Moving together towards "better": Stakeholder-centered research to catalyze sustainable agricultural transformations

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Transdisciplinary research for a healthy planet:
Half of the world's habitable land is used for agriculture, making agricultural lands the ***largest biome on the planet***.

(Ramankutty et al., 2018., Ellis et al., 2010, FAO, 2022)

In the EU:

- Agricultural area covers **39% of the EU's total land area**.

- Agriculture is the source of **11% of all greenhouse gases** emitted in the EU, including over **54% of all methane** emissions.

- In France, field crops (cereals, oilseed, beet) represent over 45% of agricultural area ([source](#)).

European Environment Agency

Globally—and certainly in the US and EU—agricultural landscapes are increasingly:

- Productive*
- Efficient**
- Specialized
- Simplified
- Large-scale
- Capital intensive

*Though with yield plateaus and major threats from climate change.
**Gains in total factor productivity—the amount of output per unit input—are also diminishing and threatened by climate change.

…and how are the people who grow our food doing?

In Brussels, right now.

Why?

- Les agriculteurs ne pouvant pas assumer seuls **les conséquences de près d'un demi-siècle de révolution verte et de libéralisation à outrance de l'agriculture.** ([FIAN](#))

- Les agriculteurs travaillent **80 heures par semaine pour un revenu très inférieur au revenu moyen wallon**. Ils ne reçoivent en moyenne que **5% à 10% de la valeur ajoutée d'un produit, le reste étant capté par les distributeurs et transformateurs**. ([UNAB](#))

- La conditionnalité de la PAC, qui s'est accentuée au fil des années, fait que le métier d'agriculteur, de plus en plus, passe par une **bureaucratie qui est très lourde**, très contraignante, avec beaucoup de comptes à rendre, de rapports à remplir, de formulaires à compléter… Le métier d'agriculteur ne devrait pas ressembler à ce qu'il est devenu. ([La Libre](#))
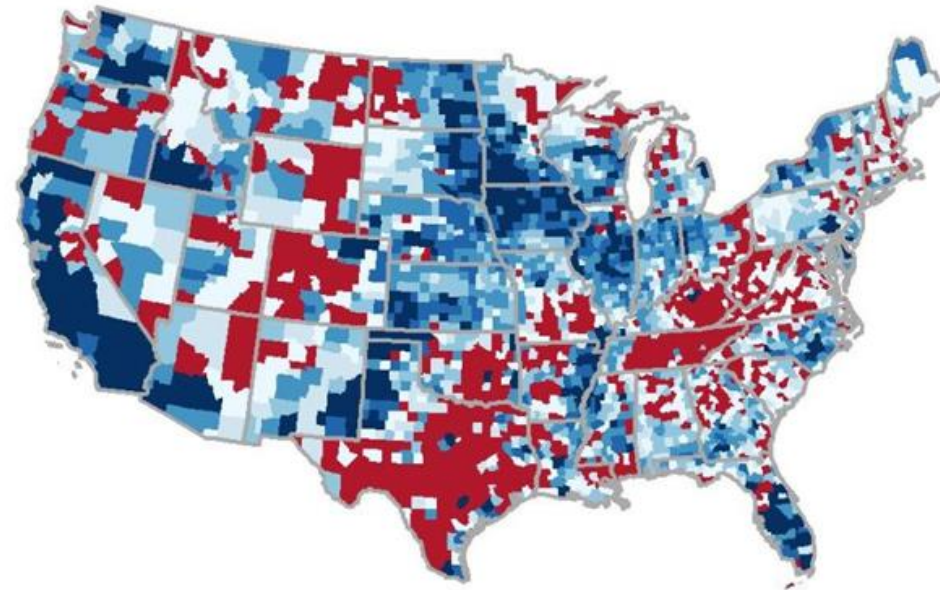
Why?

In 2017, in 14.6% of reporting counties, farm operators reported **negative net cash farm income**, with a national median farm income of **negative $1,035**.

A.

B.

■	< $0
■	$0 - $5M
■	$5 - $10M
■	$10 - $20M
■	$20 - $40M
■	$40 - $60M
■	> $60M
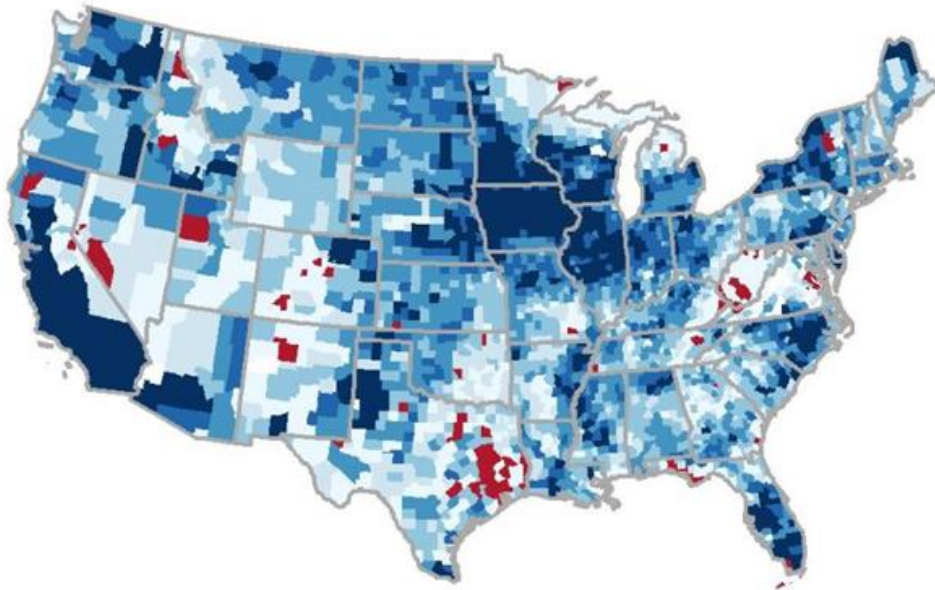
Realized net income of farmers in **(A.)** 1969 (adjusted to 2019 dollars) and **(B.)** 2019. Net income is defined as total cash receipts from all farms less production expenses

Read more in Burchfield, E., Schumacher, B., Spangler, K., & Rissing, A. (2022). The state of US farm operator livelihoods. *Frontiers in Sustainable Food Systems*, 5, 566.

- Ecological degradation
- Climate change radically changing production geographies
- Farm workers, labor rights, massive exploitation
- High food prices for consumers and resultant food insecurity despite miniscule profits for farmers
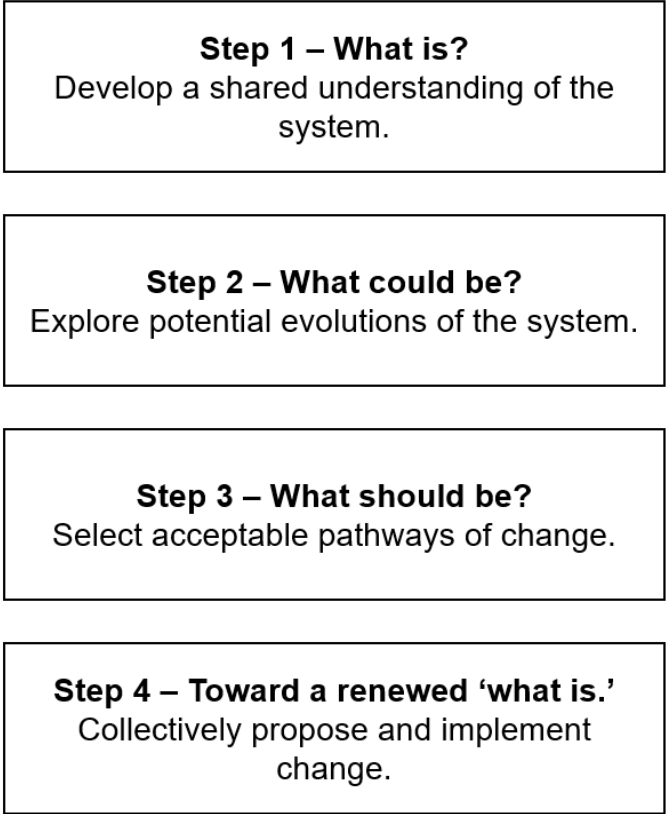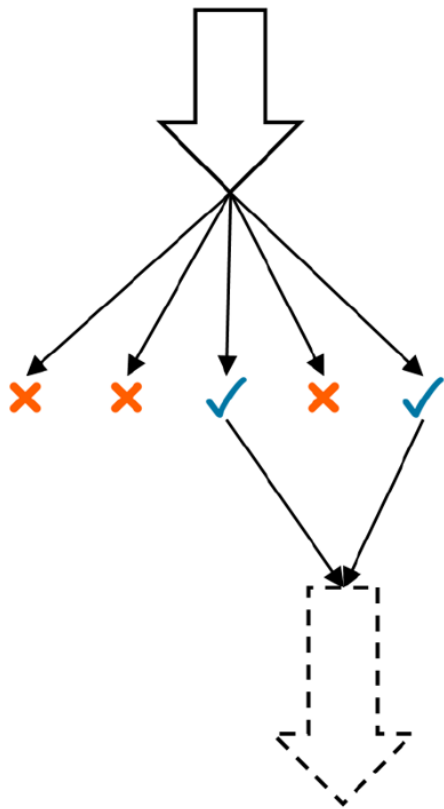- Implications of Western agricultural paradigms in the global South.
- …

Major transition* is necessary and inevitable.

Transition towards *what?*

And given where we are, how do we get there?

## How do we (as researchers) support this transition?

*this talk is about agricultural systems, but sustainable and just transition is needed across most sectors and at most scales.

Step 1 – What is?
Develop a shared understanding of the system.

Step 2 – What could be?
Explore potential evolutions of the system.

Step 3 – What should be?
Select acceptable pathways of change.

Step 4 – Toward a renewed 'what is.'
Collectively propose and implement change.

1. What forces shape current agricultural landscapes in the US?
2. What biophysical, technological, and political-economic forces are likely to transform agricultural landscapes over the next 40 years?
3. What agricultural futures are most desirable to diverse stakeholders?
4. What changes are required to create transition pathways toward more desirable futures?

Figure inspired by and adapted from Dendoncker N, Boeraeve F, Crouzat E, Dufrêne M, König A, Barnaud C. How can integrated valuation of ecosystem services help understanding and steering agroecological transitions? Ecol Soc. 2018 Jan 26 ;23(1).
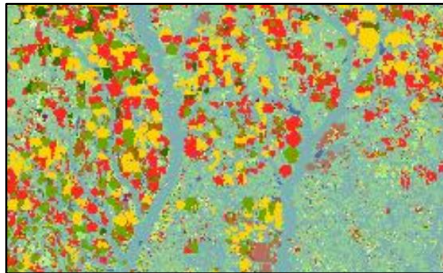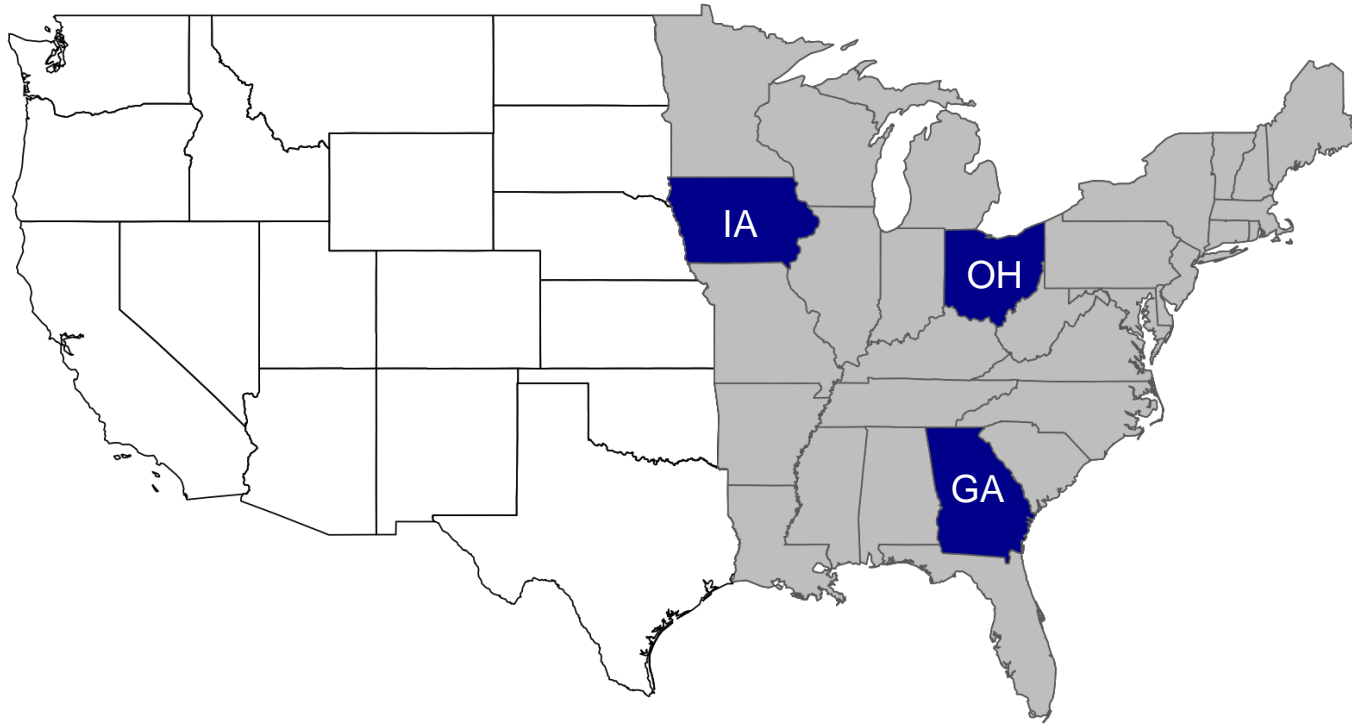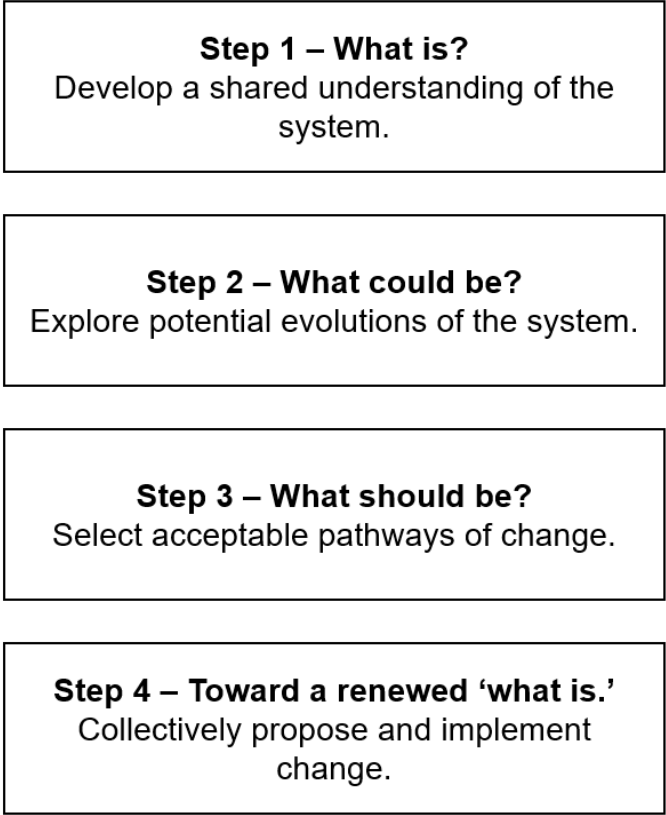
Georgia

Iowa
"the most altered landscape on Earth"
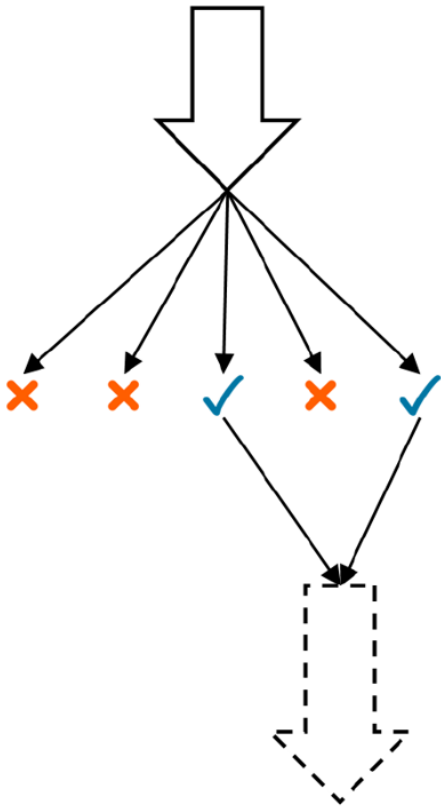
Ohio

$$cultivation\ geographies \sim f(☀️,🟫,💧,...)$$

All the messy people stuff
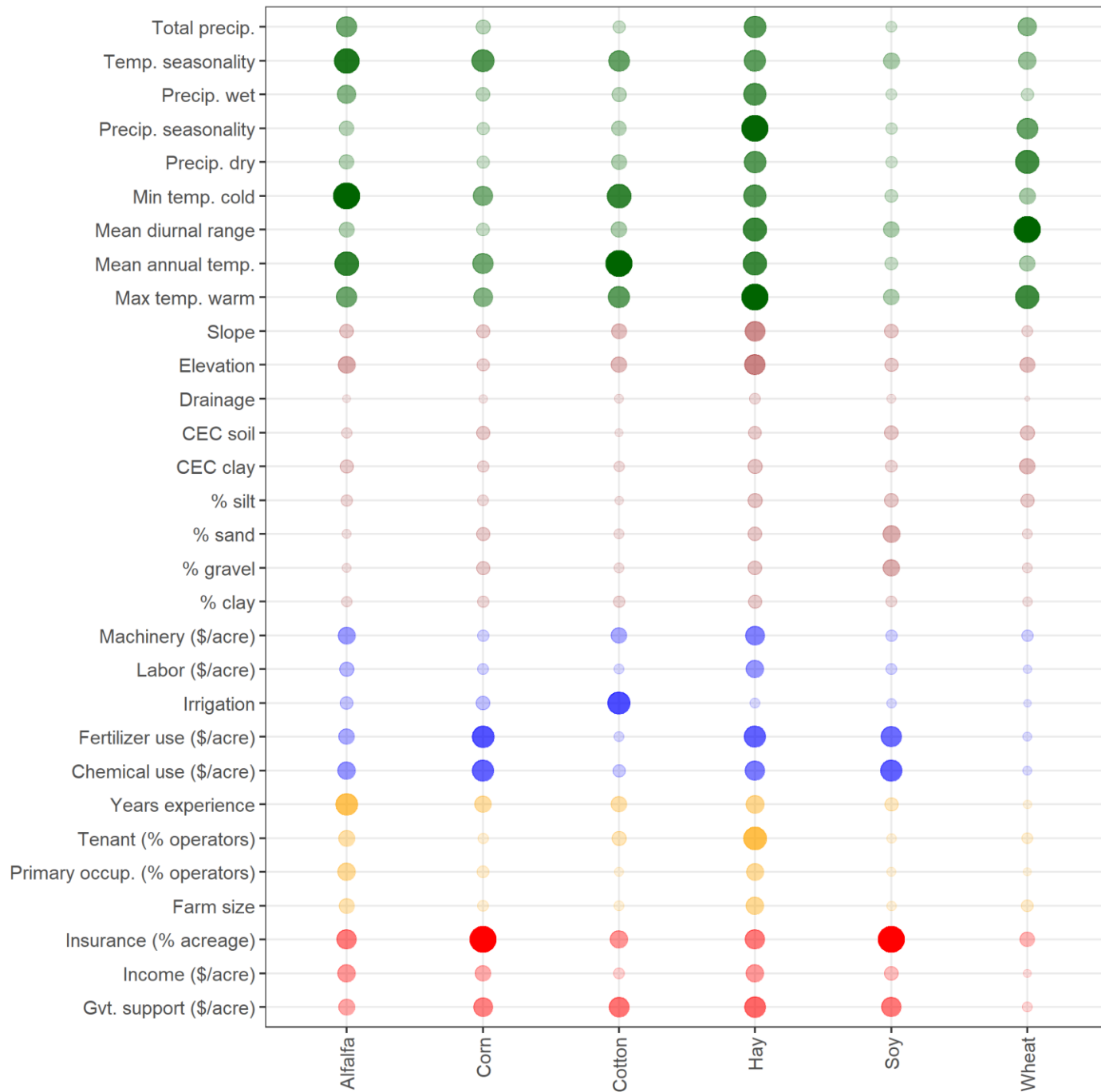- Farm-level management
- Technology
- Political-economic incentives
- Household constraints
- Power, access, inequality
- …

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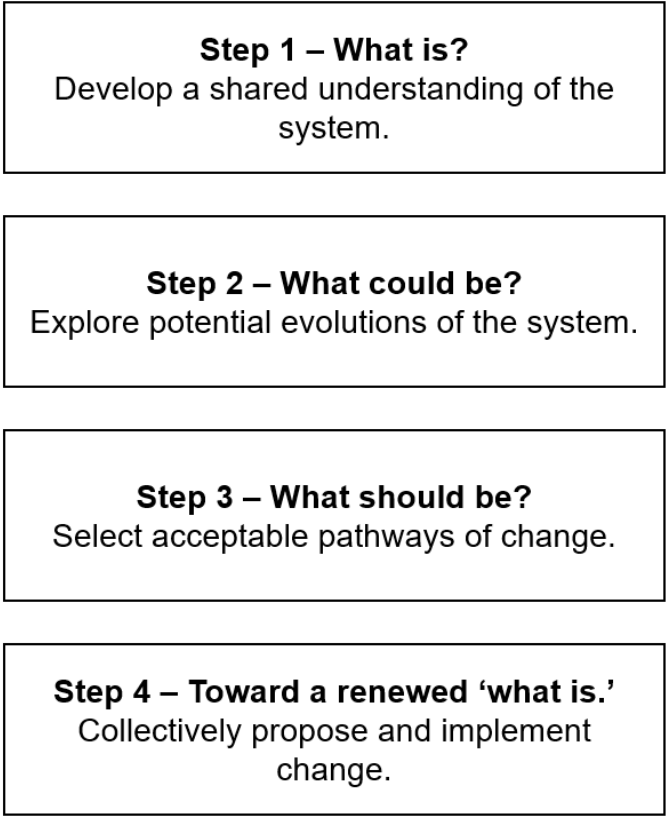4. What changes are required to create transition pathways toward more desirable futures?
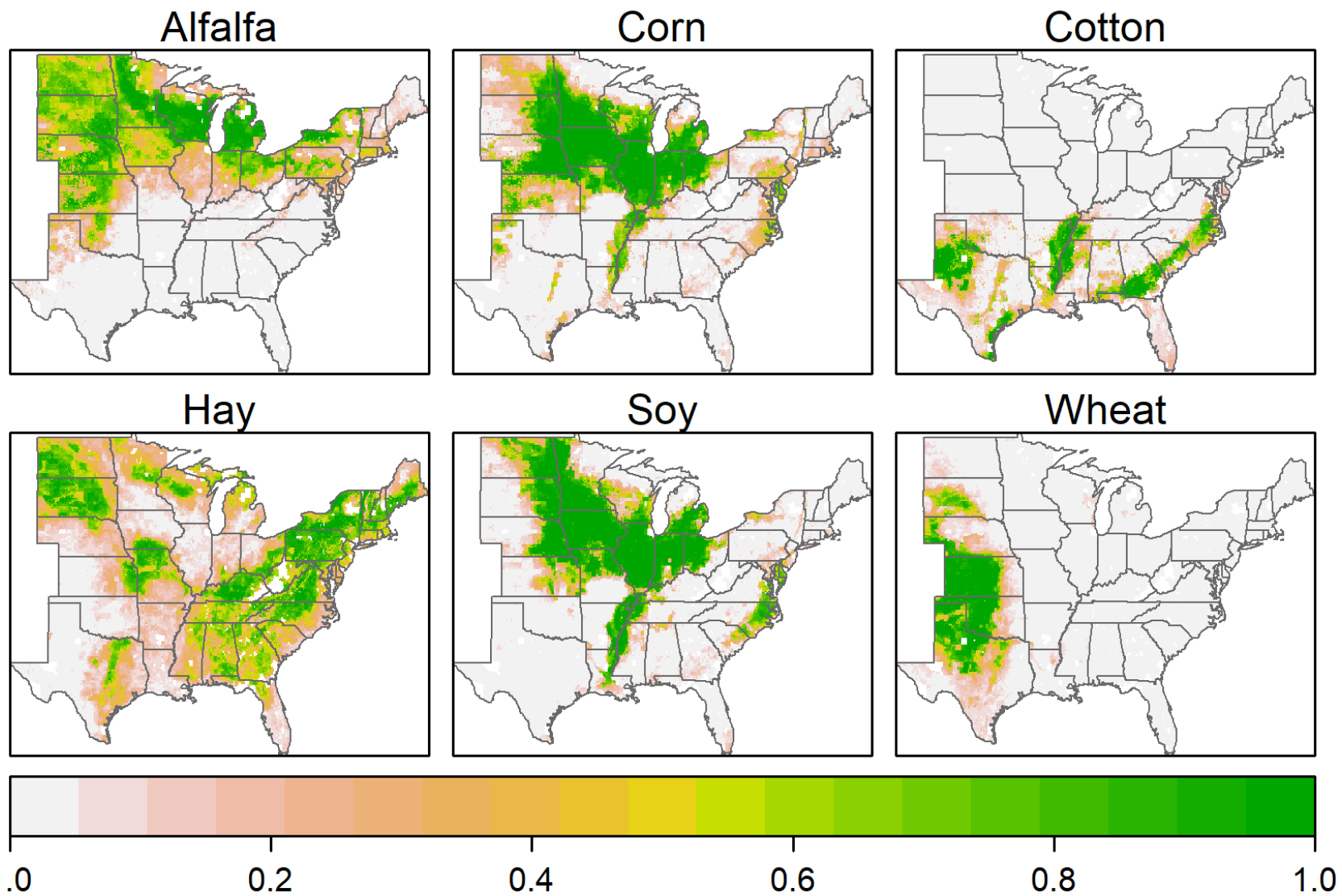
For more details see Burchfield, E. (2022). Shifting cultivation geographies in the Central and Eastern US. *Environmental Research Letters, 17*(5), 054049.

Climate drives cultivation geographies…

…but so does **input use**…

…and **crop insurance**.

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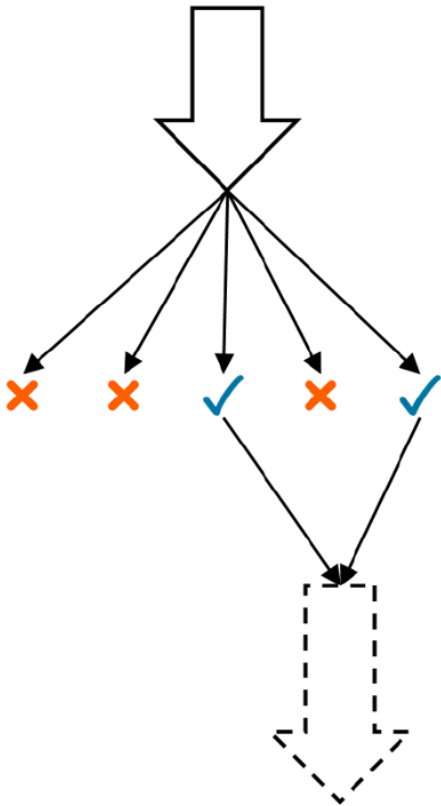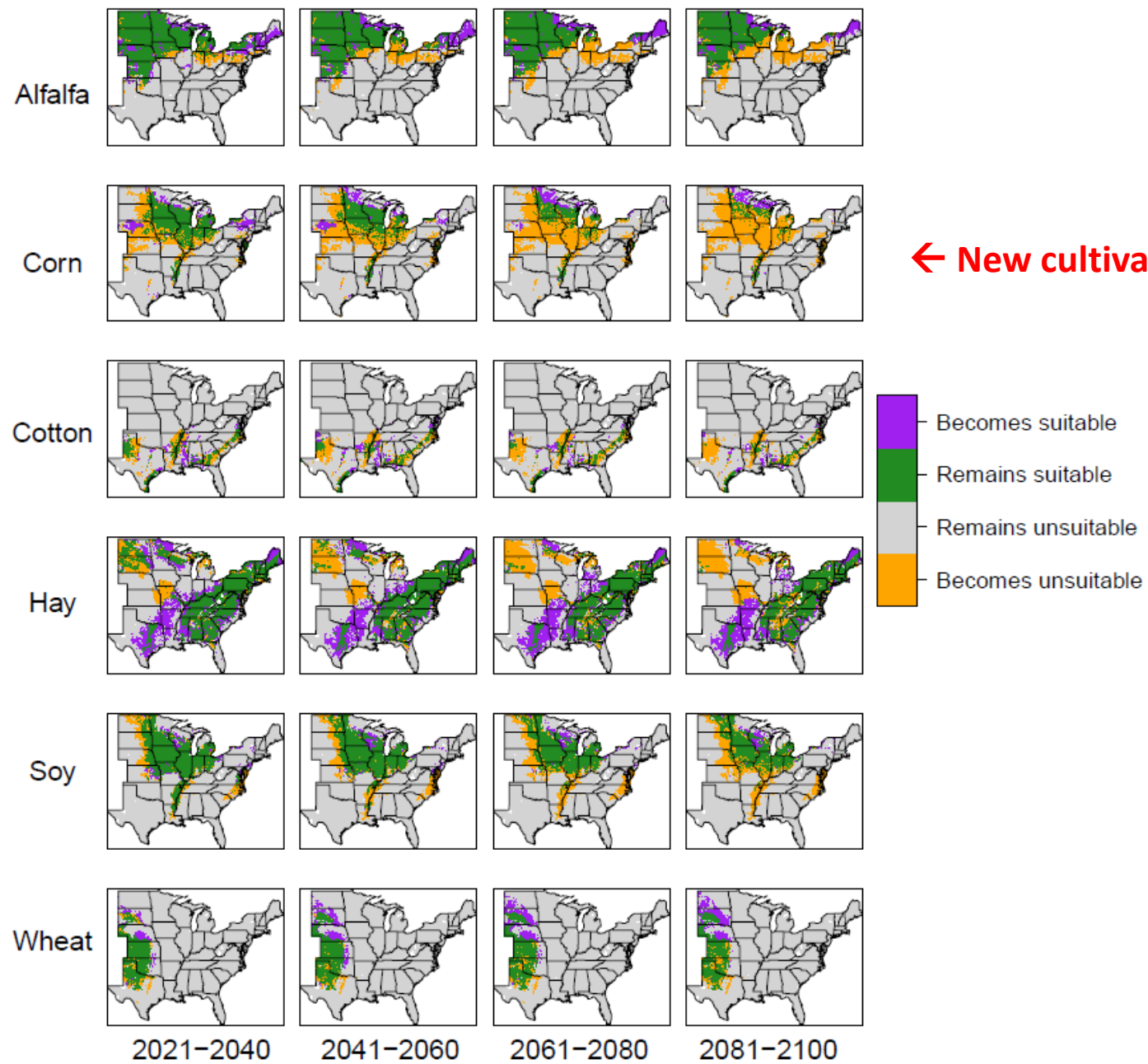4. What changes are required to create transition pathways toward more desirable futures?

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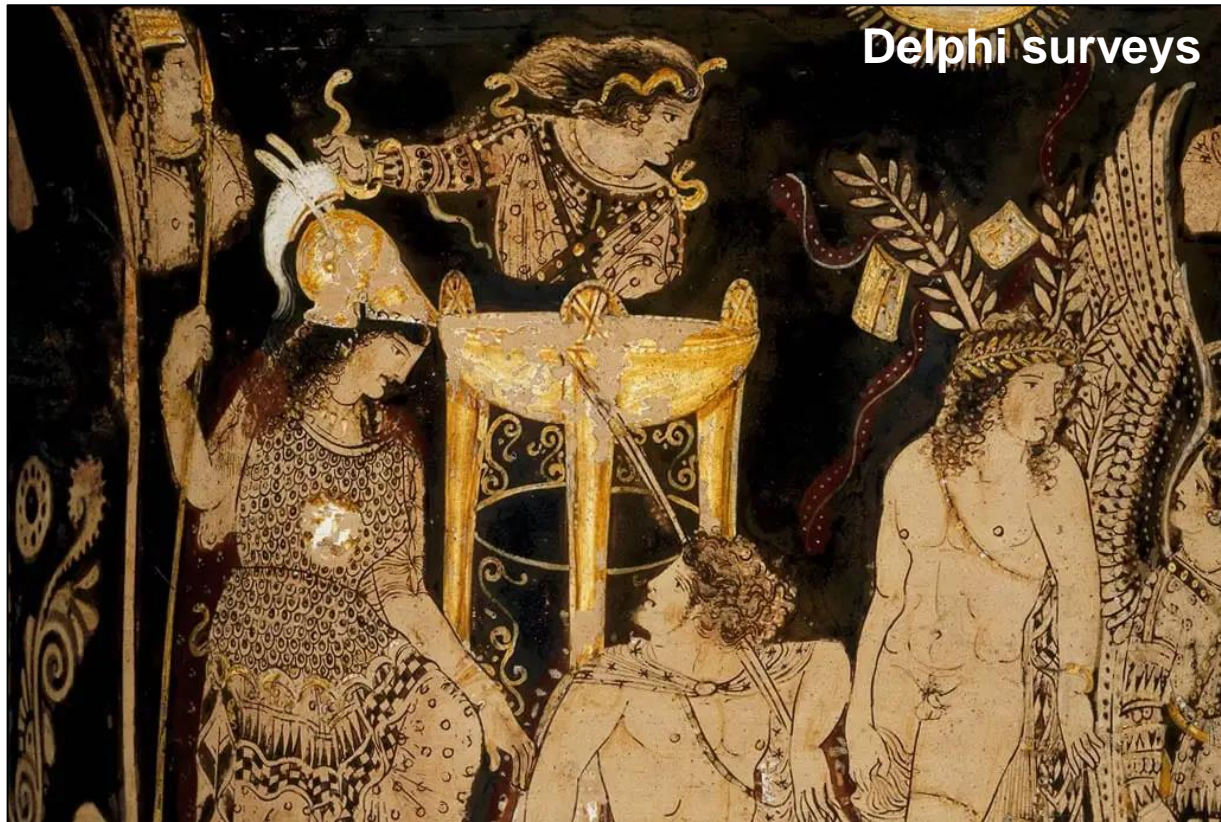
All the messy people stuff
- Farm-level management
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← **New cultivation paradigms needed**

Legend: Becomes suitable, Remains suitable, Remains unsuitable, Becomes unsuitable

Burchfield, E. 2022). Shifting cultivation geographies in the Central and Eastern US. *Environmental Research Letters, 17*(5), 054049.

How to parameterize the people, *with and for* the people?

Here's what we're experimenting with:

Delphi surveys

(Lots of) farmer focus groups

Delphi surveys

Goal: capture best estimates of key technical, policy and market changes that will alter ideas about 'most suitable' crops under future climate
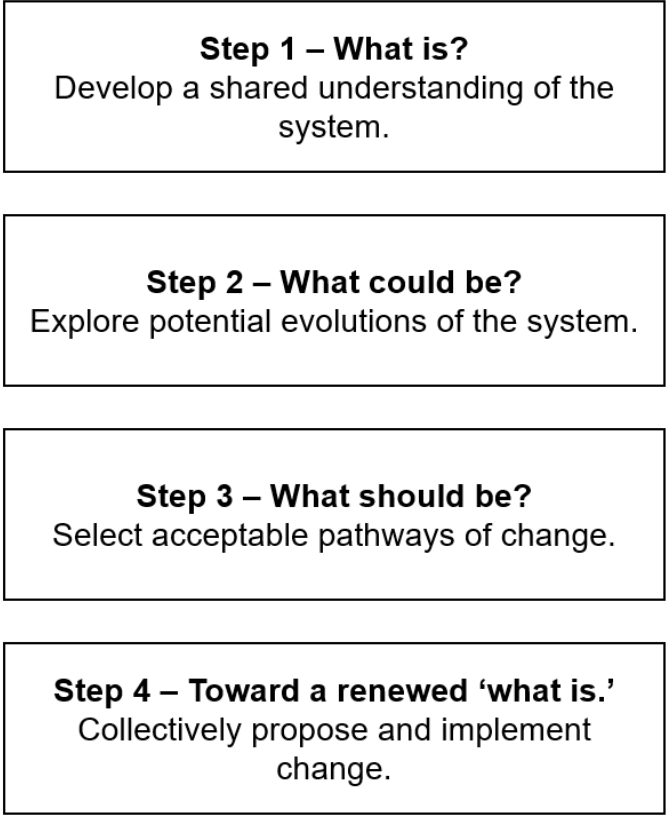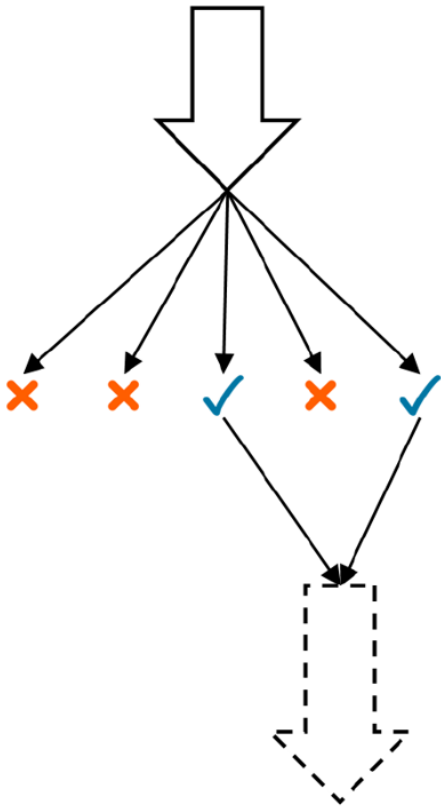
Method:
- Developed by Rand Corp in 1950s
- Iterative surveys of experts
- Sharing results with group between rounds
- Generates convergence towards "best" estimate
- Outcome here is *quantitative* estimate of the impacts of technological and political-economic shifts on cropping geographies

Farmer focus groups:

Goal: capture farm and household factors that shape suitability but are often missed; new emergent crops and techniques; share modeling process, increase transparency of climate science; try to catch surprises and nuance the models can't see.

Method:
- Facilitated session addresses a series of questions designed to encourage group conversation + responses to each other
- Conventional, alternative, and beginning farmers in each state

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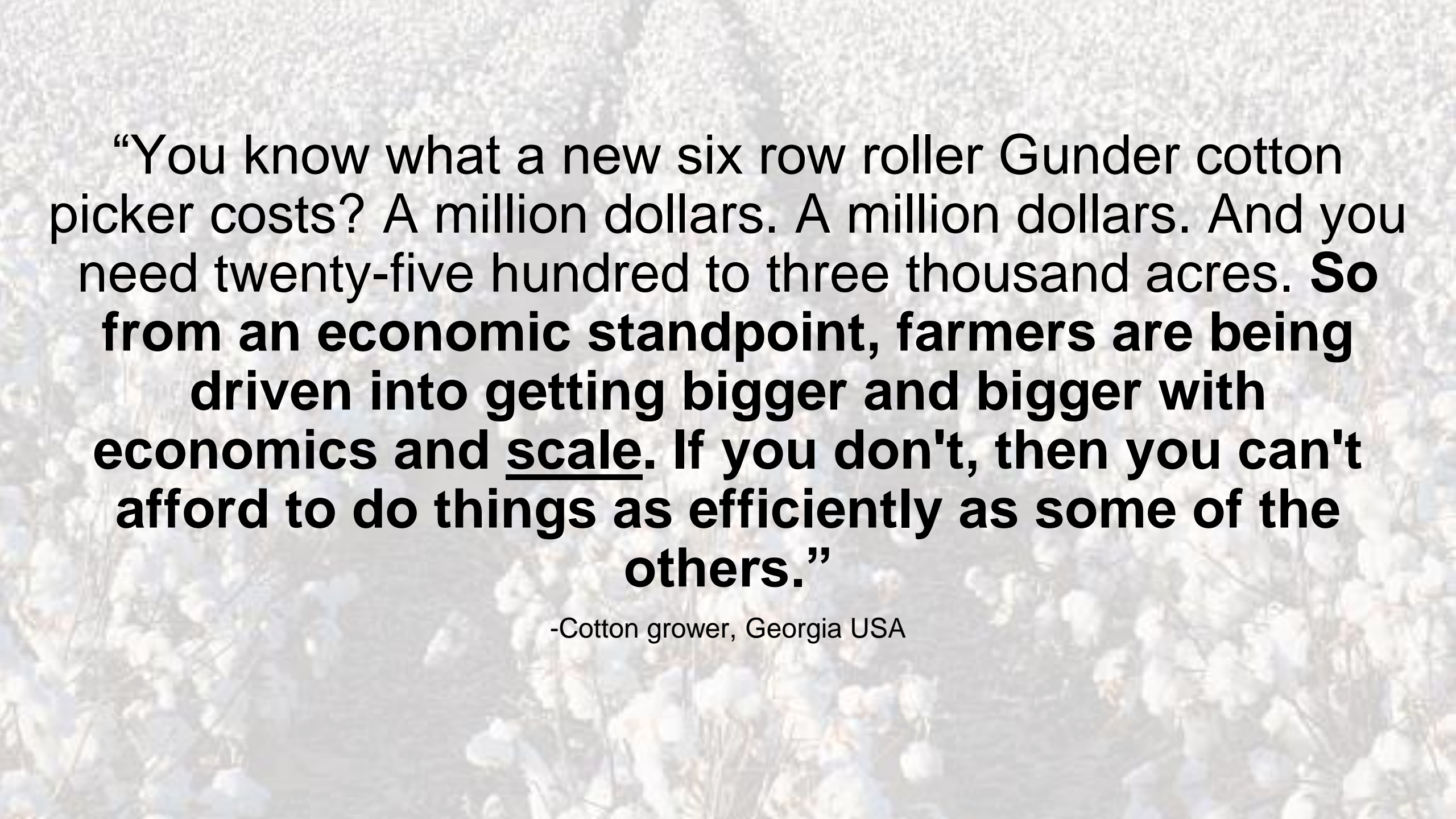
Articulating what "should" be:

Goal: Identify overlaps in stakeholder visions of desirable agricultural futures; identify barriers and bridges to making these visions real

- Environmental impact assessment
- Farmer focus groups
- Food system stakeholder focus groups
- Delphi key informant interviews

Major barriers to enacting on-farm visions

1. Money
2. Money
3. Money

"If you really want to talk about barriers or bridges to adaptation, I mean, you have to talk about **money** and the challenges of farming today... **Farmers have vision, but they often lack resources to see that vision through.**"

"You know what a new six row roller Gunder cotton picker costs? A million dollars. A million dollars. And you need twenty-five hundred to three thousand acres. **So from an economic standpoint, farmers are being driven into getting bigger and bigger with economics and <u>scale</u>. If you don't, then you can't afford to do things as efficiently as some of the others.**"

-Cotton grower, Georgia USA

Major barriers to enacting on-farm visions

1. Money
2. Money
3. Money
4. Risk

"You know, a conventional row crop farmer goes to an insurance company, the insurance company already knows that guy is getting paid whether he's growing a crop or not and whether or not that crop is successful. They know they're in bed with a security net, they know that our risks are internalized, and they can't take us out in good faith usually… but **I've never really come across an insurance company that really could insure me viably.**"

-Small-scale organic farmer, Georgia USA
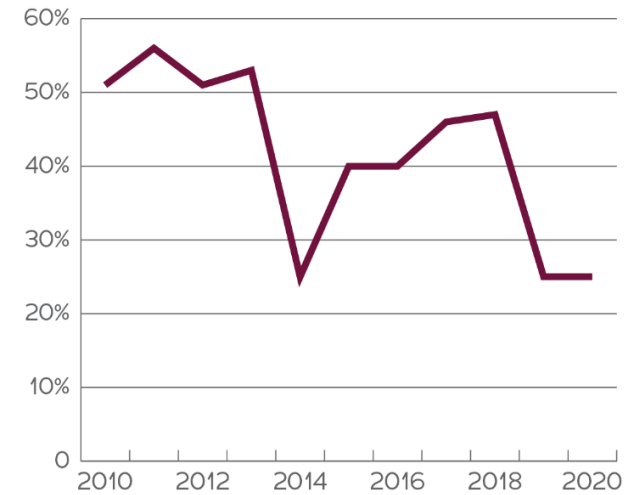
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5. Access

FIGURE 1: EQIP Applicants Awarded Contracts, 2010-2020
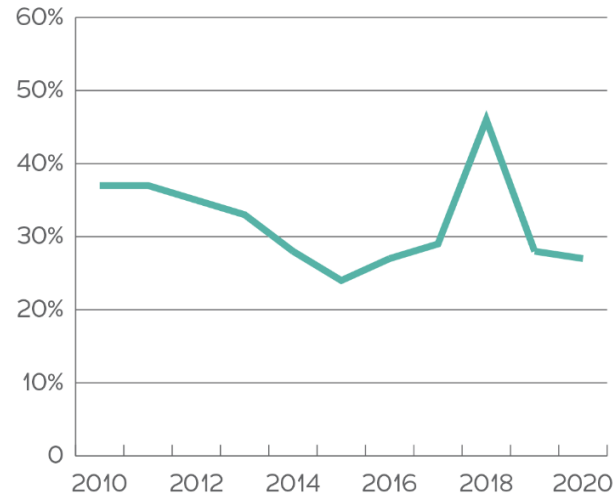
Source: United States Department of Agriculture (2021). *EQIP – Regular: Number of Applications by State and Contract Fiscal Year, Contract Fiscal Years 2005-2020*

FIGURE 2: Percentage of CSP Applications Awarded Contracts, 2010-2020
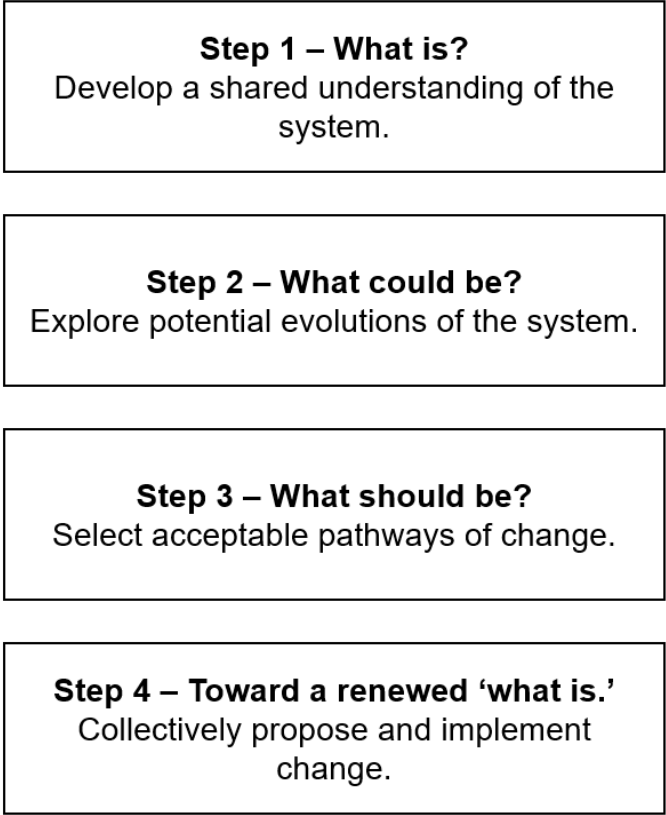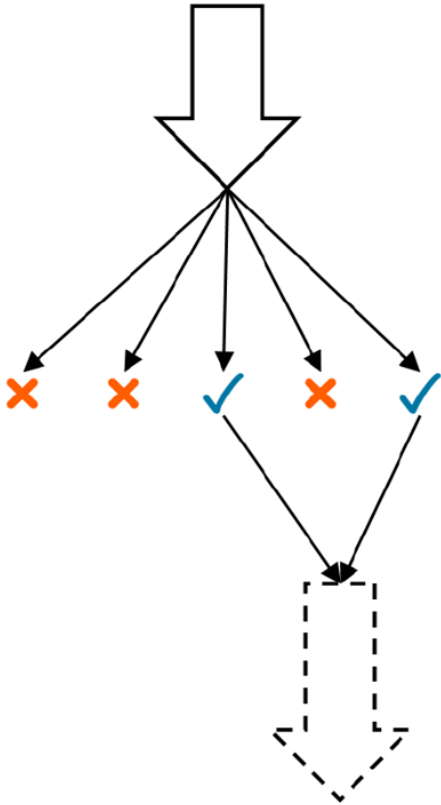

Source: United States Department of Agriculture (2021). *CSP and CStP:– Regular: Number of Applications by State and Contract Fiscal Year, Contract Fiscal Years 2005-2020*

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Convergence to spark change

Converge folks who don't normally interact, but who share strong interest in thriving agricultural futures in each state:

- Diverse farming populations
  - Conventional, organic, experience, demographics
- Other agricultural experts
  - USDA representatives
  - Academic researchers
  - Extension personnel
  - Agribusiness
  - Advocacy and non-profit groups
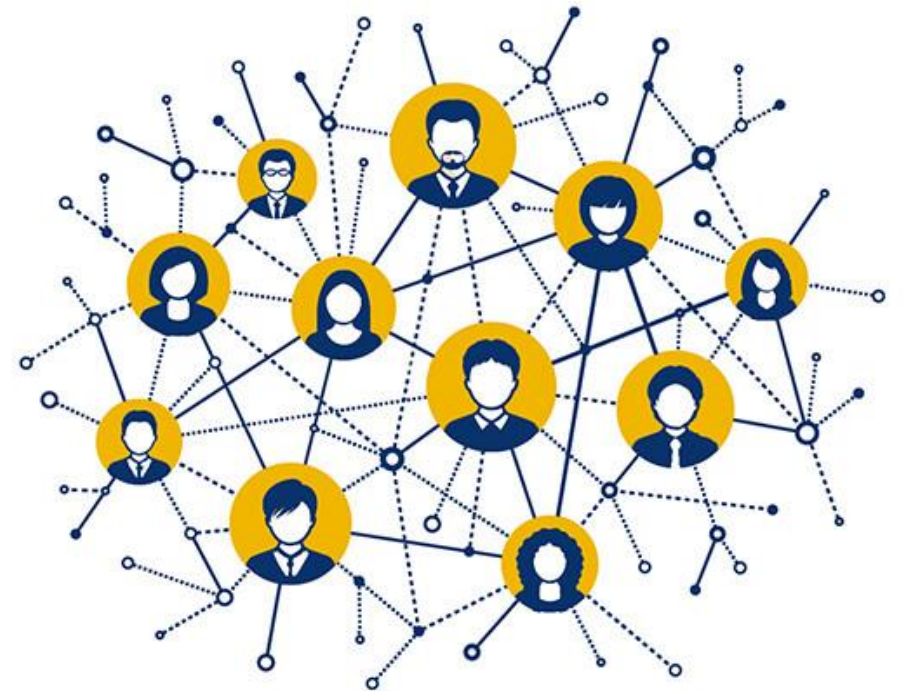
Convergence for what?

- Converge on *shared vision of better*
- Identify and prioritize transition pathways and specific interventions to move *towards better* (State Action Plans)
- Form networks/coalitions/relationships
- Translation through art, narrative, public outreach, extension materials, and policy briefings
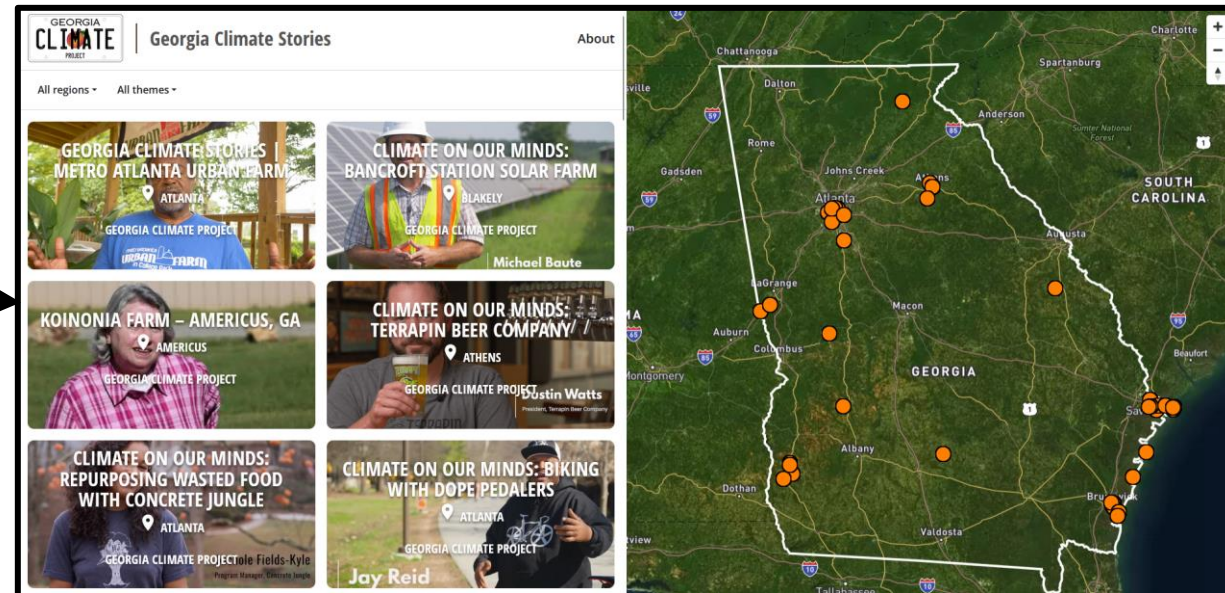
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- Assemble the best of what we currently know—what are the major forces shaping the current system?
- Leverage resources to understand likely trajectories in the system.
- Create space to envision *alternative trajectories* – to imagine desired futures and the work needed to make them manifest.
- Leverage our institutional capacities to converge invested stakeholders to make change real. Do the hard work of translation *beyond our academic communities.*

Thanks to my students + collaborators + the NSF for funding this research.

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A

Biophysical suitability

Density

Where might individual farms end up in this future probability space based on their attributes (income, household structure, cropping regime, demographics)?

How might this probability distribution change if we account for (meso/macro) technological and political-economic shifts?

B

Socio-environmental suitability

Density

Do peoples' visions for their operations, their food systems, align with what's probable given system persistence?

F1   F2

F2 • • F1