BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

Biodiversity and Resilience of
Agroecosystems workshop
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Socio-economic dimensions of biodiversity conservation initiatives in agricultural landscapes

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This talk

- Seed system resilience
- Natural Insurance value
- Diversitas landscape approach
- Economic incentives and equity
- Directions of further research

Assumptions for a resilience centred ecologicval economic approach

- Social Ecological systems (SESs) may contain thresholds and can exhibit non-linearities
- We are often dealing with uncertainty-ignorance beyond probabilistic risk
- Agents are boundedly rational
- Well-defined property rights do not exist for many key ecosystem services
- Market imperfections are the norm rather than the exception
- Agents hold preferences, over the social, economic, and political processes → Expert solutions rarely maximize legitimacy

Walker et al (2002) **Resilience Management in Social-ecological Systems: a Working Hypothesis for a Participatory Approach.** *Conservation Ecology,* **6**(1)

Cross scale resilience in agrobiodiversity reseach

GOVERNANCE

FAIRNESS

Seed system

Landscape system

ECONOMICS

Farm system

Resilience, food security and ecosystem services

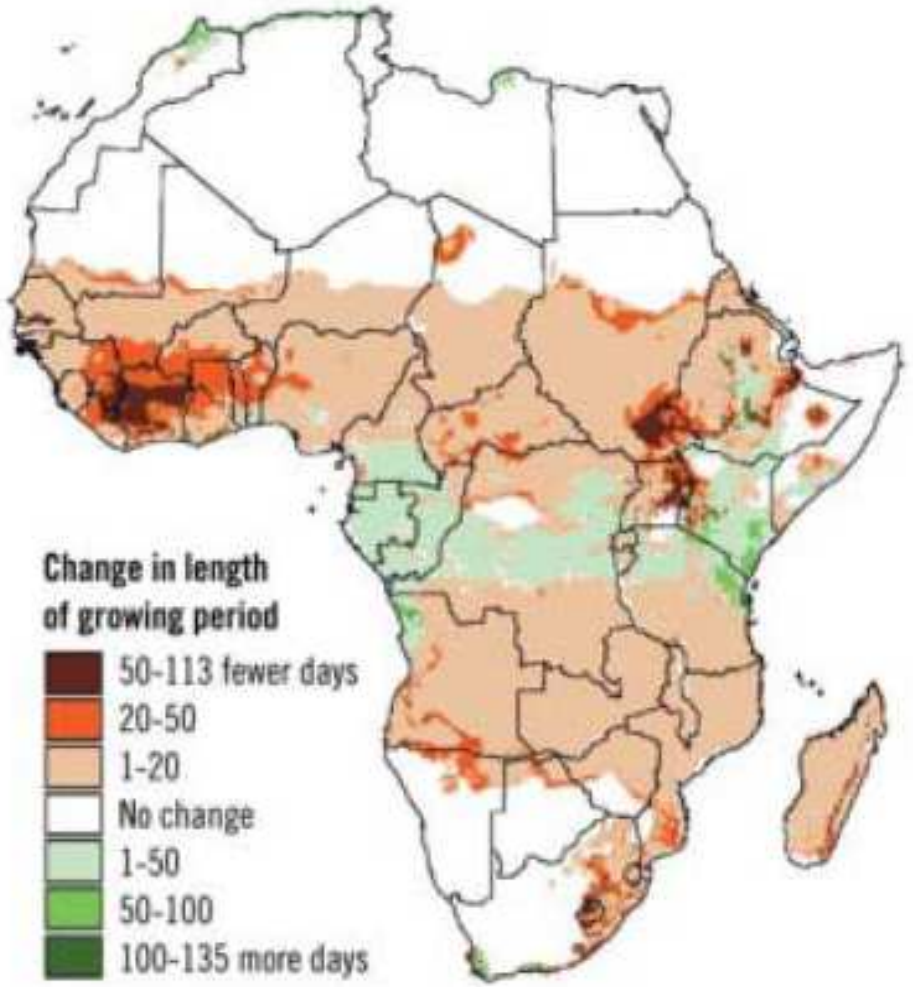
- 900 million people live with chronic hunger globally
- Less a problem of inadequate food supplies but of lack of purchasing power to buy food
- Resilience research for ensuring food security and multiple ecosystem services



Resilience and Vulnerability

FIGURE 1.2 CLIMATE CHANGE AND FOOD SECURITY

Changes in Projected Growing Season, 2000-2050



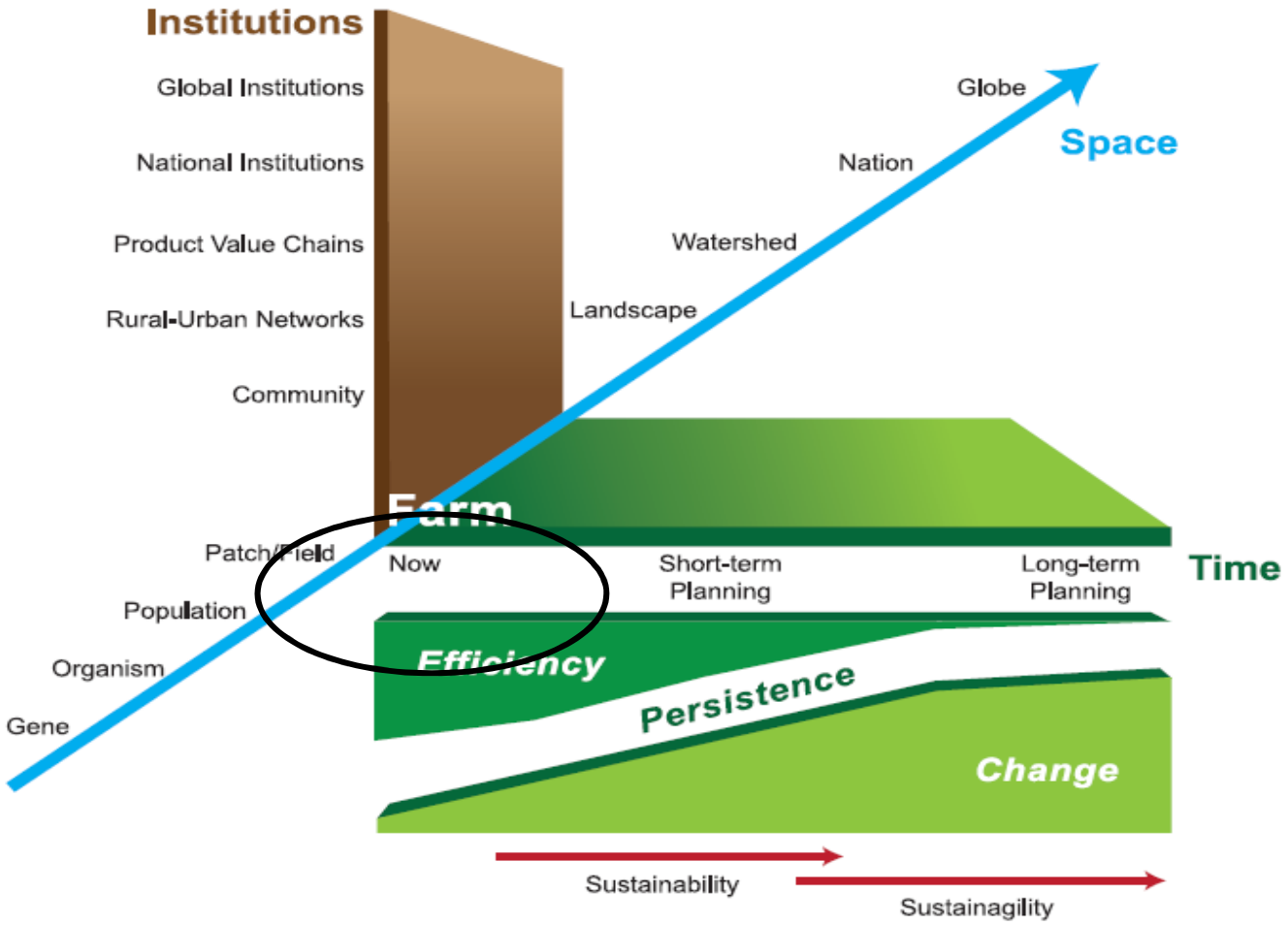
Source: Thornton et al. 2002:89

LDCs may experience around 10% decrease in lands suitable for rainfed agriculture by 2080 due to climate change

Interventions needed for adaptation and resilience

Reduction of social vulnerability through the extension and consolidation of social networks (Tompkins and Adger, 2004)

Planning for biodiversity based transformation of agriculture in the face of global change



(Jackson et al., 2010, Curr Opinion Env Sci 2: 80)

Using efficiency frontiers as risk management tools

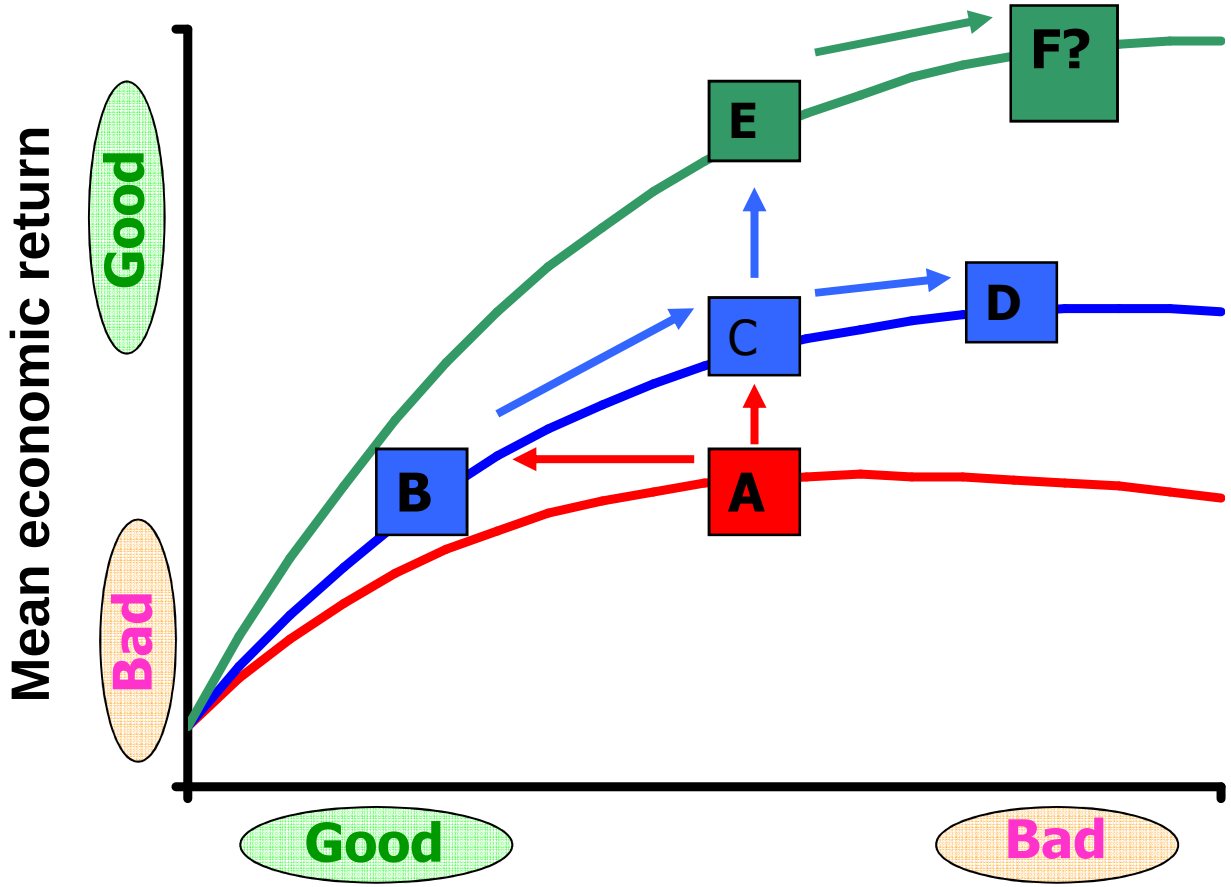
Pathways for productivity improvement

(i) Using enabling technologies to maintain current productivity but reduce risk (A to B)

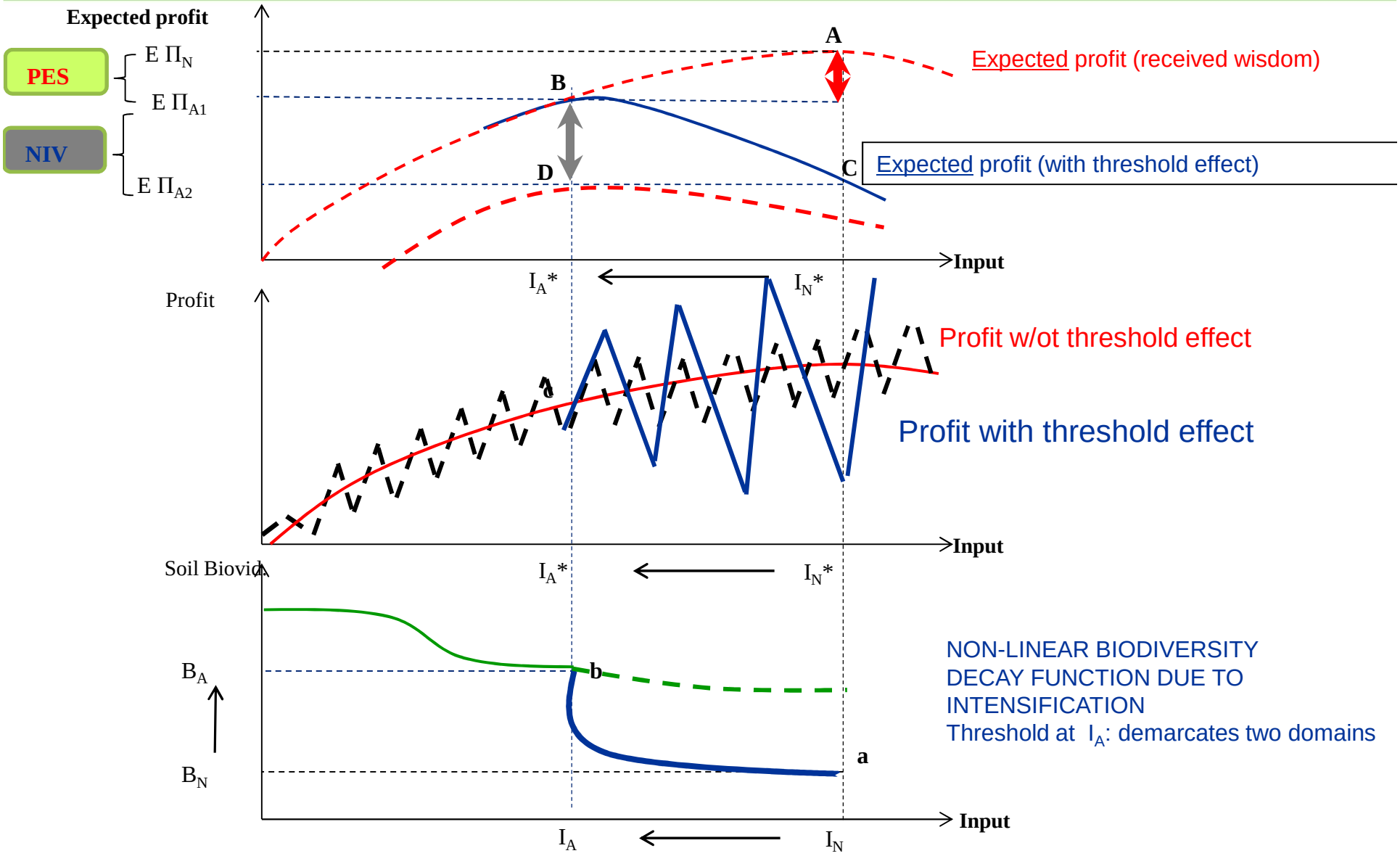
(ii) Addressing system in-efficiencies at "constant risk" (A to C)

(iii) Moving along the new efficiency frontier (C to D)

(iv) Lifting productivity to a new level through transformational technologies (C to E)



Keating et al., 2010, Crop Science, 50, 109-119.


Expected profit
PES
E Π_N
E Π_A1
NIV
E Π_A2
A
B
D
C
Expected profit (received wisdom)
Expected profit (with threshold effect)
Input
I_A*
I_N*
Profit
Profit w/o threshold effect
Profit with threshold effect
Input
Soil Biovid
I_A*
I_N*
B_A
B_N
b
a
NON-LINEAR BIODIVERSITY DECAY FUNCTION DUE TO INTENSIFICATION
Threshold at I_A: demarcates two domains
Input
I_A
I_N

Seed system resilience

Seed system resilience

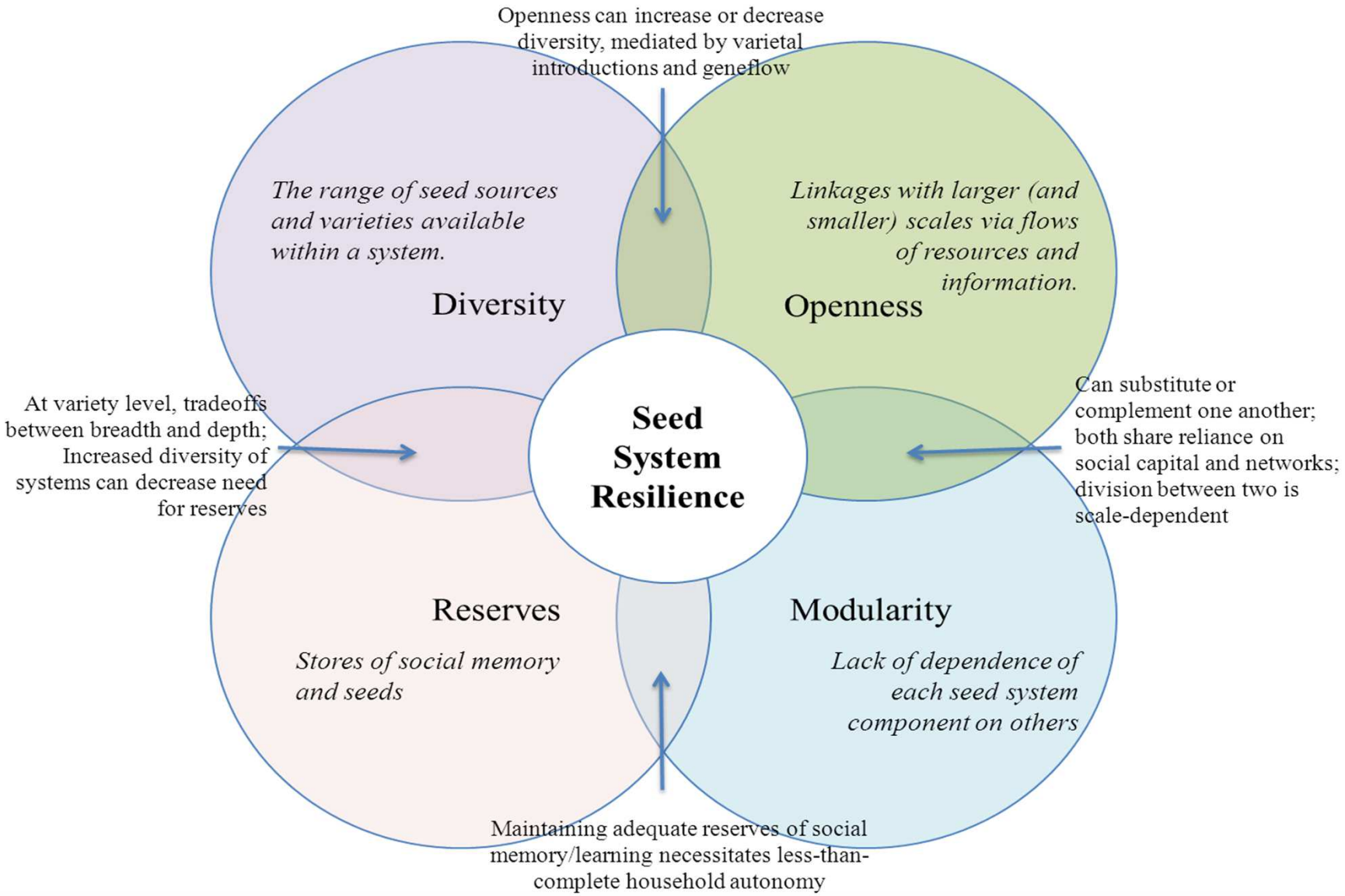
- Crucial for agbio conservation and food security
- It comprises many sources: own harvest, personal exchanges, informal markets, private seed companies, public procurement…
- Provide *natural insurance* in the face of rapid global economic and environmental change leading to shifts in growing conditions around the world
  - → need enabling institutions for cross-geographic exchanges of planting materials and local knowledge

Seed resilience

- Seed systems are prone to shocks (e.g., droughts, bottlenecks in supply) and must respond to slow stresses (e.g., changes in crop variety demand)

- Problem: Tendency towards greater centralisation and ‘control’ of seed systems, replacing social capital with financial capital.

- Key characteristics of seed system resilience:
  - **diversity** of sources and planting materials
  - **openness** of seed networks
  - **reserves** of planting materials and knowledge
  - **autonomy/modularity** and connectedness between individuals/institutions within scales

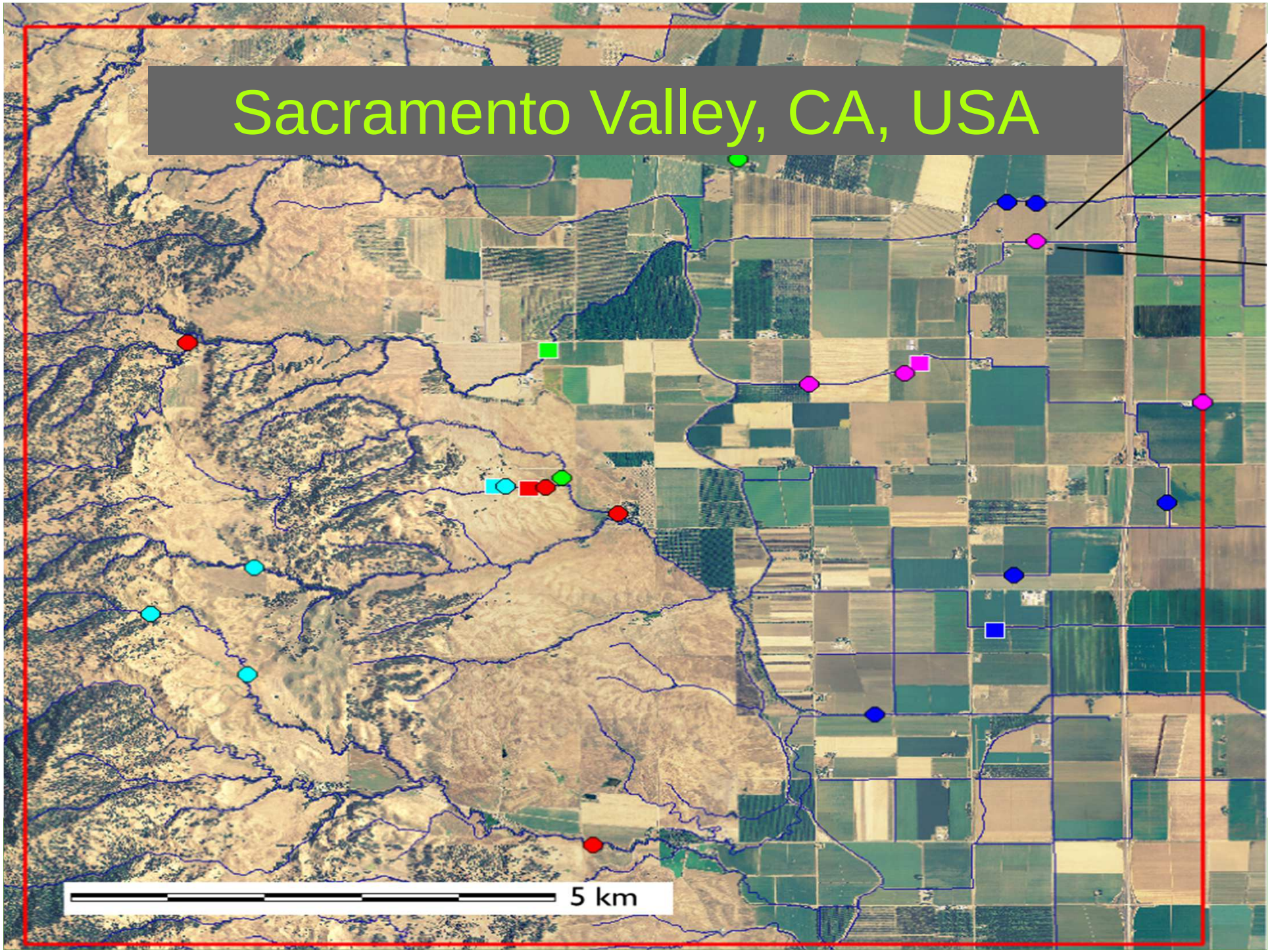

Openness can increase or decrease diversity, mediated by varietal introductions and geneflow
The range of seed sources and varieties available within a system.
Diversity
Linkages with larger (and smaller) scales via flows of resources and information.
Openness
At variety level, tradeoffs between breadth and depth; Increased diversity of systems can decrease need for reserves
Seed System Resilience
Can substitute or complement one another; both share reliance on social capital and networks; division between two is scale-dependent
Reserves
Stores of social memory and seeds
Modularity
Lack of dependence of each seed system component on others
Maintaining adequate reserves of social memory/learning necessitates less-than-complete household autonomy

Landscape approach

Agrobiodiversity in 8 landscapes

DIVERSITAS
an international programme
of biodiversity science

What role for agbio in different types of landscapes?
What forms of capital support transition to agbio based system?


Sacramento Valley, CA, USA
5 km


Hoeksche Waard, NL


Chiapas, MX


6: Jeune *capoeira*
1: Forêt exploitée
10: Pâturage avec peu de ligneux
4: Ancienne *capoeira*
7: Pâturage avec ligneux
1
6
4
7
10
8
2
3
7
E. Amazonia, Pacajá, BR
Proyecto AMAZ
2: Bas-fond avec végétation arborescente
8: Pâturage avec *babaçu* (*Orbignya sphacelata*)
7: Pâturage avec ligneux
3: Bas-fond avec végétation herbacée

Native forest

Agroforestry

Sun-coffee

Zona da Mata, BR

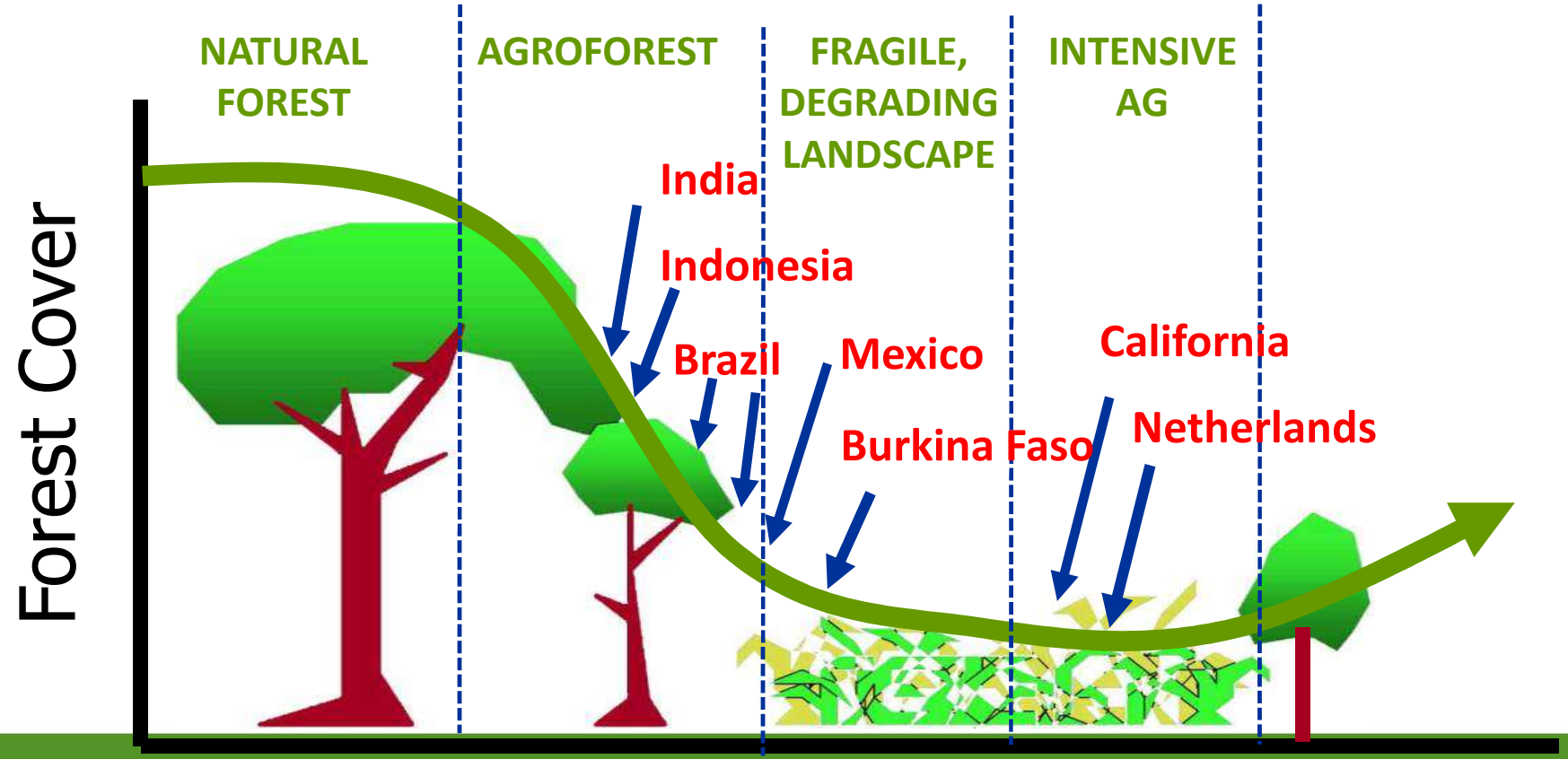

SELAMAT DATANG
MENTERI KEHUTANAN REPUBLIK INDONESIA
BAPAK H. M.S. KABAN
Jambi, Sumatra, ID
Hutan Desa
APPROXIMATELY 5000 people come to the Lubuk Beringin village
Partial answer to the issues of local use rights and tenure security?
MENTERI KEHUTANAN RI
30 MARET 2009

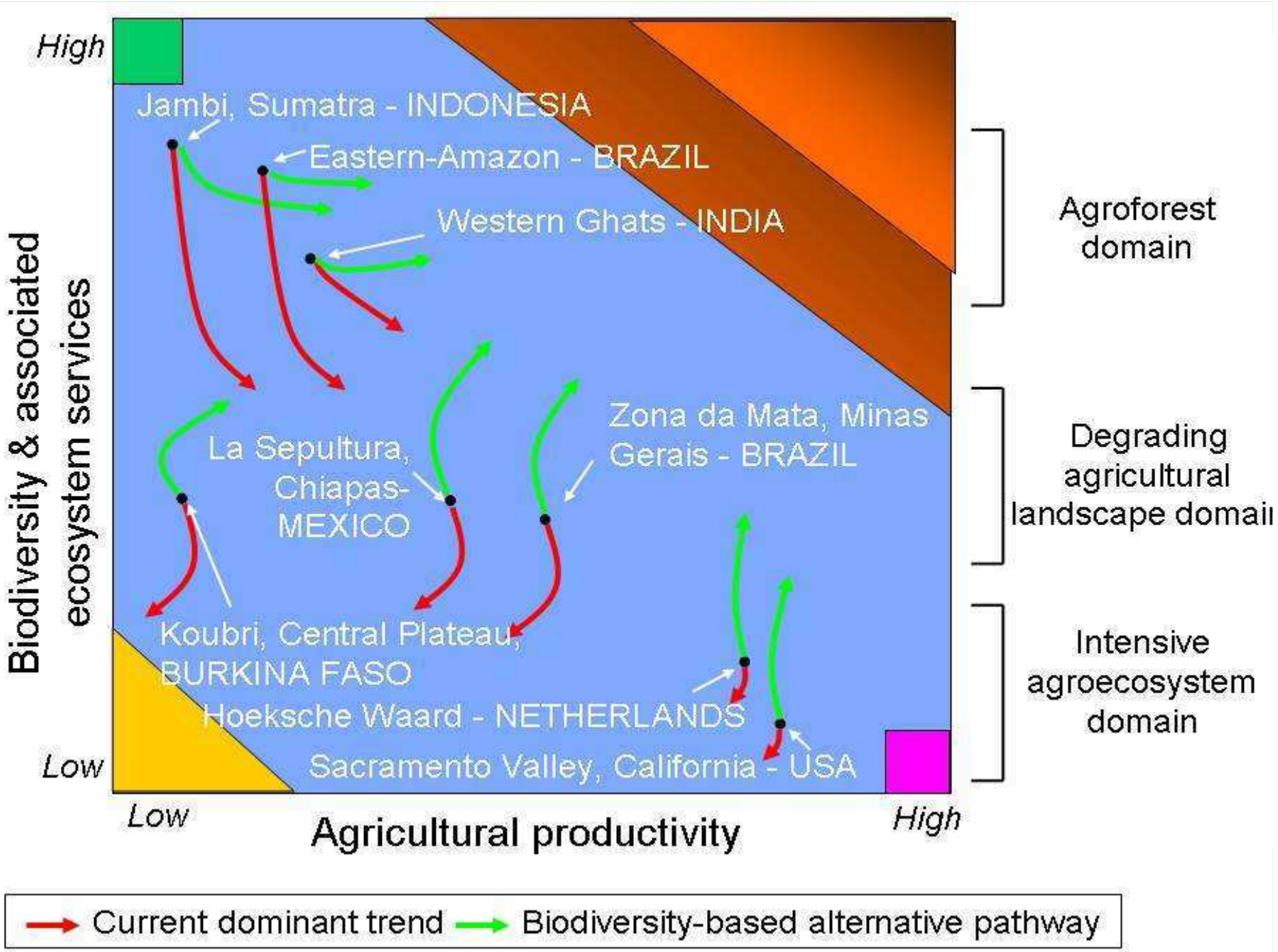
Western Ghats, IN

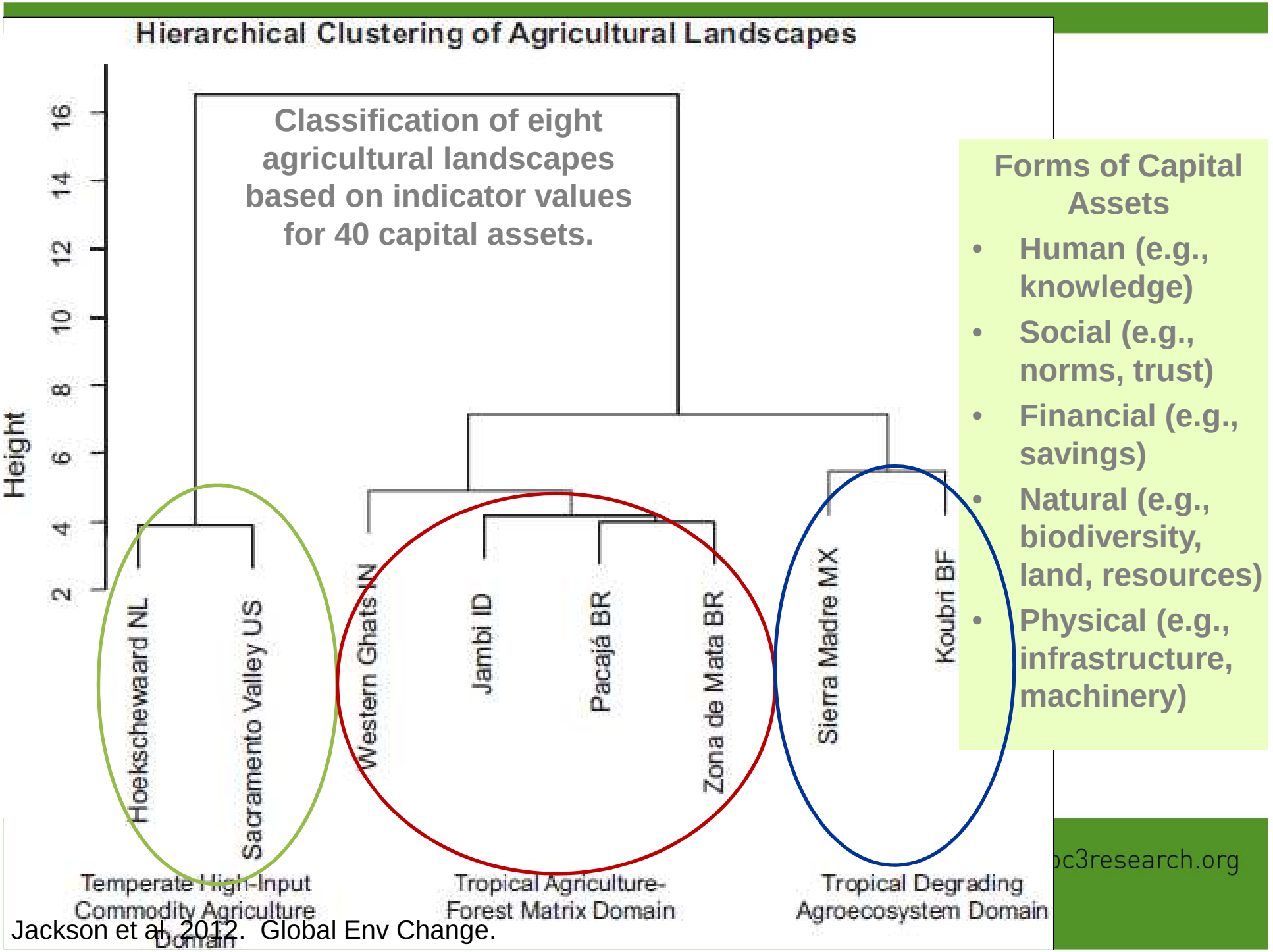
The eight agricultural landscapes

150 - 600 km^2 in area; biodiversity hotspots
Participatory research on social-ecological systems

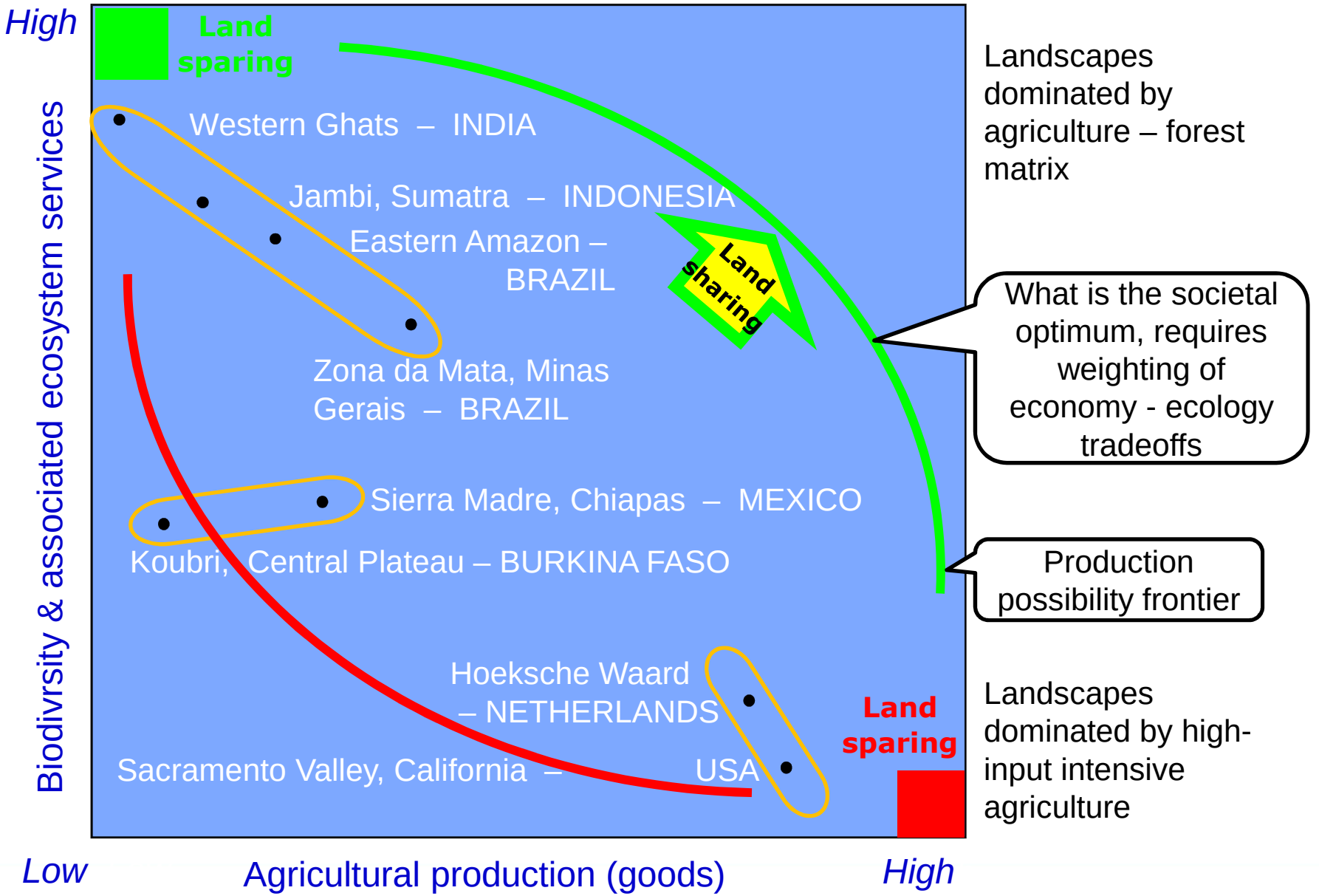
Sites represent landscapes positioned along a biodiversity-productivity gradient and a wide range of socio-economic conditions




High
Low
Low
High
Biodiversity & associated ecosystem services
Agricultural productivity
Jambi, Sumatra - INDONESIA
Eastern-Amazon - BRAZIL
Western Ghats - INDIA
La Sepultura, Chiapas- MEXICO
Zona da Mata, Minas Gerais - BRAZIL
Koubri, Central Plateau, BURKINA FASO
Hoeksche Waard - NETHERLANDS
Sacramento Valley, California - USA
Agroforest domain
Degrading agricultural landscape domai
Intensive agroecosystem domain
Current dominant trend
Biodiversity-based alternative pathway



Jackson et al. 2012. Global Env Change.



Modified after: Jackson LE et al. (2012) Global Environmental Change 22: 623-639.

Results of the exploratory analysis

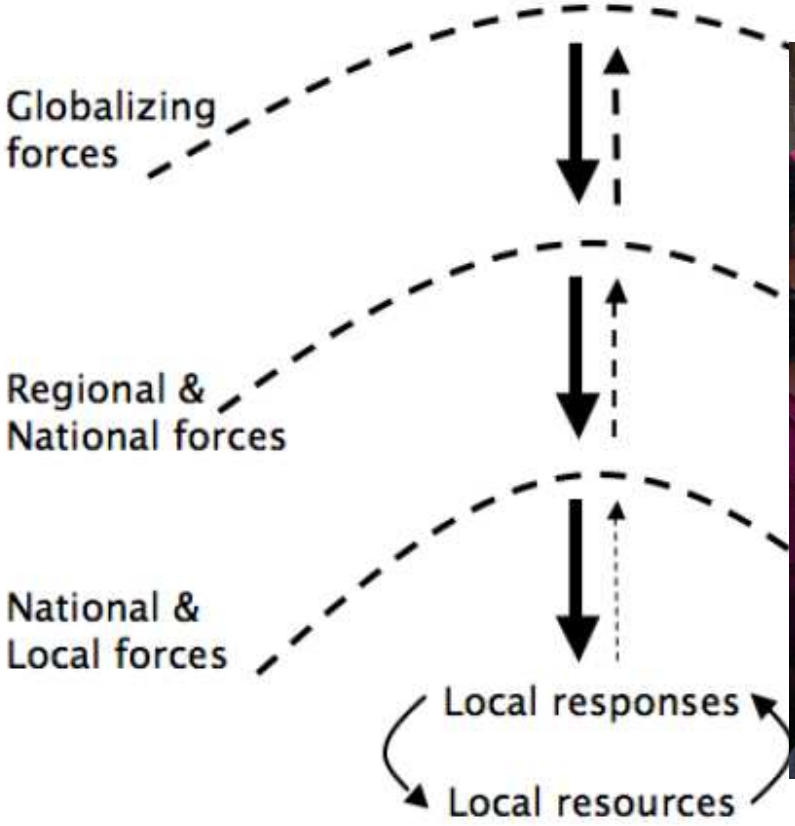
- Implementation of interventions differed among the landscapes, e.g. financial capital for new farming practices in the intensive ag domain vs. developing market value chains in the other domains

- Agrobiodiversity positively associated with indicators of human and social capital: Farmers' knowledge about the social-ecological system, trust and reciprocity can increase a domain's capacity for *self-organization*.

- Inventories of assets at the landscape level can inform *adaptive management* of agrobiodiversity-based interventions

- Multi-landscape research approach to support local knowledge, context-specific interventions that stimulate *regional innovation*, adaptive capacity and transformational ag system at the farm and landscape scales

Key of local to global connectivity for adaptative mg



The challenge for resilient agricultural systems includes identifying enabling governance/interventions that can foster local transformation through innovation and strengthen local communities' influence at higher scales

Economic incentives
Direct payments/reward/compensation

Payments for Agrobiodiversity Services (PACS)

Economic incentives for on-farm conservation

- PES is increasingly promoted as a flexible approach to reward resource managers for conservation and associated ecosystem services
- Economic incentive design must acknowle the institutional context, e.g., collective action of CPRs
- What role for direct payments to enhance cooperation and reciprocity? Focus on institutinonal tradeoffs
- Crowd-in/out of non-economic motivations for agbio conservation

Can there be a PES for agrobiodiversity (PACS)

- Some challenges include
  - conflicting tenurial arrangements
  - lack of baseline information and verification
  - leakage
  - performance evaluation metrics
  - Targeting payment recipients
  - Distribution of payments.

- PES often contested for narrow efficiency focus on conservation


Quito
Perú
Lima
Lago Titicaca
Arequipa
El Alto
Bolivia
Chile
Peru: Northern Altiplano
➔ subsitence-based
Bolivia: Southern Altiplano
➔ commercial farming systems

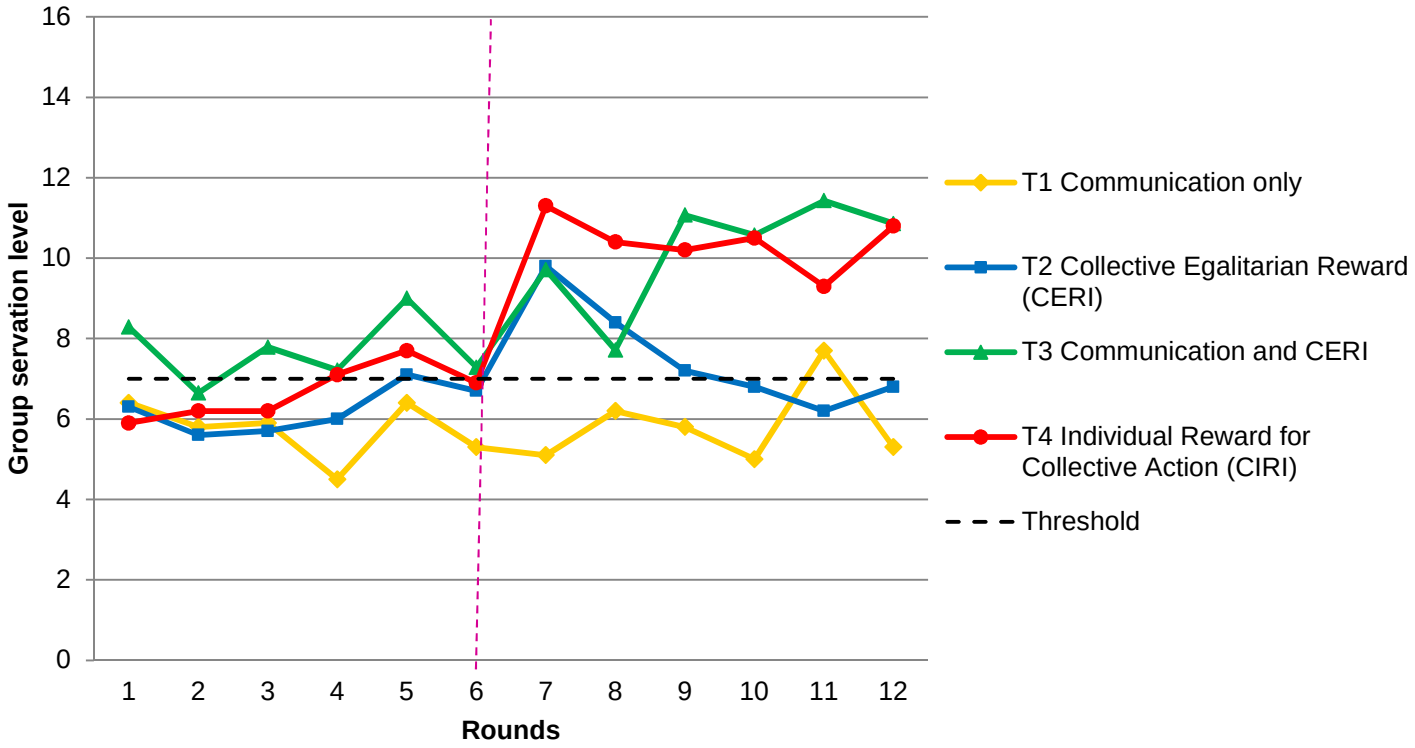
PACS experiment (1st round, 2010)

- 80 farmers (baseline rounds + treatment rounds)
- Results indicate a complex system where *unconditional cooperation* is strong in less commercial ag & *free riding* behaviour in highly commercial contexts
- PES may *crowd-out* existing pro-social behaviour under strong CPR institutions but may *crowd-in* pro-social behavior in market orientated contexts

Narloch, Pascual and Drucker. 2012. World Development.

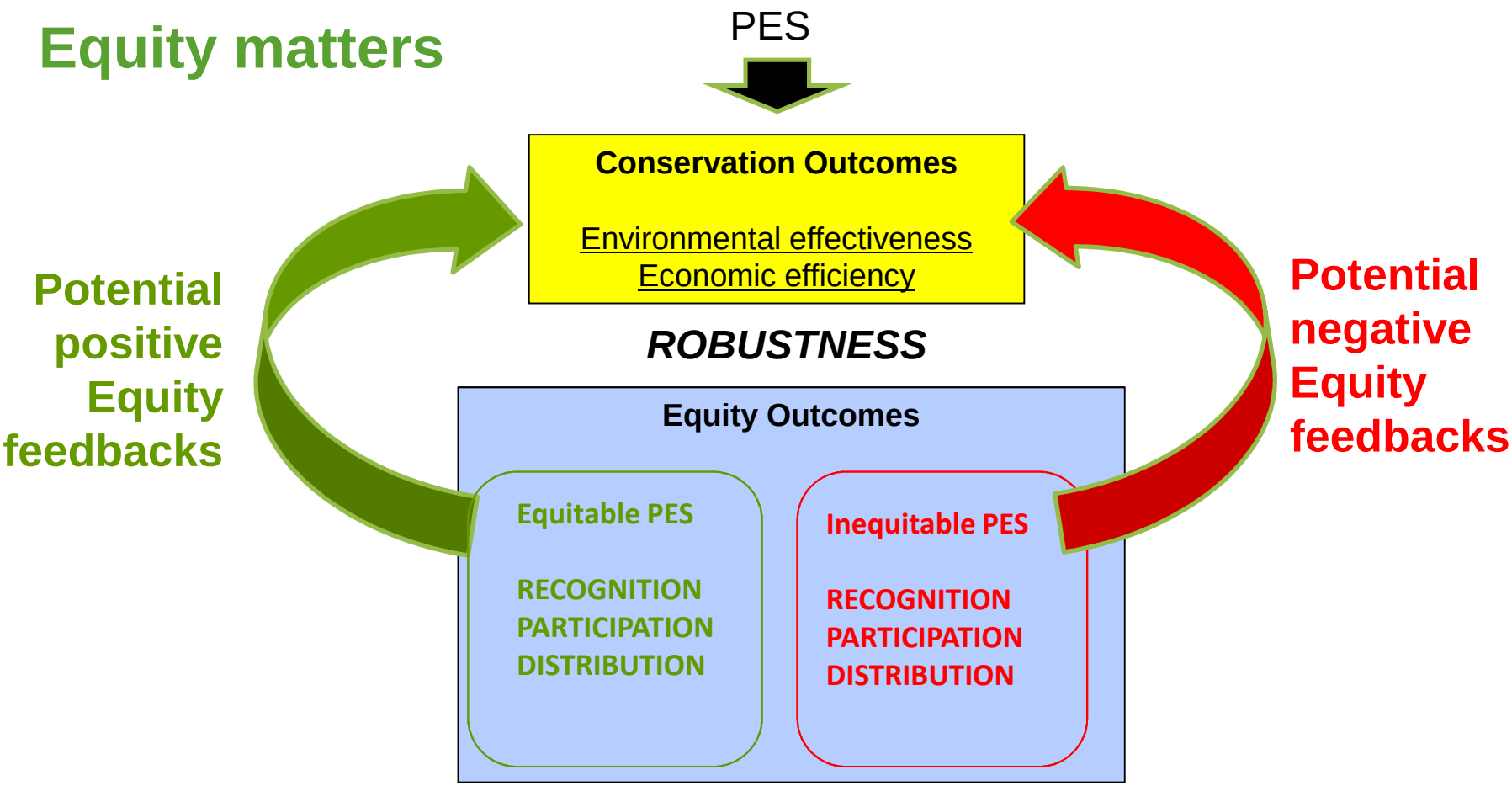
PACS field games (2nd round, 2012)

- Community/egalitarian or individual-based rewards? What role for deliberation/communication?



Midler, Pascual, et al. In preparation

Equity matters



Where to go now?

- Resilient agricultural systems based on agrobiodiversity interventions requires knowledge-intensive and context-specific management of different capital assets.
- Relying on agrobiodiversity for resilience requires new approaches to mobilizing innovation through human and social capital
- Resilience research in agricultural systems needs integration of knowledge on local and regional decision-making into global agendas
- Just Ecosystem Management → New social ecological frontier

Agrobiodiversity and the energy *crisis*

- Agrobiodiversity as an opportunity to enhance resilience in light of Peak oil?
  - Dominant intensification model based on energy intensive technology → Macroeconomic impacts, e.g., rise in commodity food (FAO, OECD)
  - What effects on farmers' livelihoods
  - How would this feedback to landscapes?

Thank you!

Eskerrik asko!