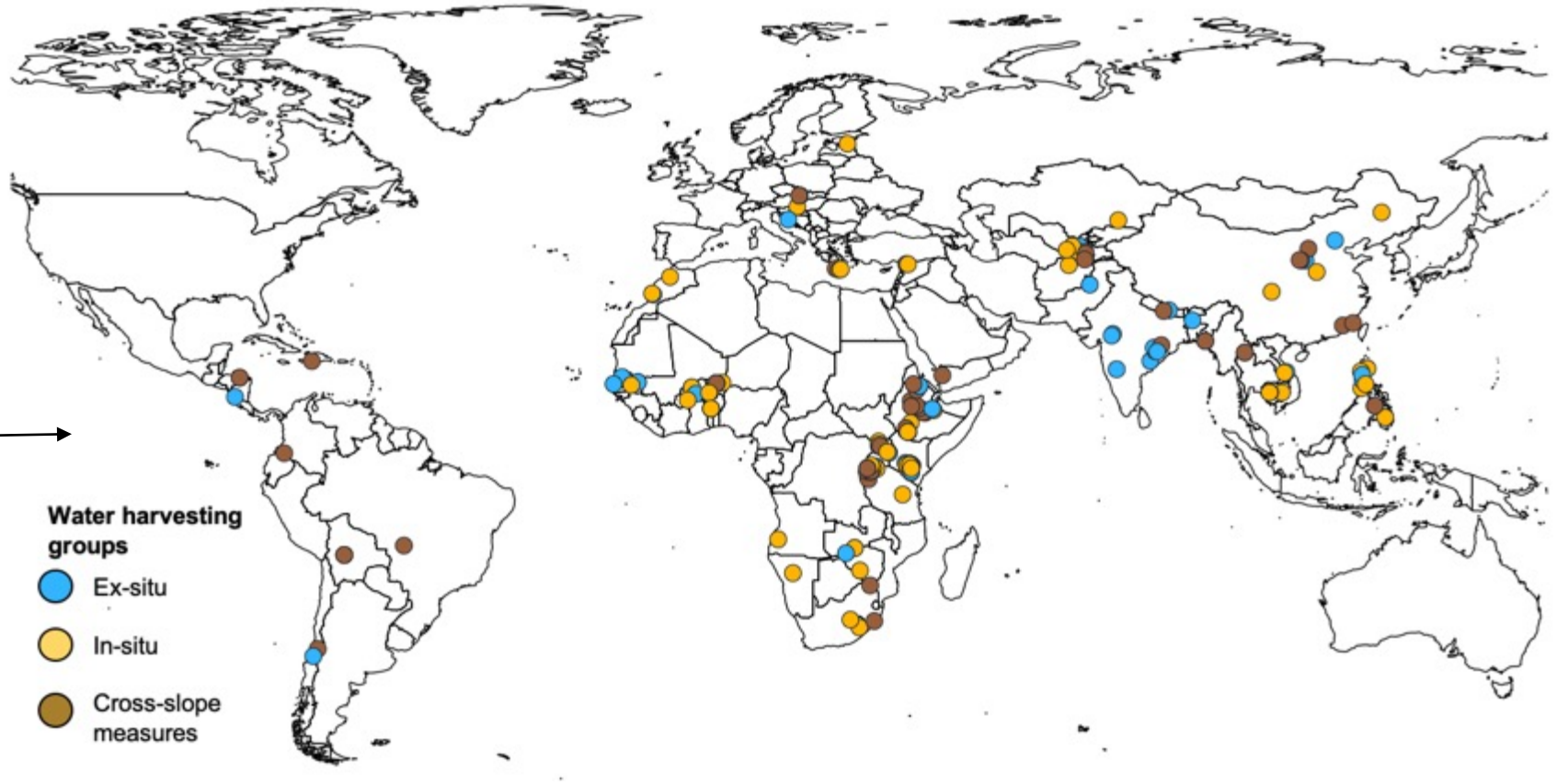
167
case studies



Evidence-based

WOCAT

167
case studies



Evidence-based

WOCAT

167
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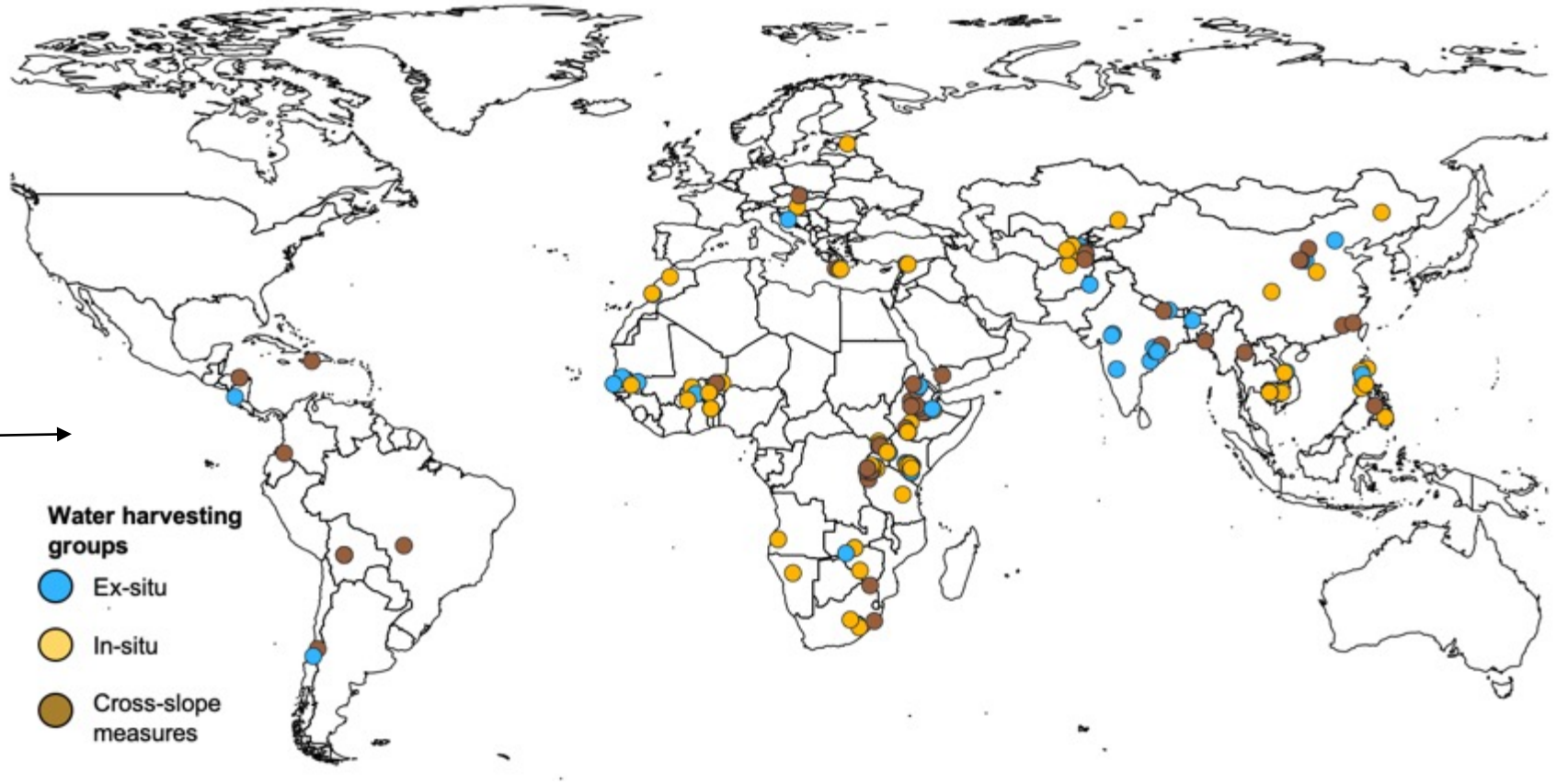

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167
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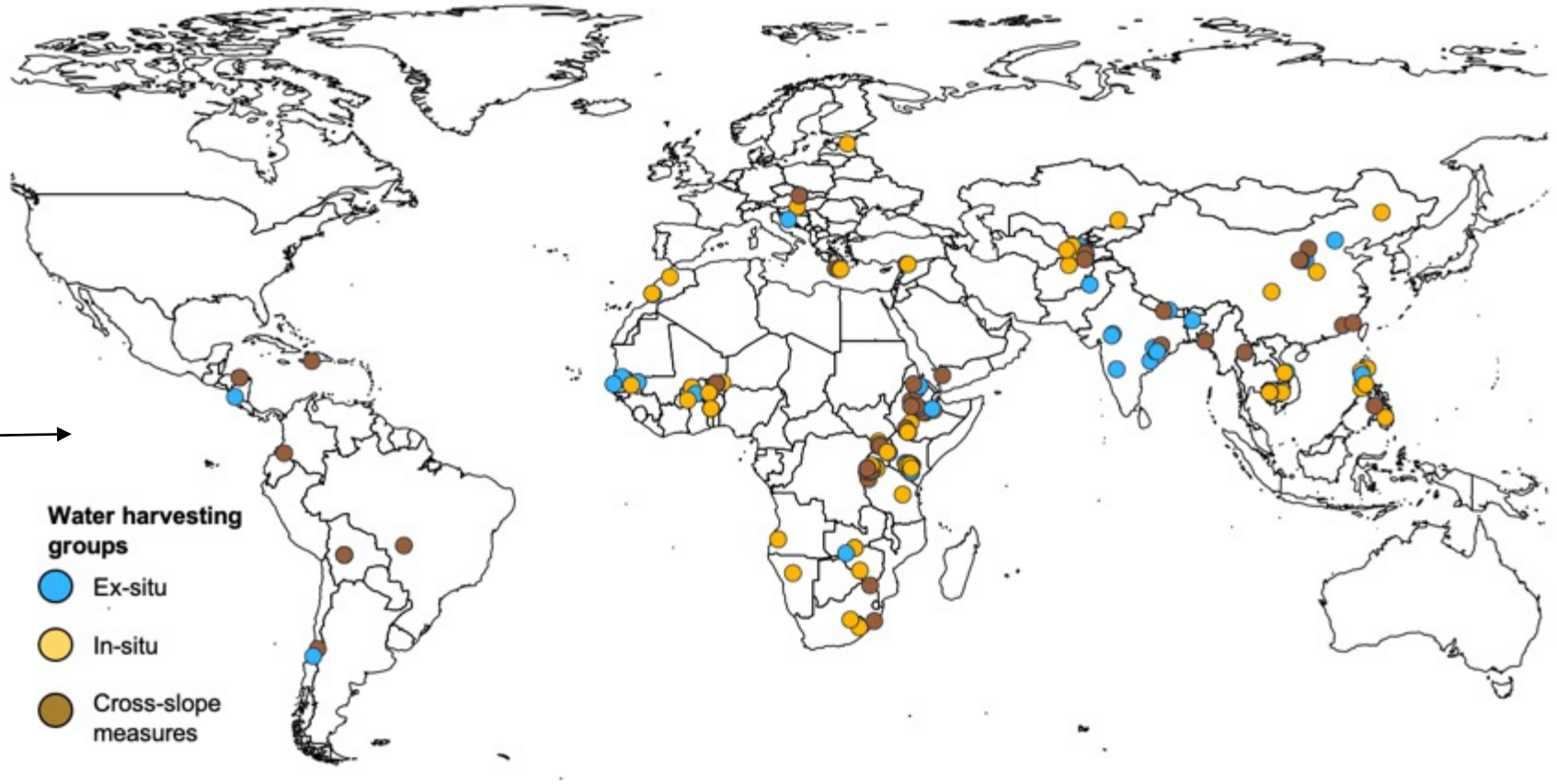

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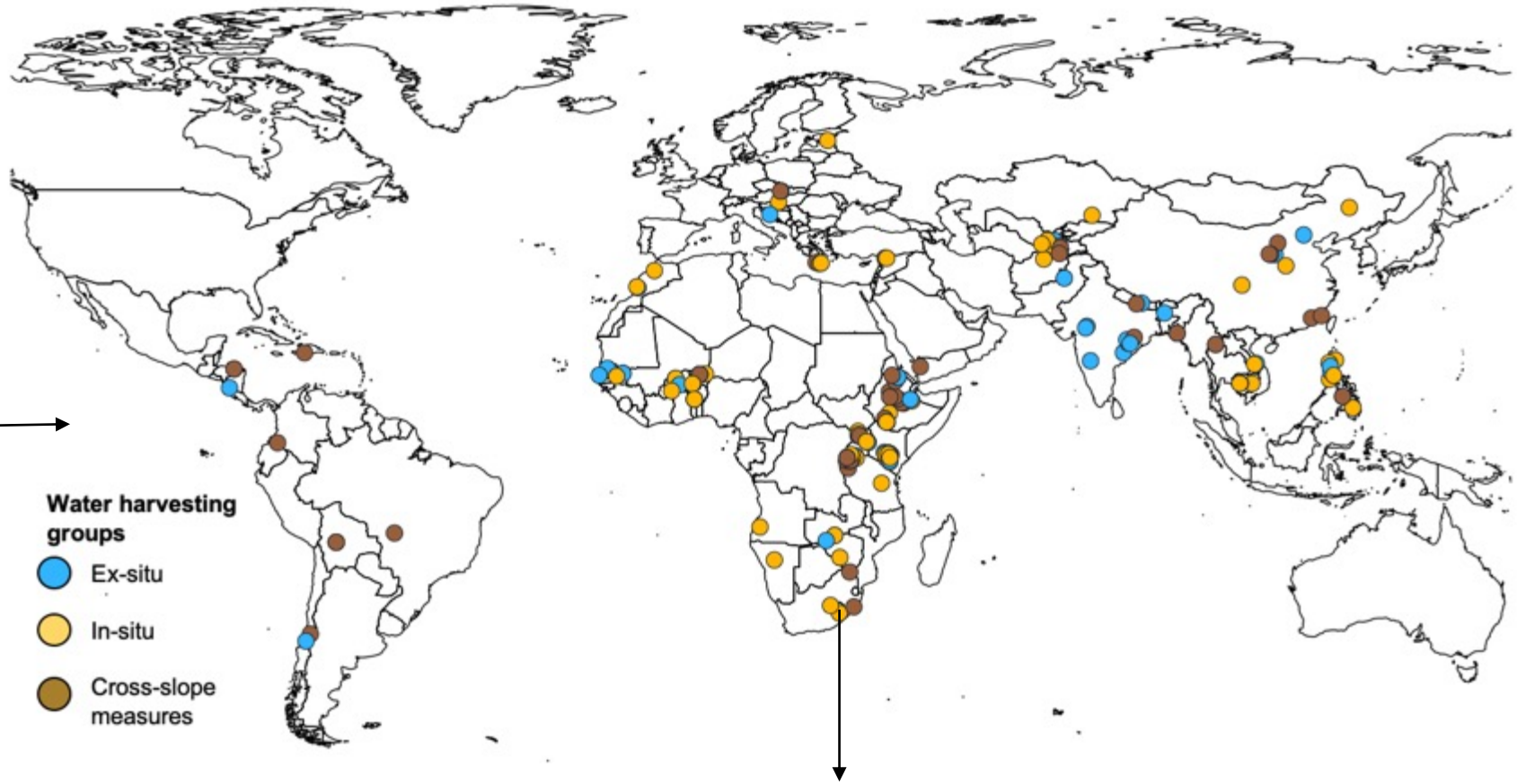

Socio-economic impacts Crop production	decreased ✓ increased	Quantity before SLM: 60 Quantity after SLM: 80 Technology reduce flood and lower lands doesnt effect by floods
irrigation water availability	decreased ✓ increased	Quantity before SLM: 20 Quantity after SLM: 25 Increasing under ground water by applying technology
farm income	decreased ✓ increased	Quantity before SLM: 0 Quantity after SLM: 50 Cultivation of cash crop in the terraces (farm income from uplands)

Evidence-based

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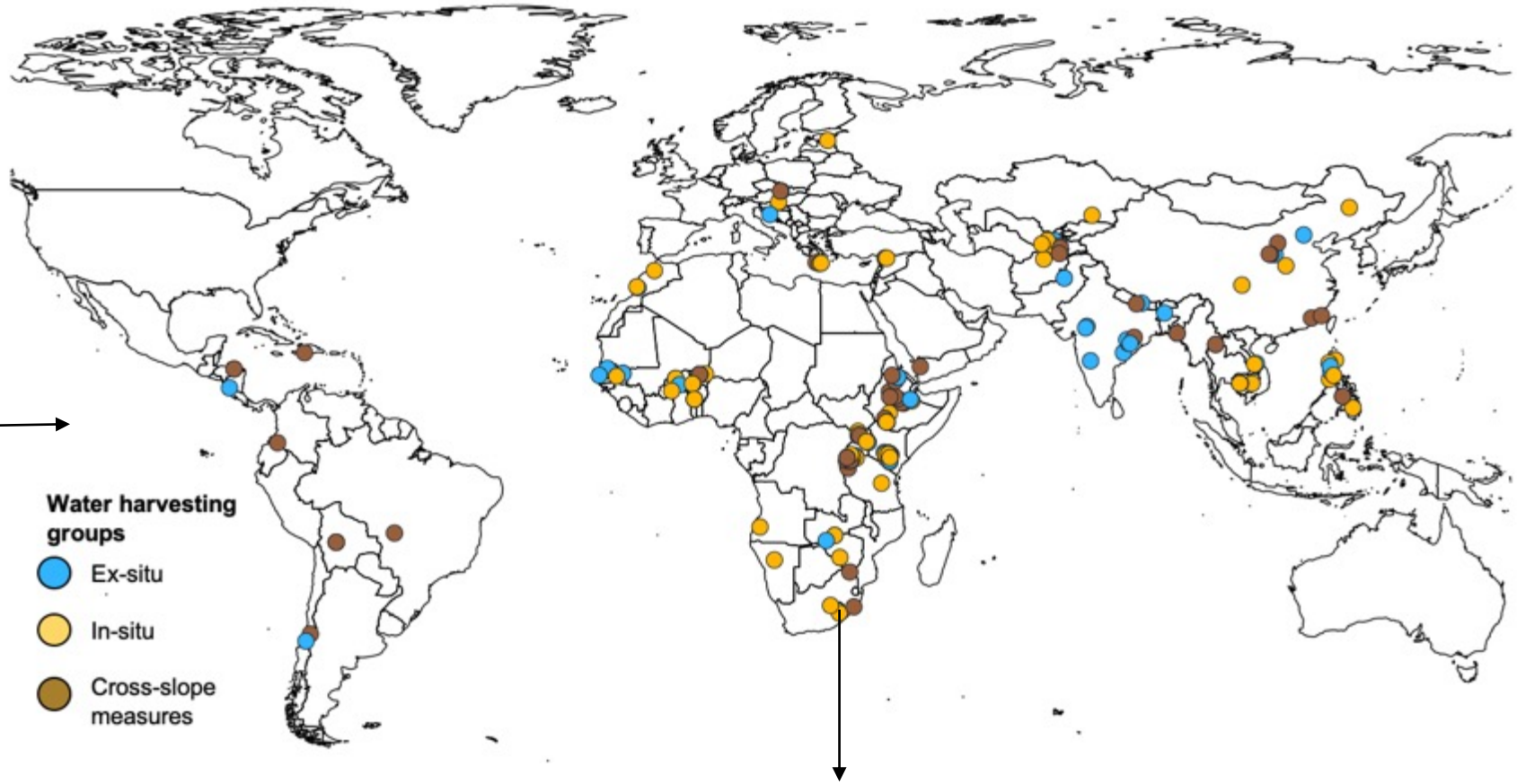
167
case studies



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Assumption:

The increase in crop production of a case study can be replicated in areas with **similar social-ecological conditions**

Archetypes approach

Identified the similar social ecological conditions across the 167 case studies based on some case studies (wocat data) and some social-ecological criteria

Social-ecological perspective

11 social-ecological criteria

- Precipitation
- Seasonality
- Aridity

Climate

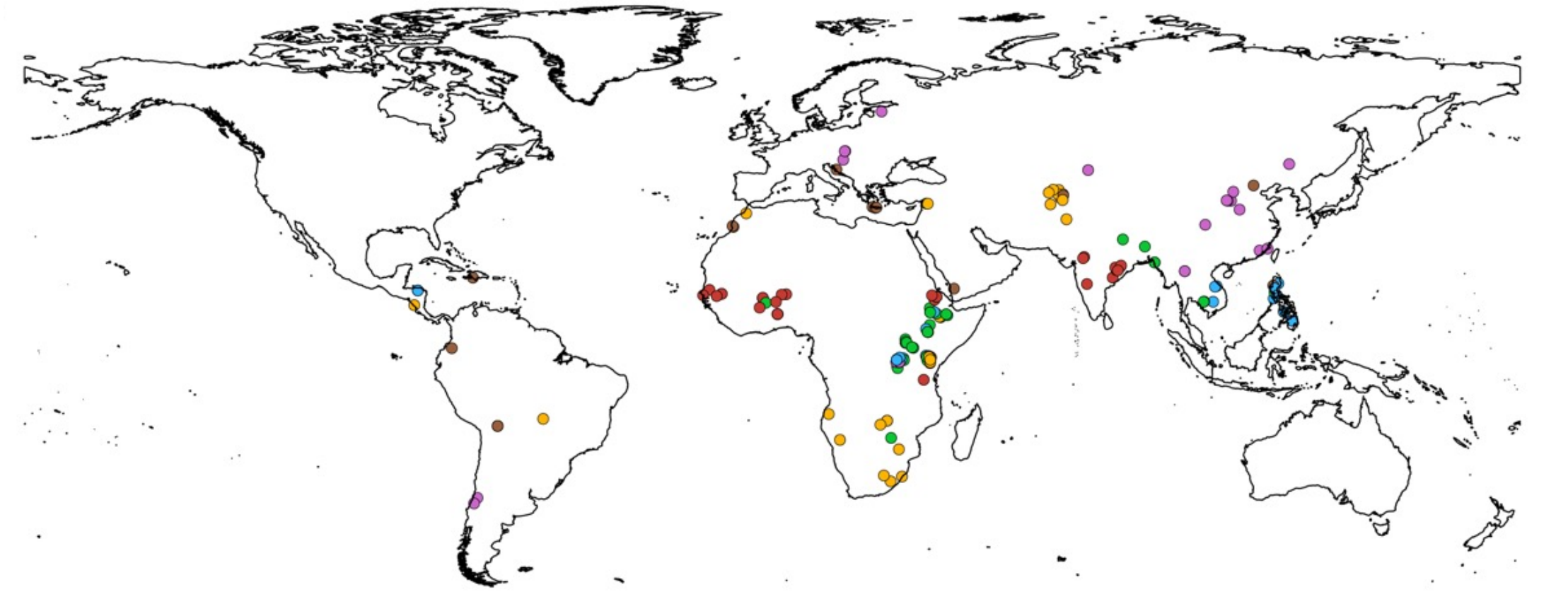
- Slope
- Soil quality
- Farm size

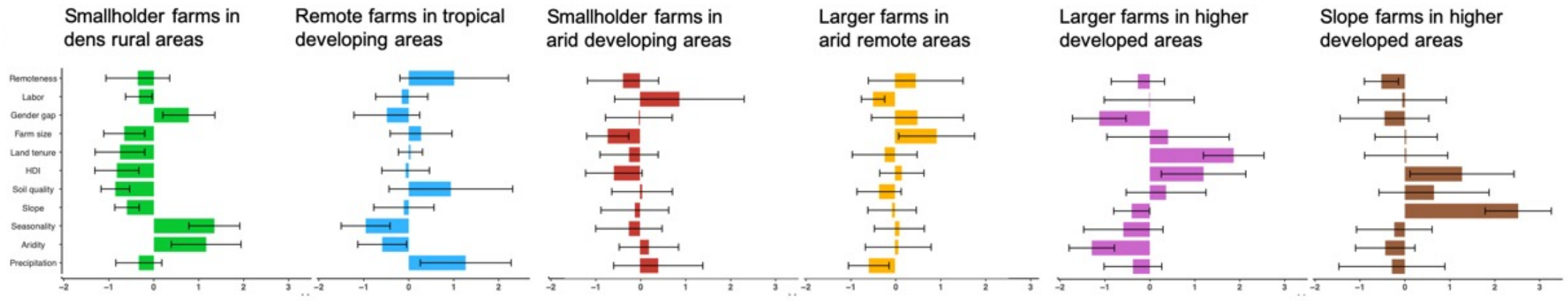
Land

- Land tenure
- Remoteness (market)
- Agricultural labor
- Human Development Index
- Gender inequality

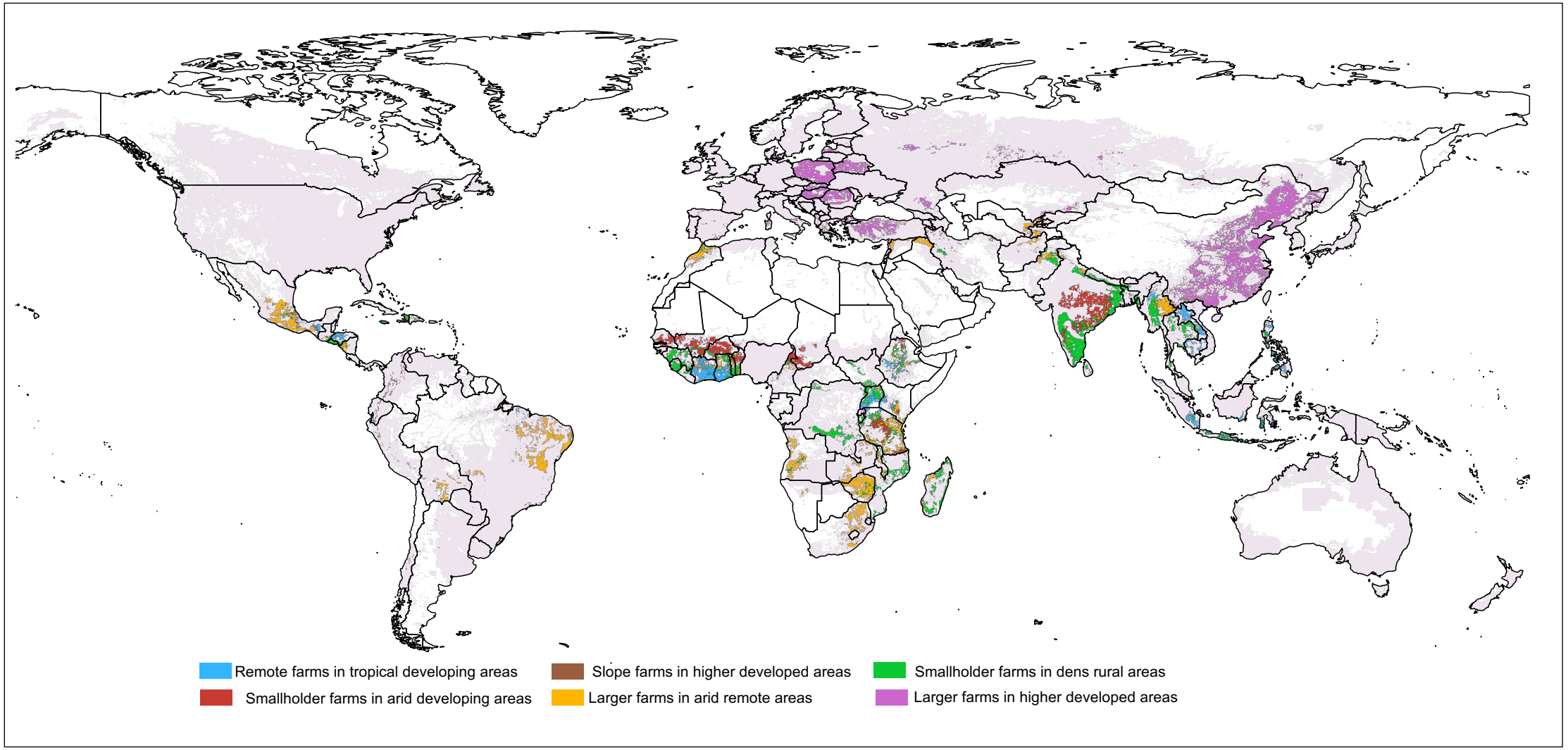
Socio-economic

Results



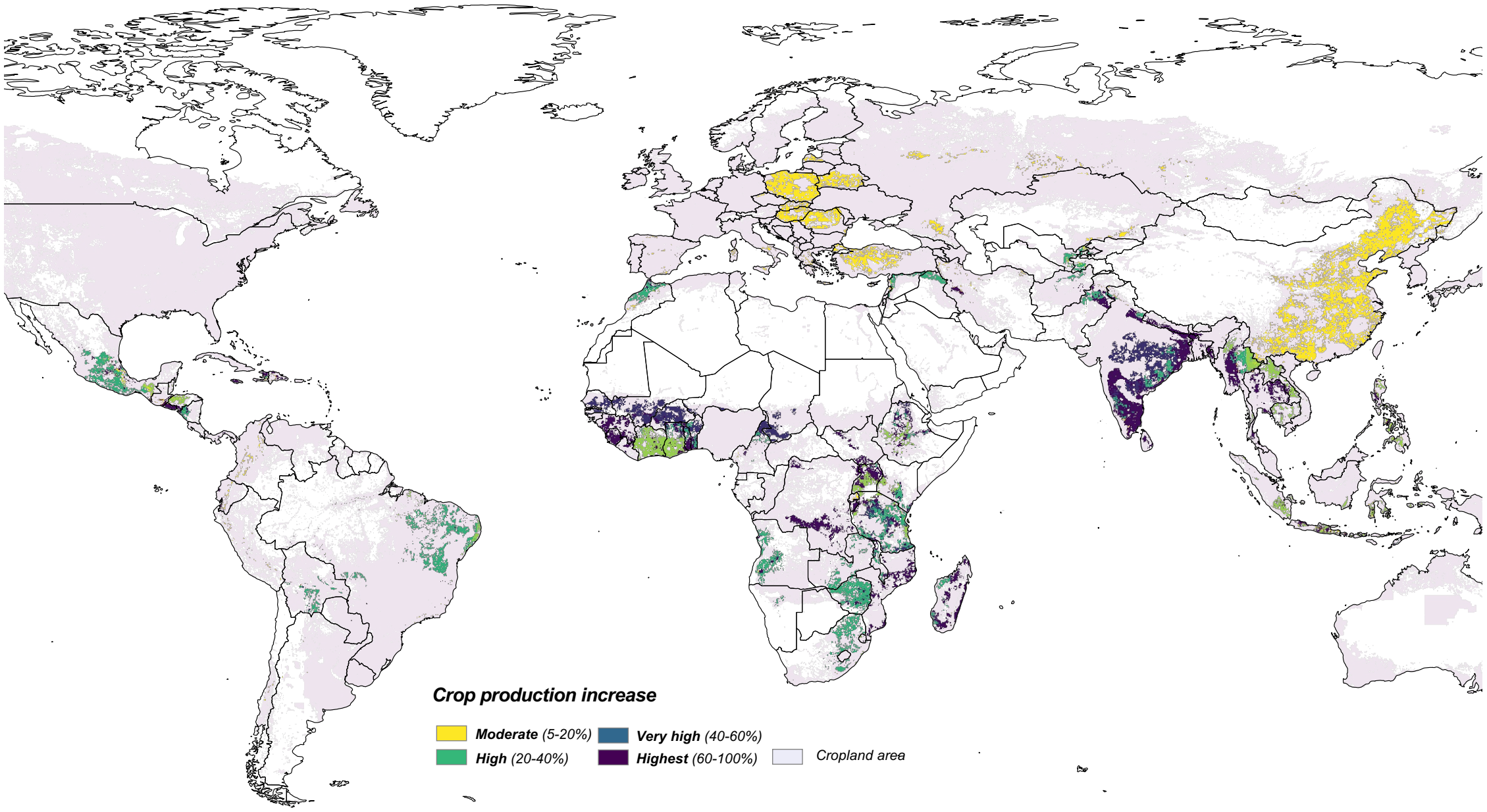

Smallholder farms in dens rural areas
Remote farms in tropical developing areas
Smallholder farms in arid developing areas
Larger farms in arid remote areas
Larger farms in higher developed areas
Slope farms in higher developed areas
Remoteness
Labor
Gender gap
Farm size
Land tenure
HDI
Soil quality
Slope
Seasonality
Aridity
Precipitation
−2
−1
0
1
2
3

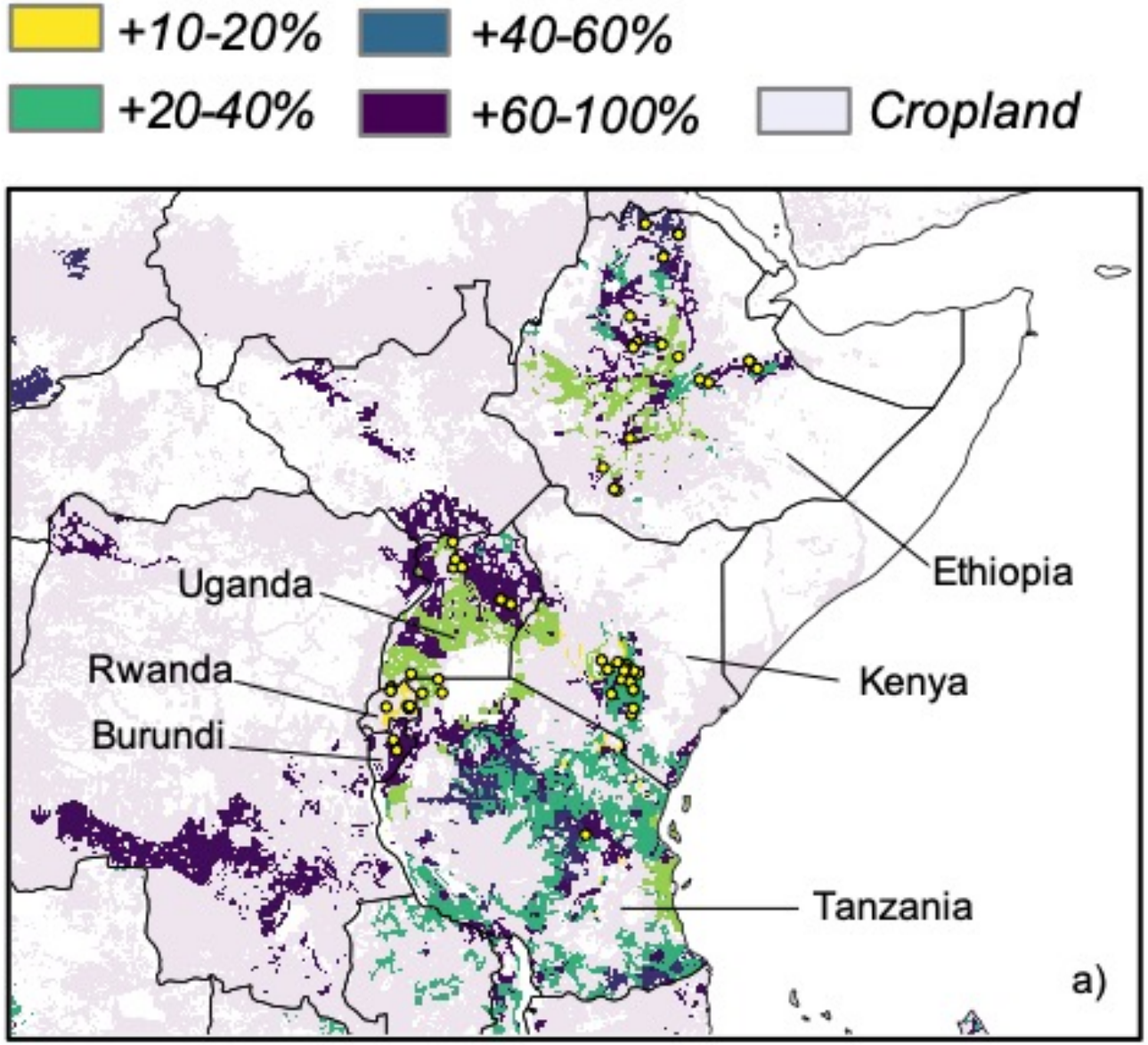
Results

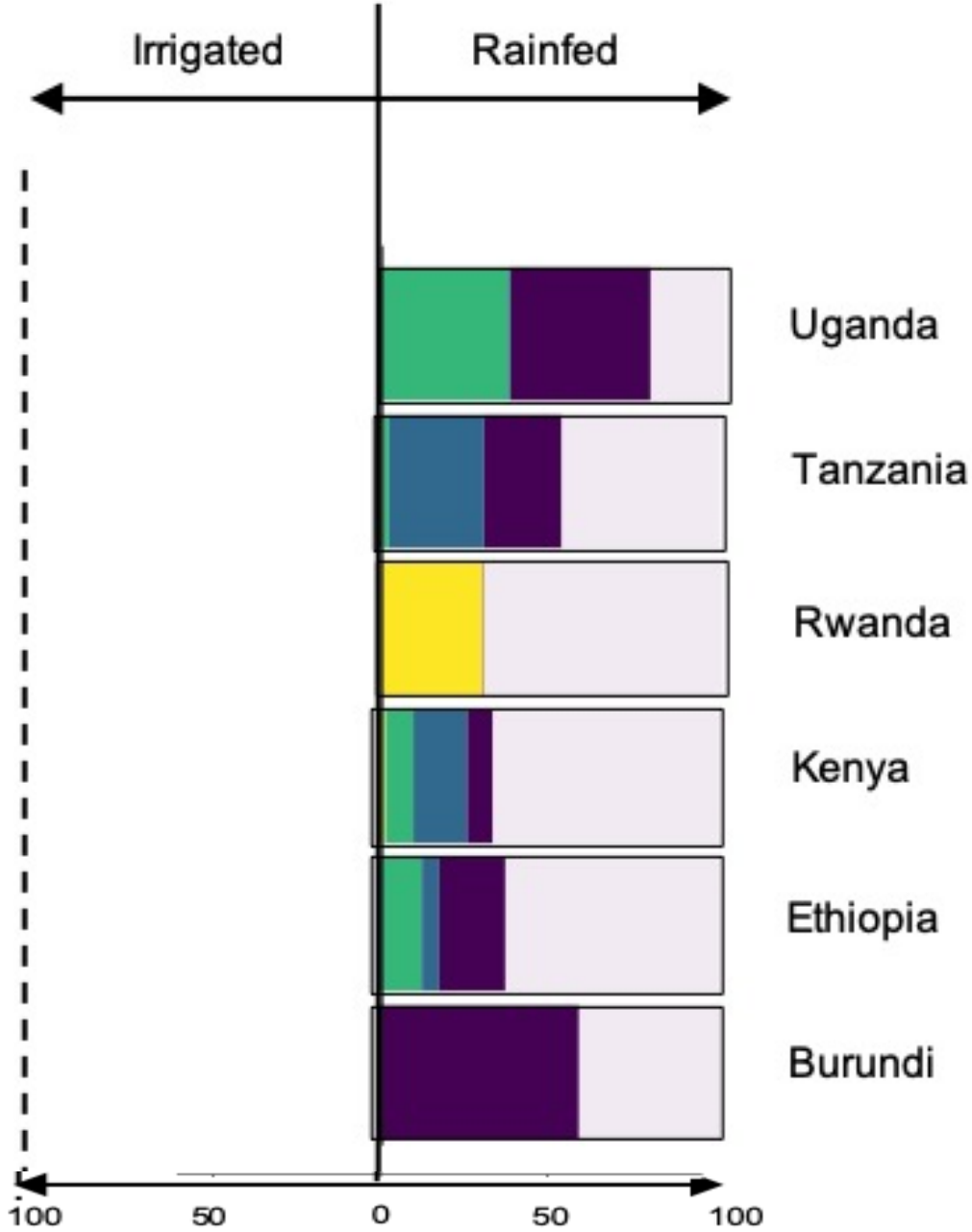


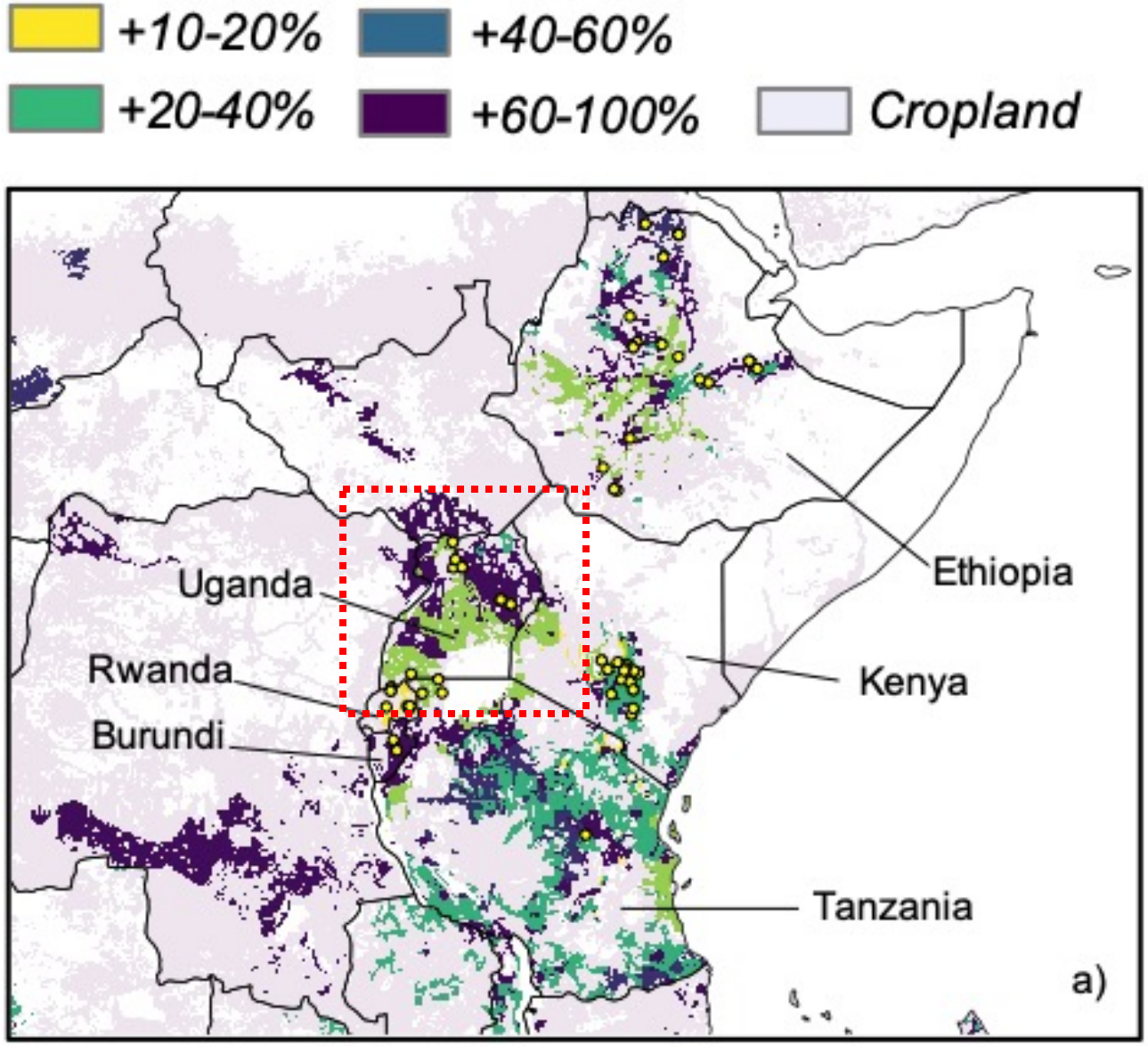
Social-ecological regions for the transferability of WH case studies

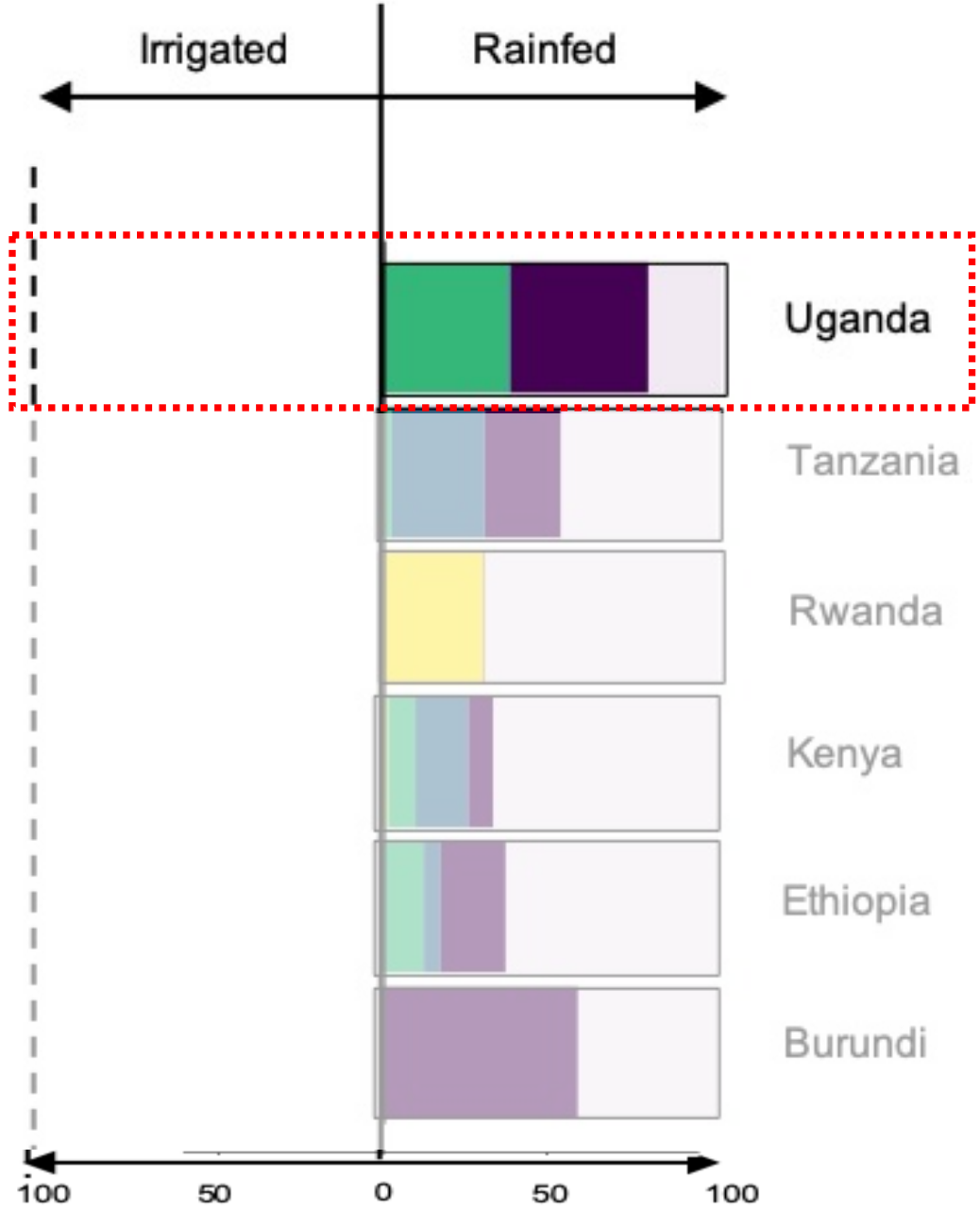
19% of global agricultural land


Crop production increase
Moderate (5-20%)
High (20-40%)
Very high (40-60%)
Highest (60-100%)
Cropland area


+10-20%
+40-60%
+20-40%
+60-100%
Cropland
Uganda
Rwanda
Burundi
Ethiopia
Kenya
Tanzania
a)


Irrigated
Rainfed
Uganda
Tanzania
Rwanda
Kenya
Ethiopia
Burundi
100
50
0
50
100


+10-20%
+40-60%
+20-40%
+60-100%
Cropland
Uganda
Rwanda
Burundi
Ethiopia
Kenya
Tanzania
a)


Irrigated
Rainfed
Uganda
Tanzania
Rwanda
Kenya
Ethiopia
Burundi
100
50
0
50
100

Article 2

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ENVIRONMENTAL RESEARCH
LETTERS

LETTER

Investing in sustainable intensification for smallholders: quantifying large-scale costs and benefits in Uganda

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Keywords: Uganda, agriculture, sustainable intensification, archetype analysis, smallholder farming, sustainability science

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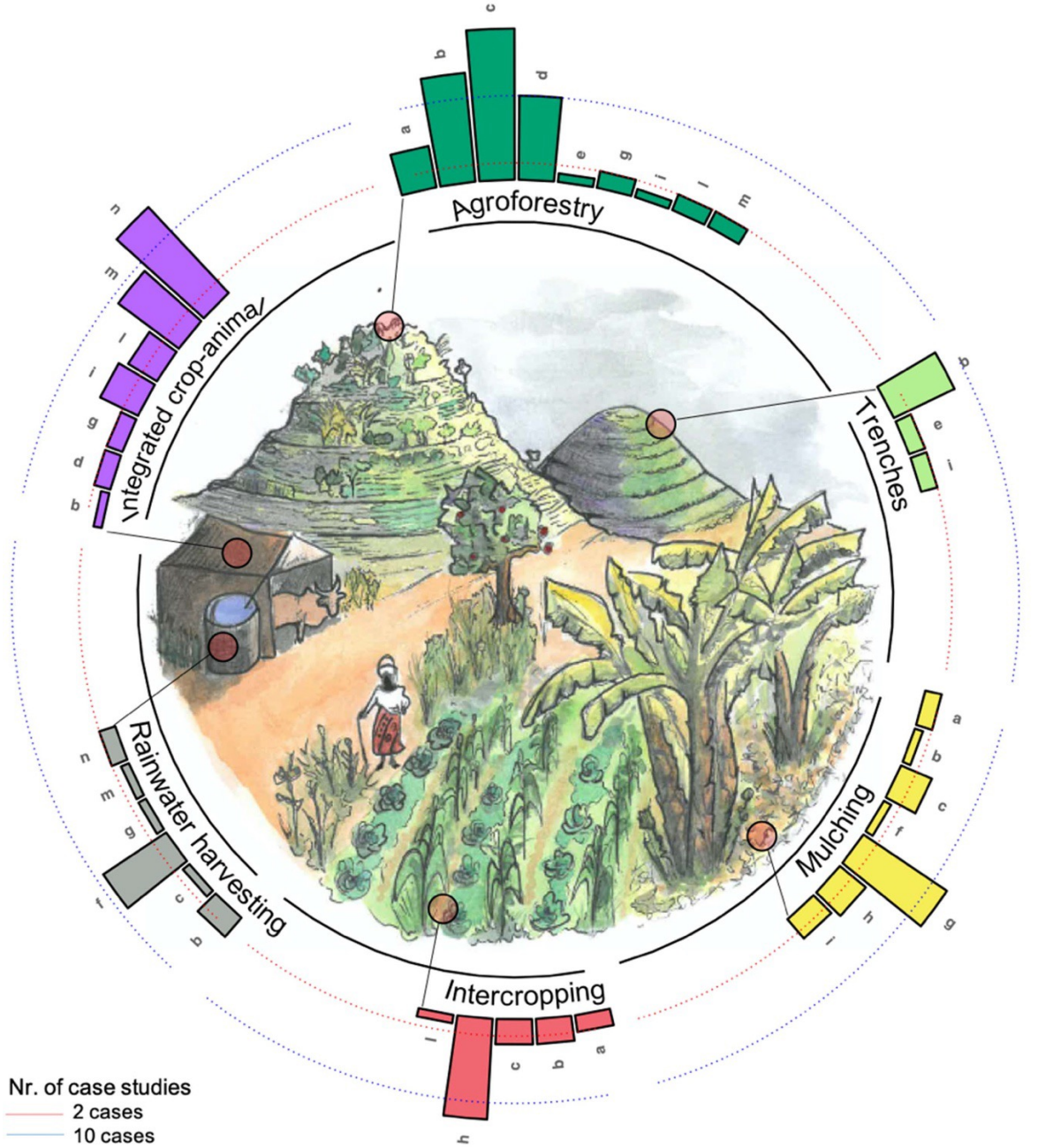
Similar Archetype approach

- 82 cases of combined SLWM practices in Uganda (about 50 from WOCAT and 30 from field interviews)
- Bundle of practices -> Recurrent combination of practices
- Spatial archetypes -> spatial domain of transferability

Statistical method

- Hierarchical clustering (bundles and spatial)

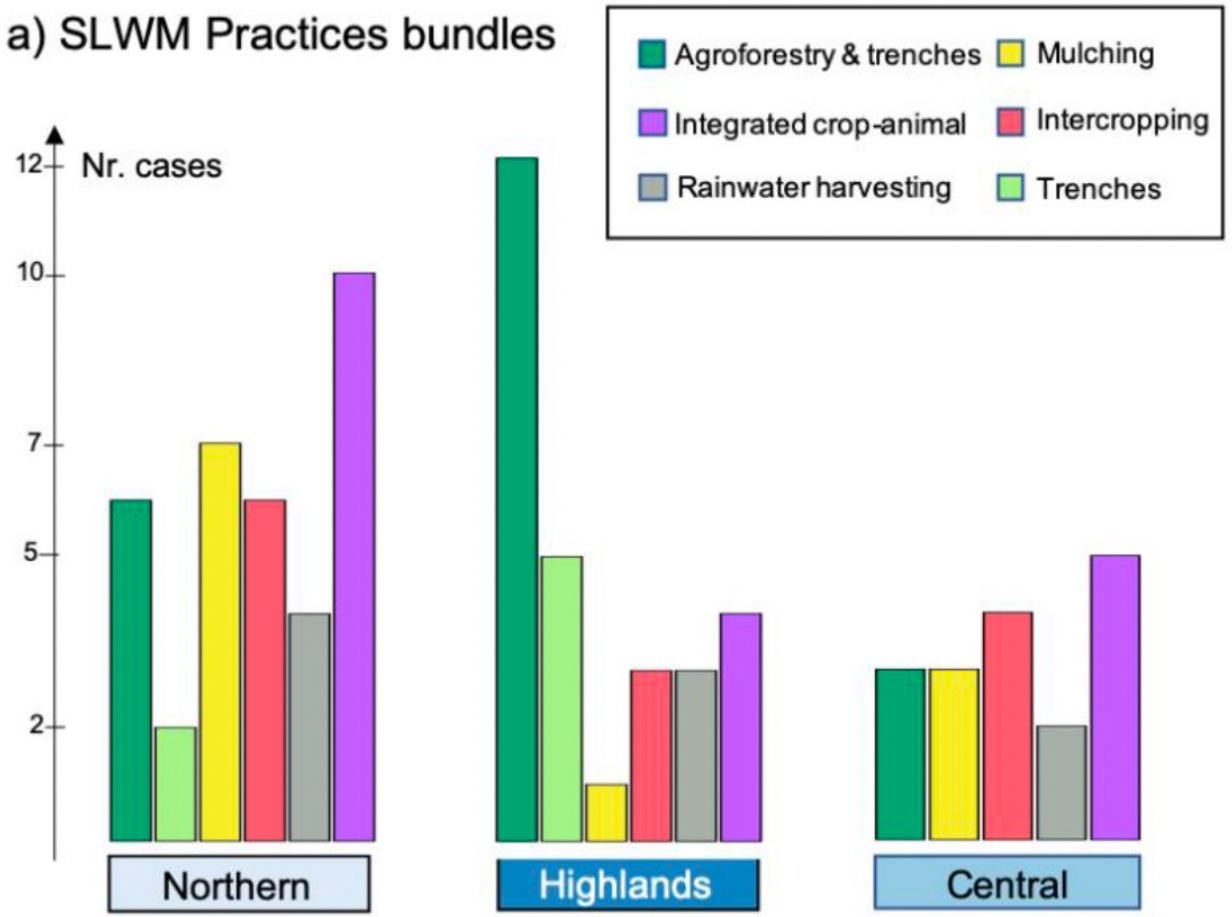


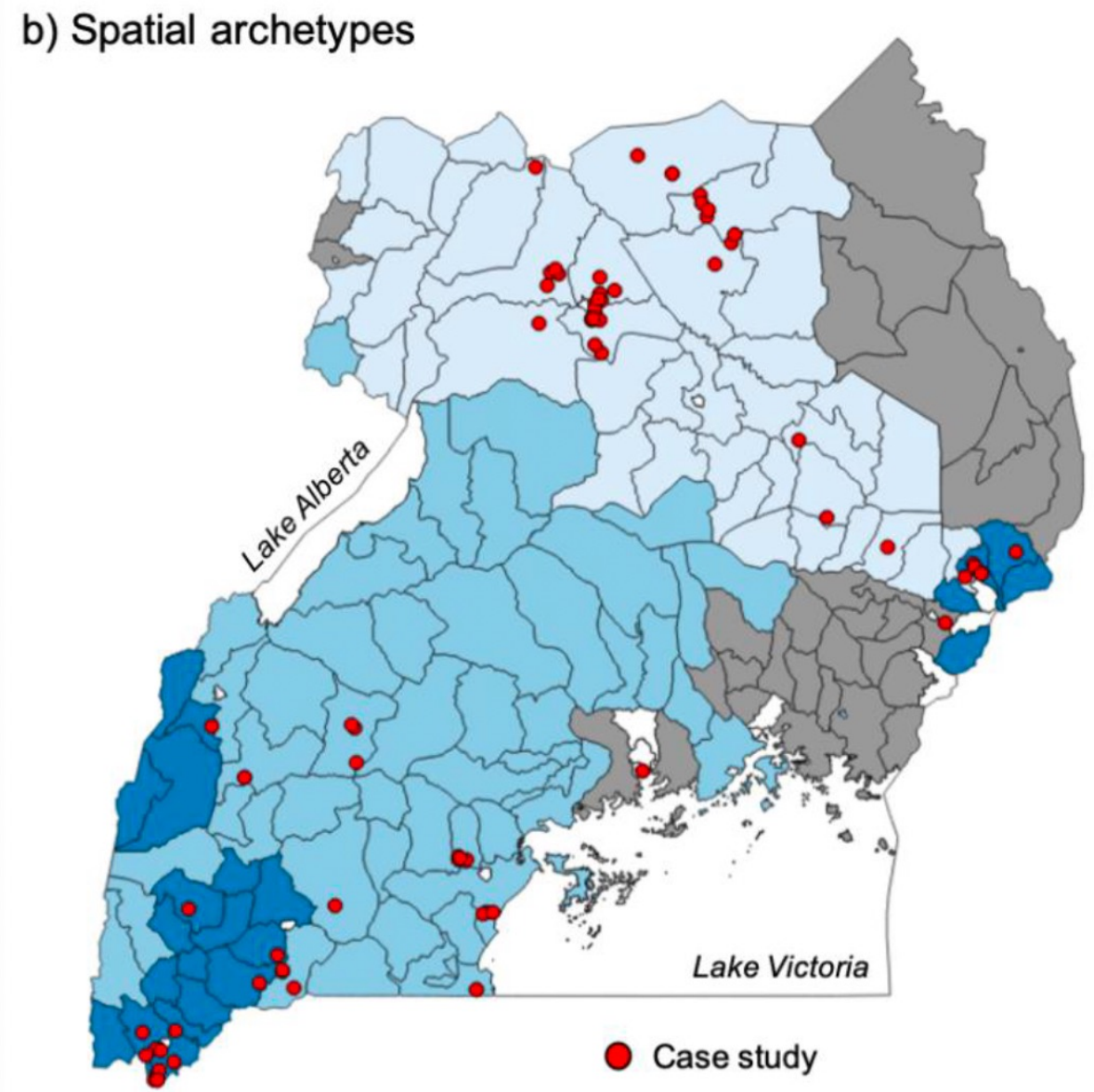
INDIVIDUAL SLWM PRACTICES

a) Terraces b) Trenches c) Agroforestry d) Grass strips e) Check dam f) Water harvesting g) Mulching h) Intercropping i) Conservation l) Zero grazing m) Manure n) Integrated crop-animal

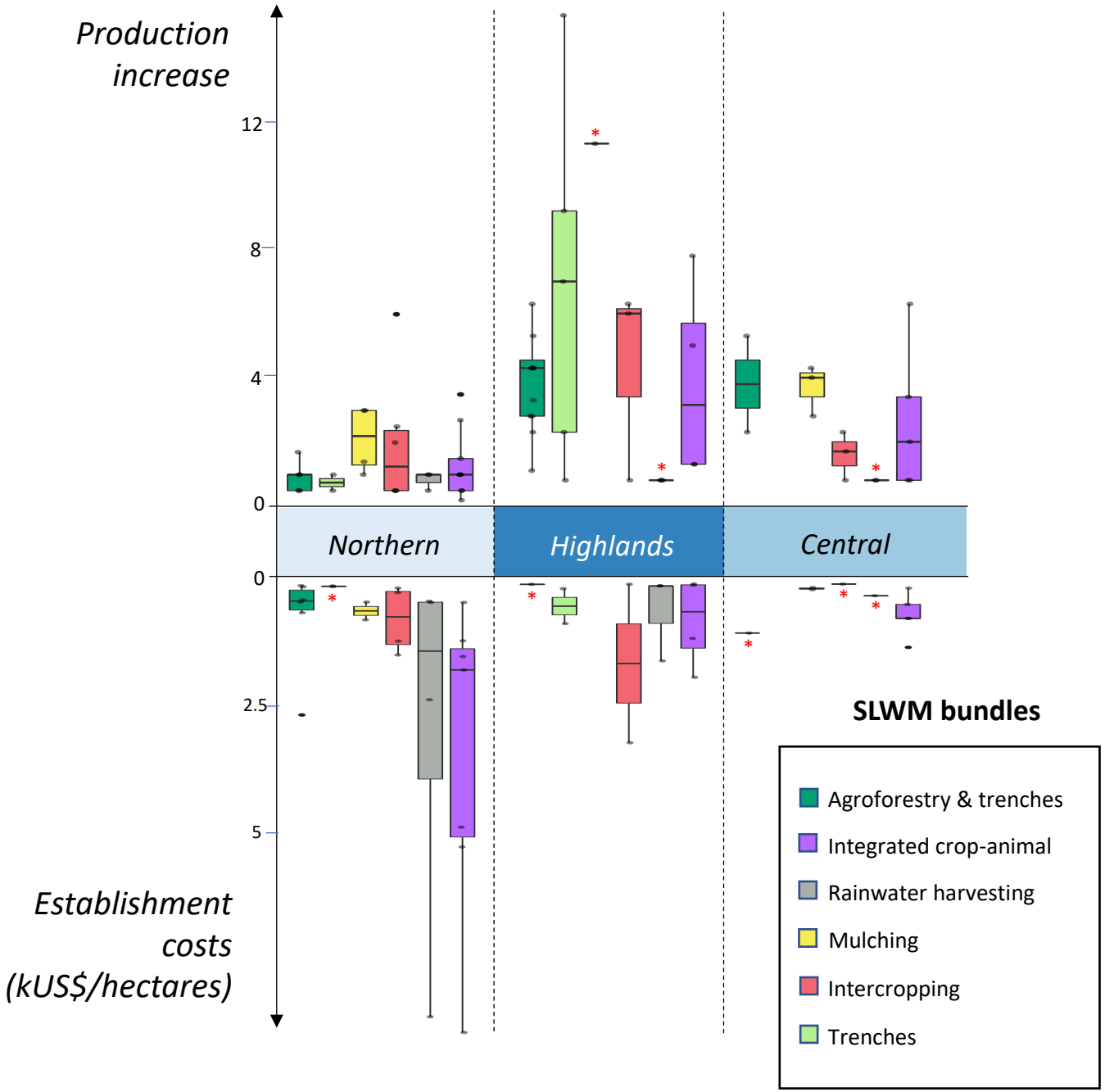
6 PRACTICES BUNDLES

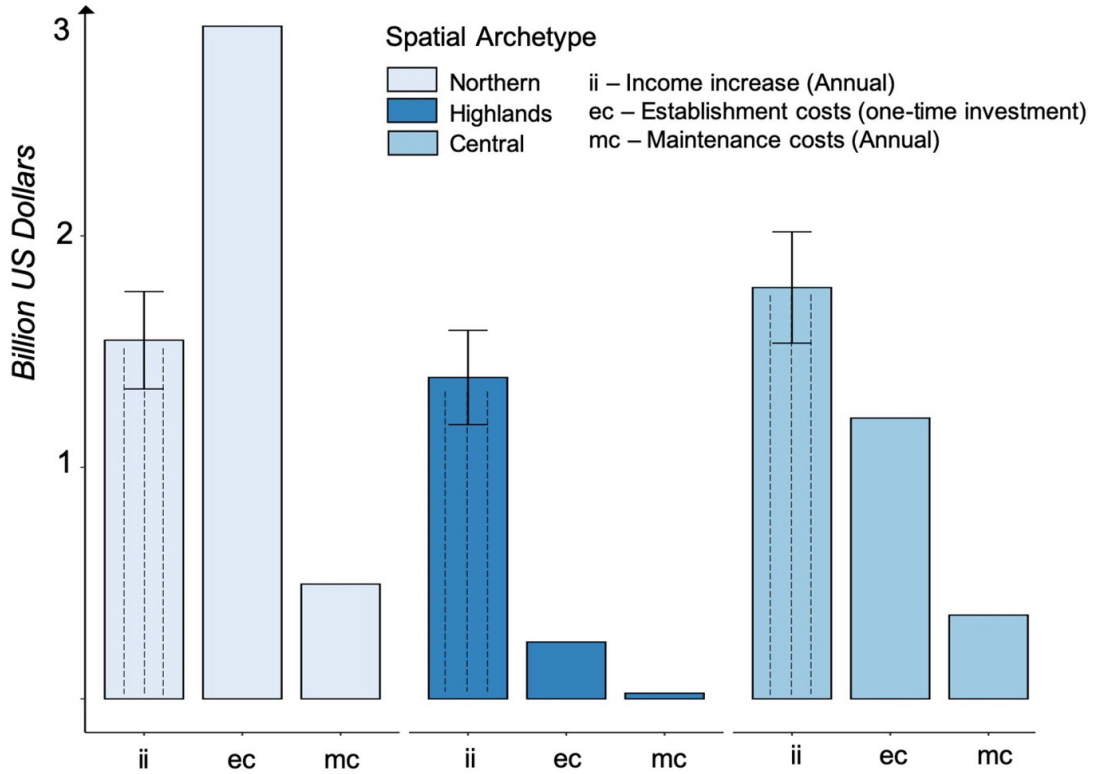
We identified the SLWM practices that WERE most often implemented together (*Hierarchical clustering*)





Clustering district with similar social-ecological conditions


Production increase
12
8
4
0
0
2.5
5
Establishment costs (kUS$/hectares)
Northern
Highlands
Central
SLWM bundles
Agroforestry & trenches
Integrated crop-animal
Rainwater harvesting
Mulching
Intercropping
Trenches


Billion US Dollars
3
2
1
Spatial Archetype
Northern
Highlands
Central
ii – Income increase (Annual)
ec – Establishment costs (one-time investment)
mc – Maintenance costs (Annual)
ii
ec
mc
ii
ec
mc
ii
ec
mc

Conclusions

- Useful tool for information on:
  - Specific technologies (technical drawings, materials etc.)
  - Extent/type of technologies in specific countries
  - Pre-post implementation assessments (costs, benefits)

- Geographical gaps (Americas and Europe)
- Qualitative information > Quantitative

Thanks!

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Youtube: Water Harvesting Lab – UNIFI

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