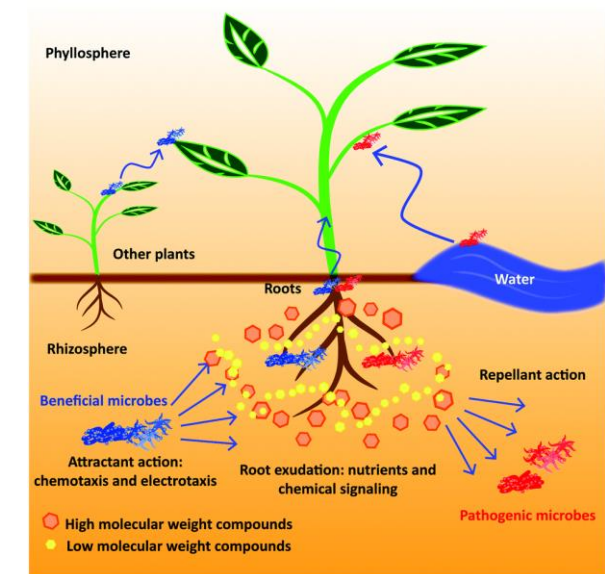
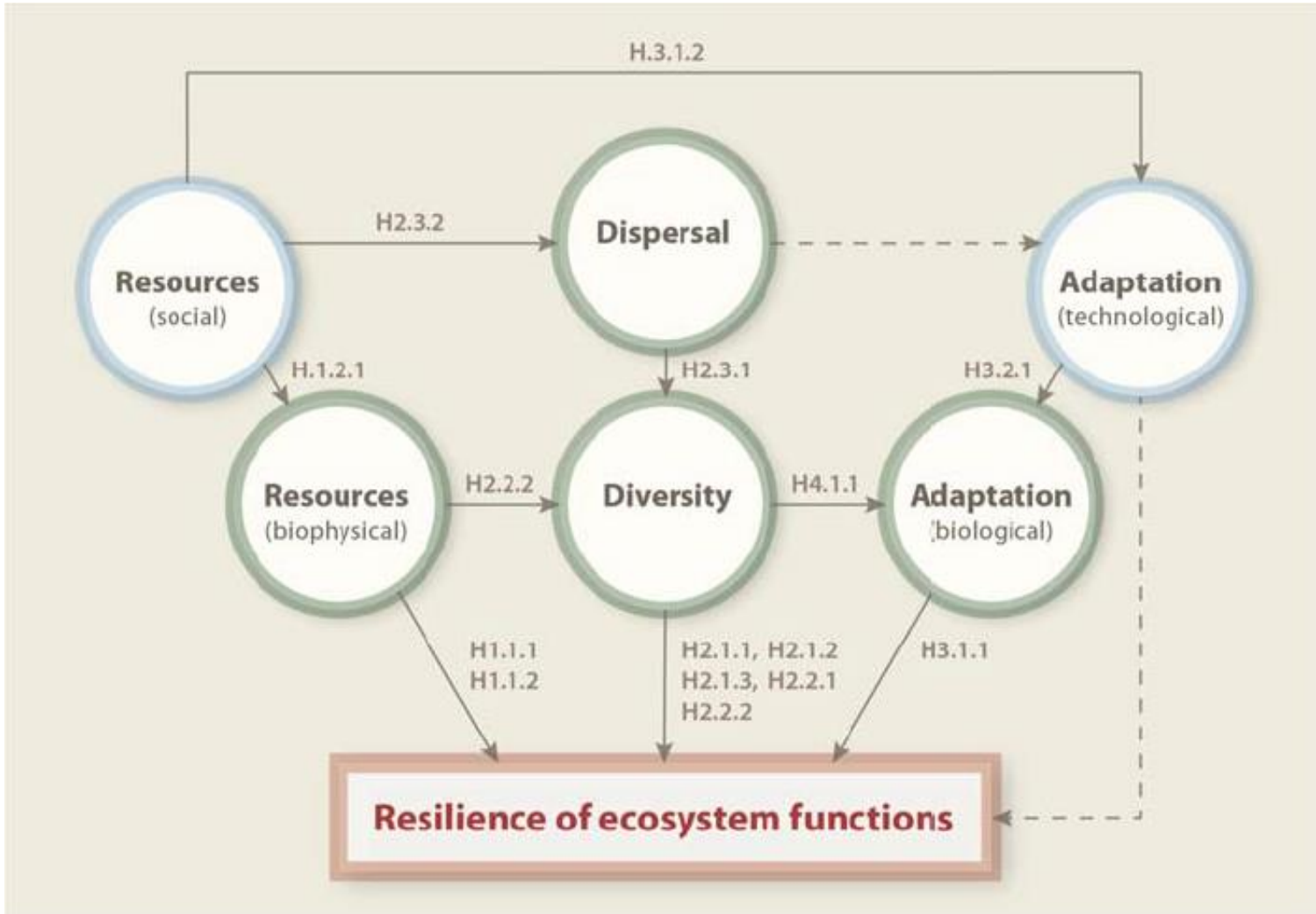


An aerial photograph of a vast agricultural landscape. The foreground shows two metal cages placed in a field of young corn plants. The middle ground is dominated by long, straight rows of mature crops, likely corn, stretching towards a distant horizon. The background features rolling hills under a clear blue sky with light clouds. A semi-transparent white box is overlaid on the center of the image, containing the title and authors' names.

# Adaptation as a mechanism of resilience

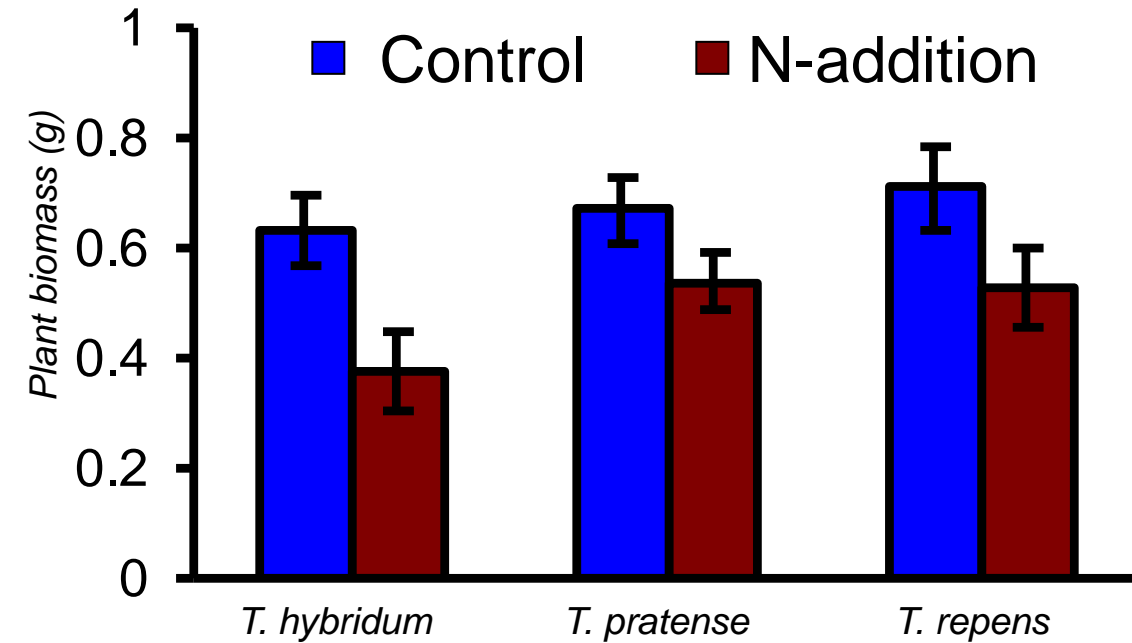
J. Lau, S. Evans, S. Marquart-Pyatt & S. Swinton

# Both biological adaptation & technological adaptation can contribute to resilience



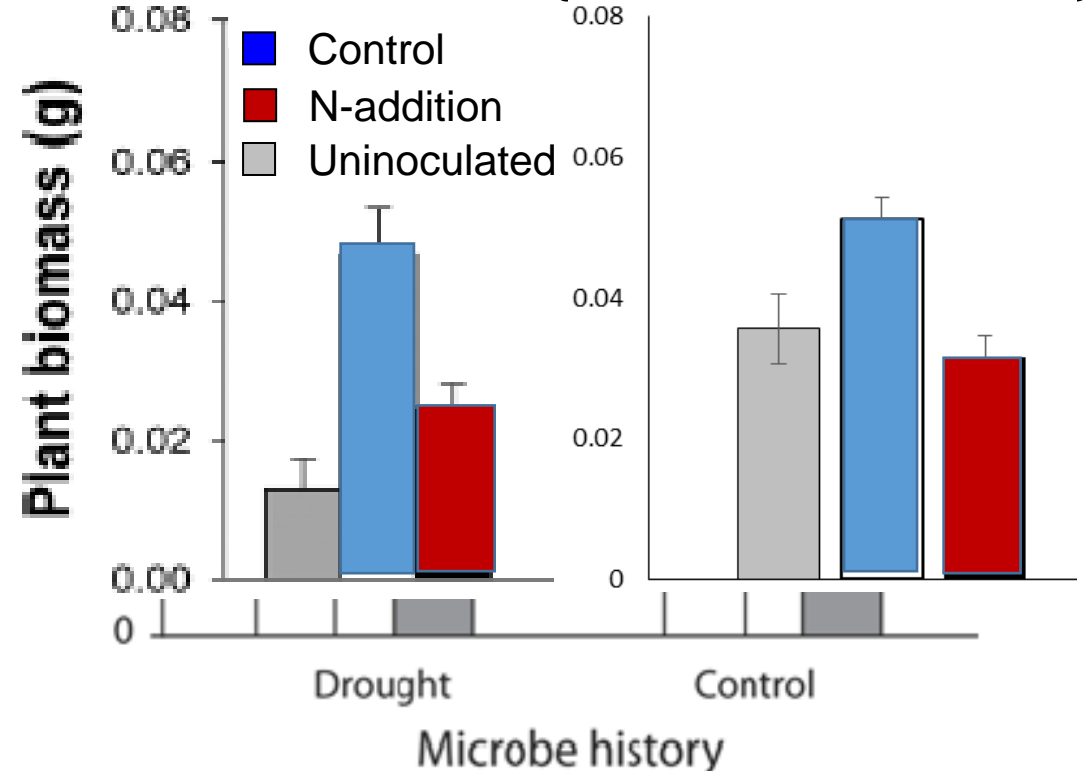
# When are adaptive biological and technological responses likely, and how do they increase resilience?

Microbes evolve in response to long-term N-addition...



ADAPTATION → REDUCED HOST RESILIENCE

Microbes shift in response to drought in 2018



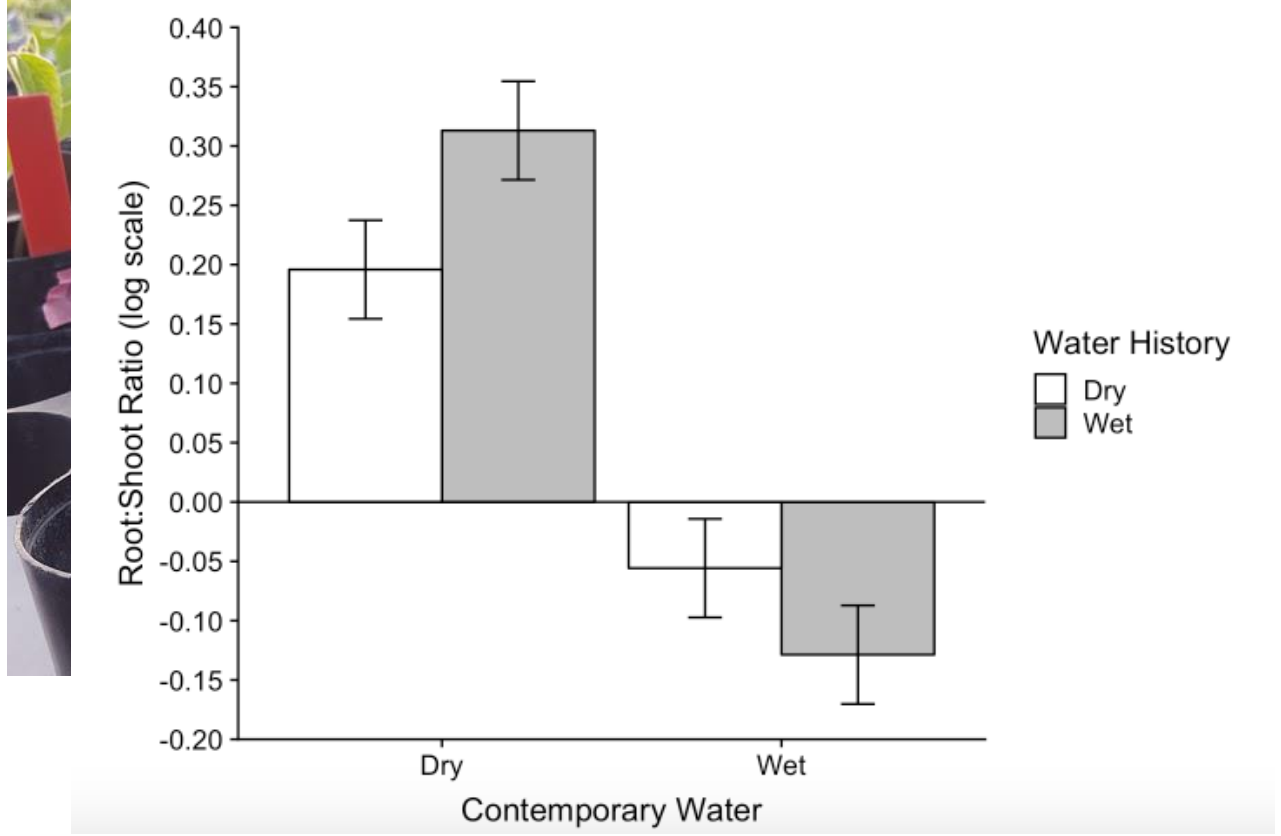
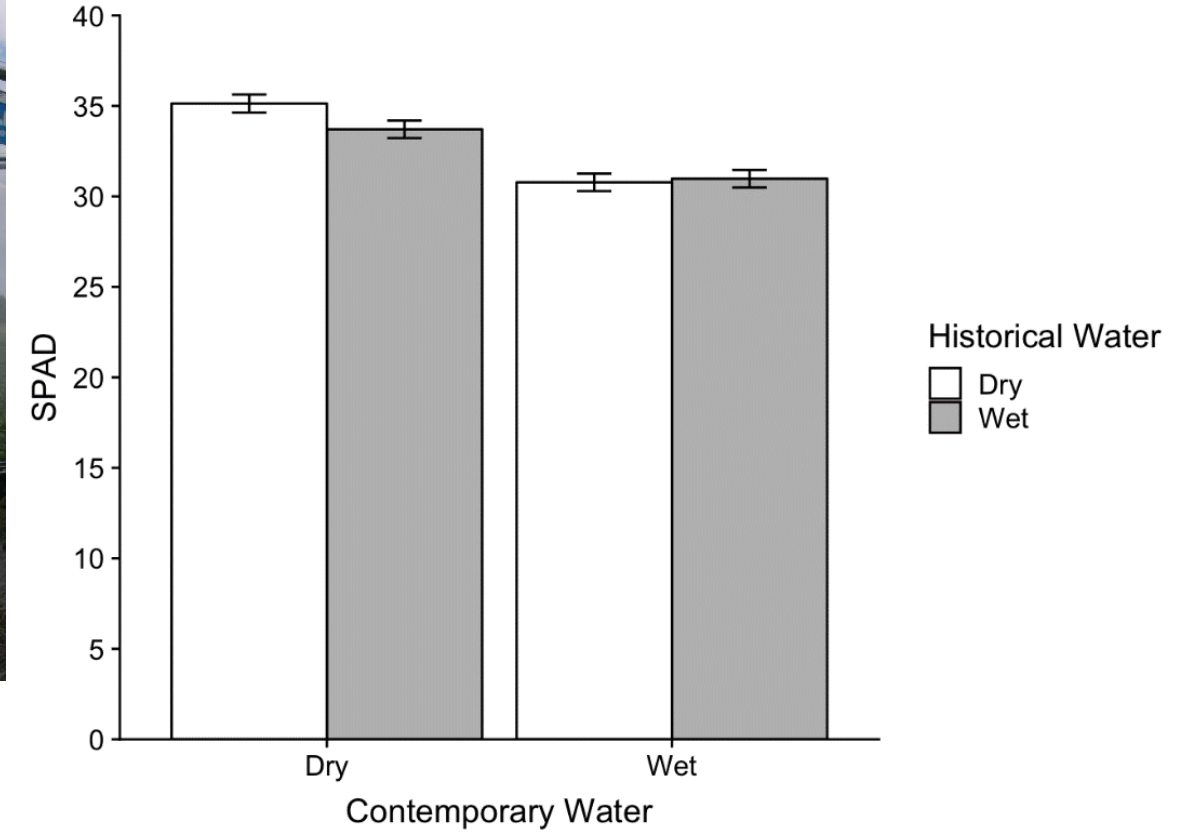
ADAPTATION → INCREASED HOST RESILIENCE

How do microbial diversity and soil resources influence the likelihood that microbial communities shift in ways that increase crop resilience?

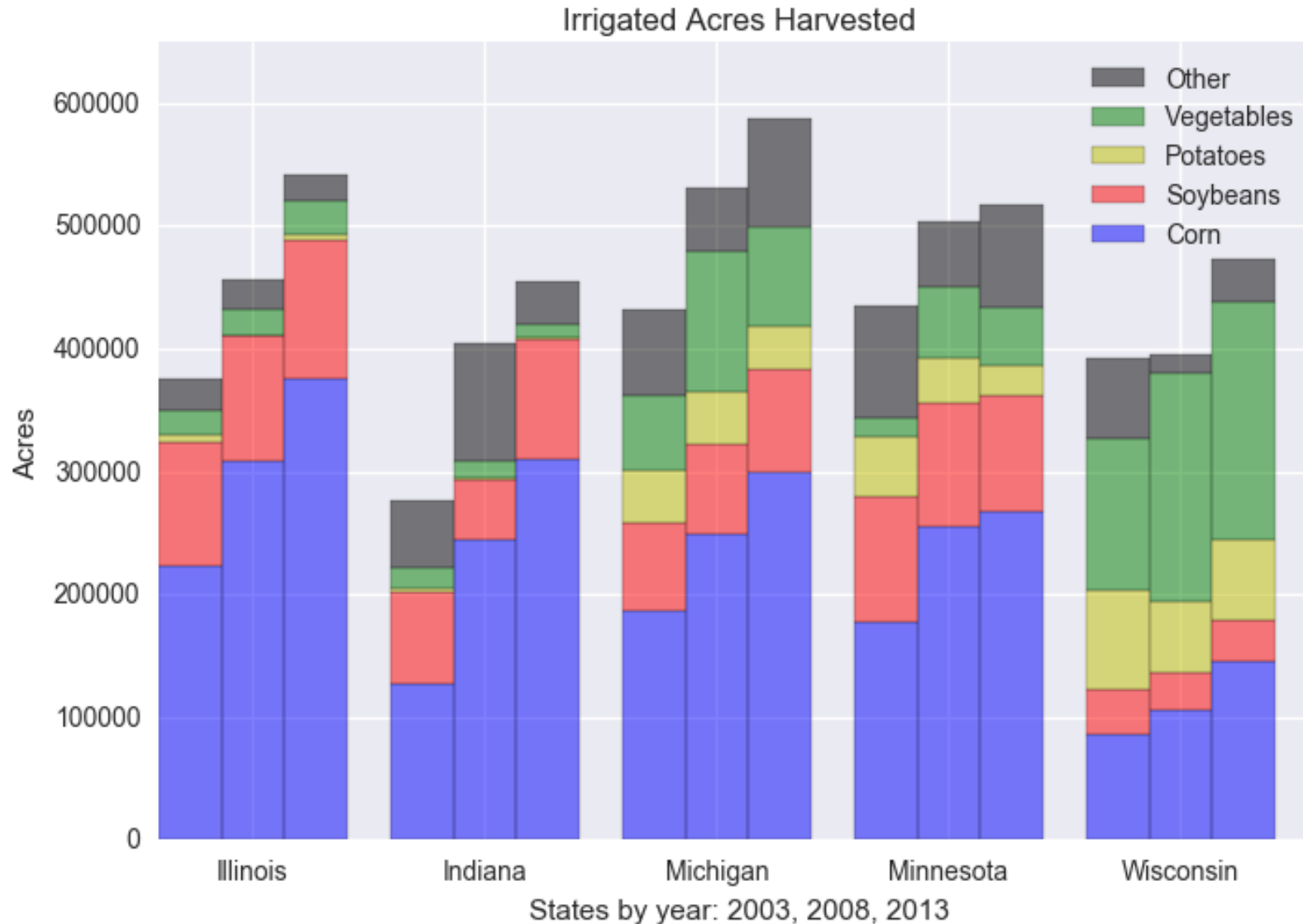


- Microbial diversity & organic matter may increase likelihood of microbe-mediated plant adaptation.
- Additionally can test for microbe-mediated plant adaptation across cropping treatments and unmanaged habitats.

# KBS Irrigation experiment to test for feedbacks between technological and biological adaptation:

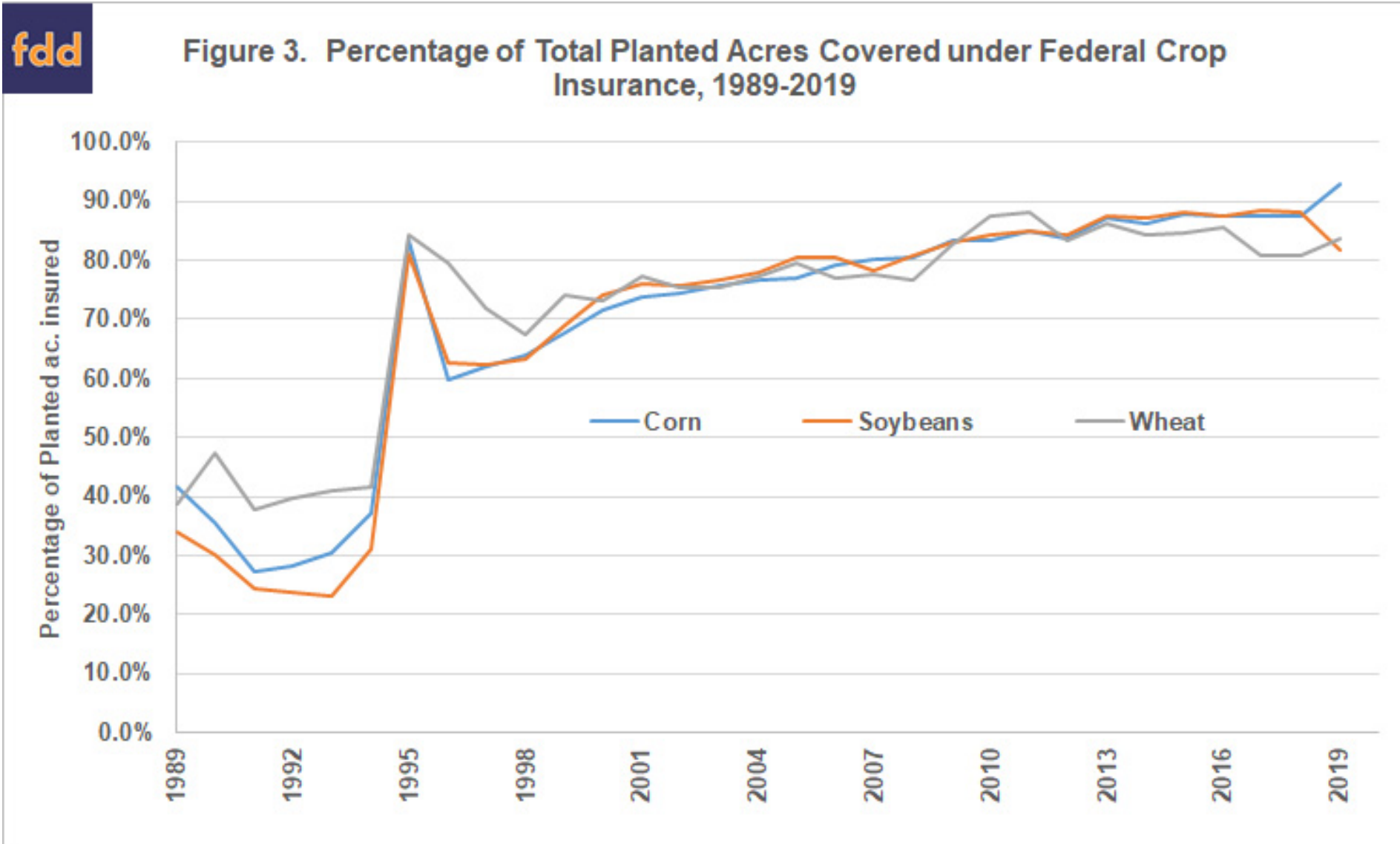


# Farmer adaptation: Irrigated acreage rising 2003-13, but that's not the only alternative



Source: A. Kornelis (2018):  
*Irrigation Water Demand*, M.S.  
thesis, MSU AFRE.

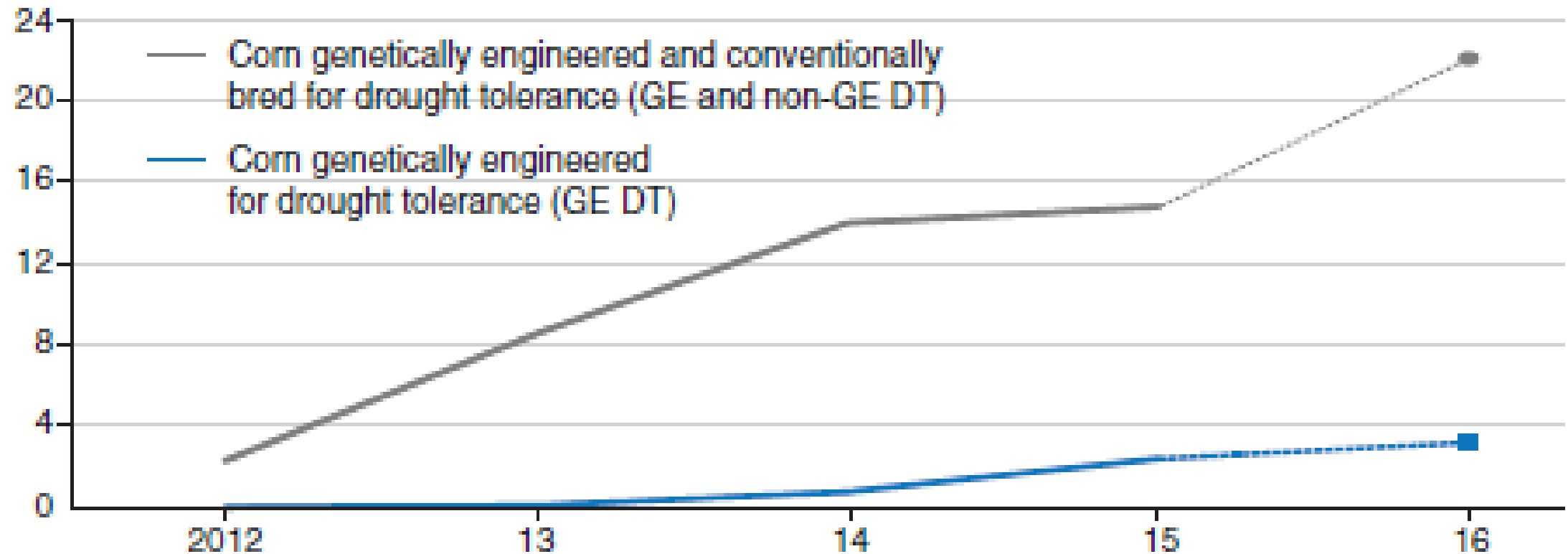
# Crop insurance enrollment for corn-soy-wheat rising gradually, 2003-19



Source: Sherrick & Schnitkey (2019), *FarmDoc Daily*, Sep 5, 2019.

# Drought-tolerant corn spreading fast: 22% of US acreage in first 5 years

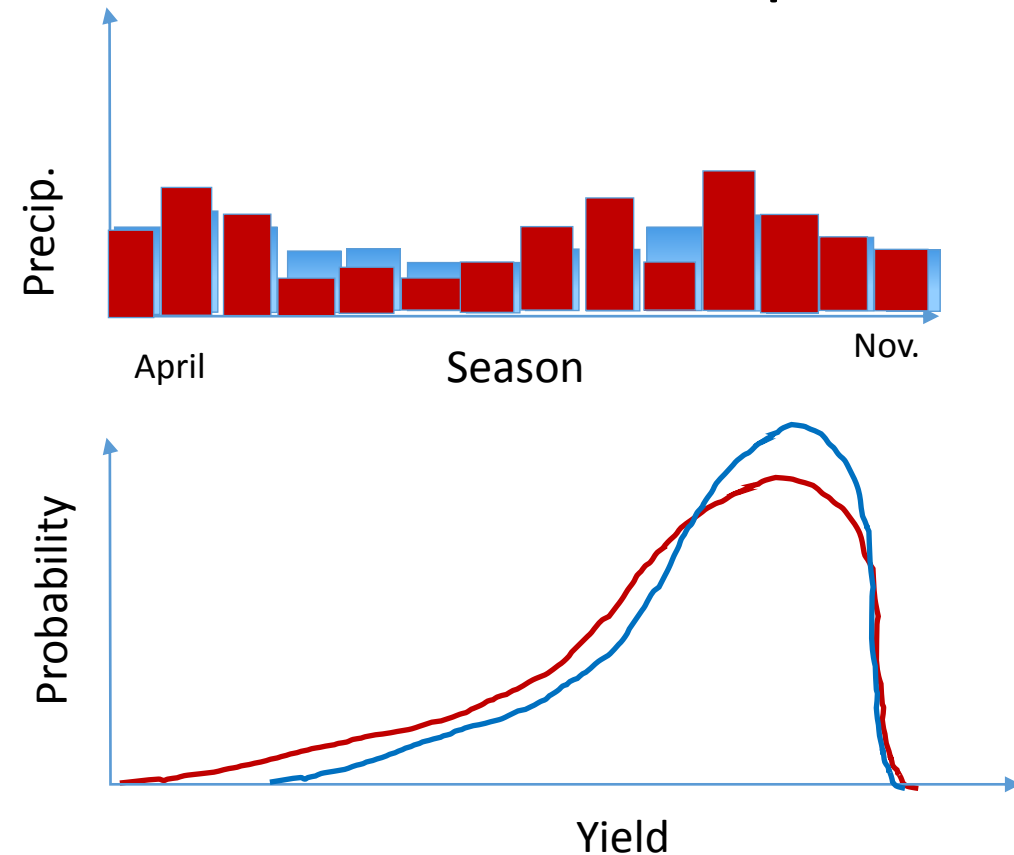
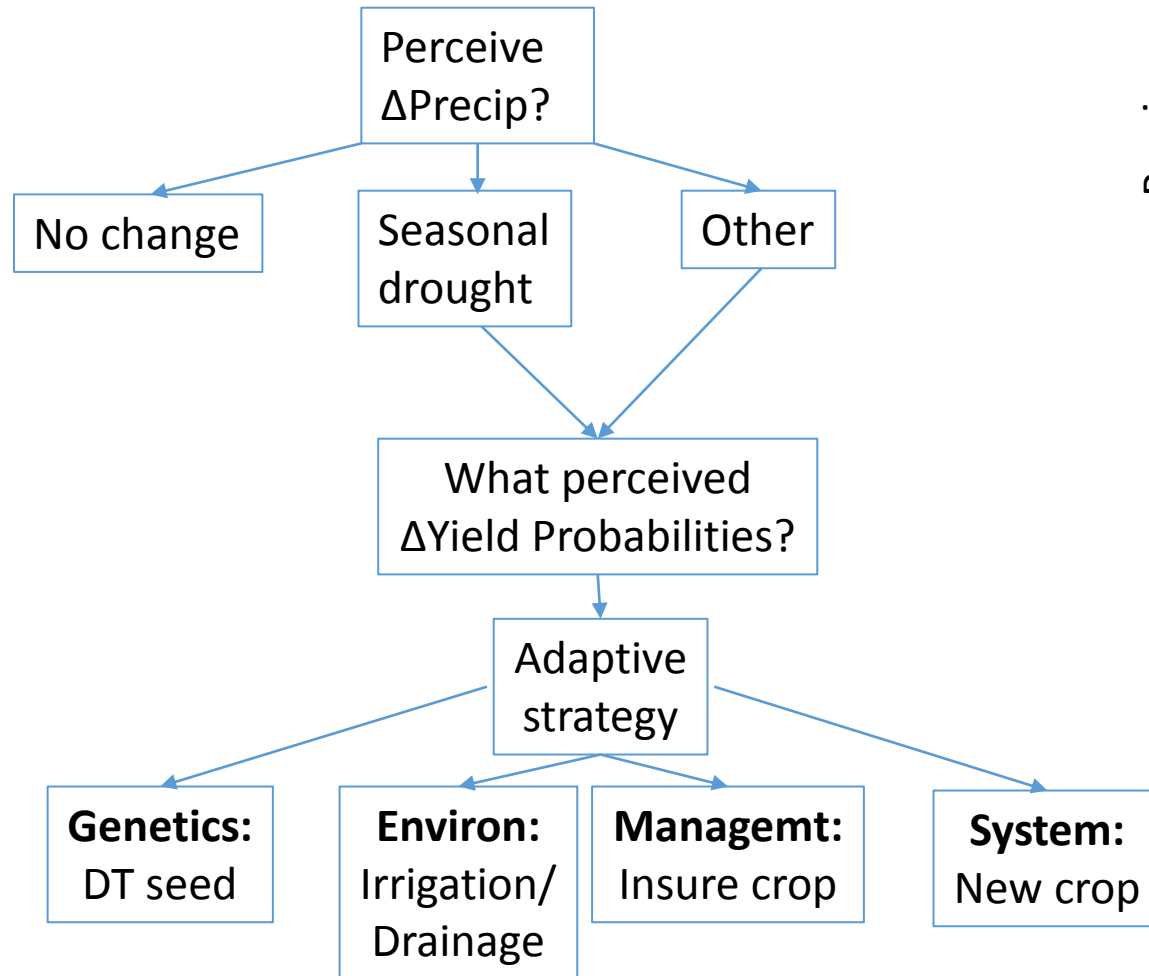
Percent of U.S. corn acreage



Source: McFadden et al (2019), *Development, Adoption, & Mgmt of Drought-Tolerant Corn*, USDA-ERS, EIB 204.



# RQ: How do farmers perceive $\Delta$ Precip? What perceived yield effect? How best to adapt?



# Adaptation research summary

- Irrigation at KBS-LTER Main Site
  - If no irrigation, how will microbial communities adapt?
  - If irrigation expands, will it impede adaptation by microbial communities?
  - What environmental effects?
- Farmer interviews on climate perceptions, adaptive actions
  - What subjective probability distributions perceived? How changing?
  - How best to adapt? G-E-M-S options

