

Ecological innovation and redesign for pesticide free crop production

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Dijon 2022-06-02

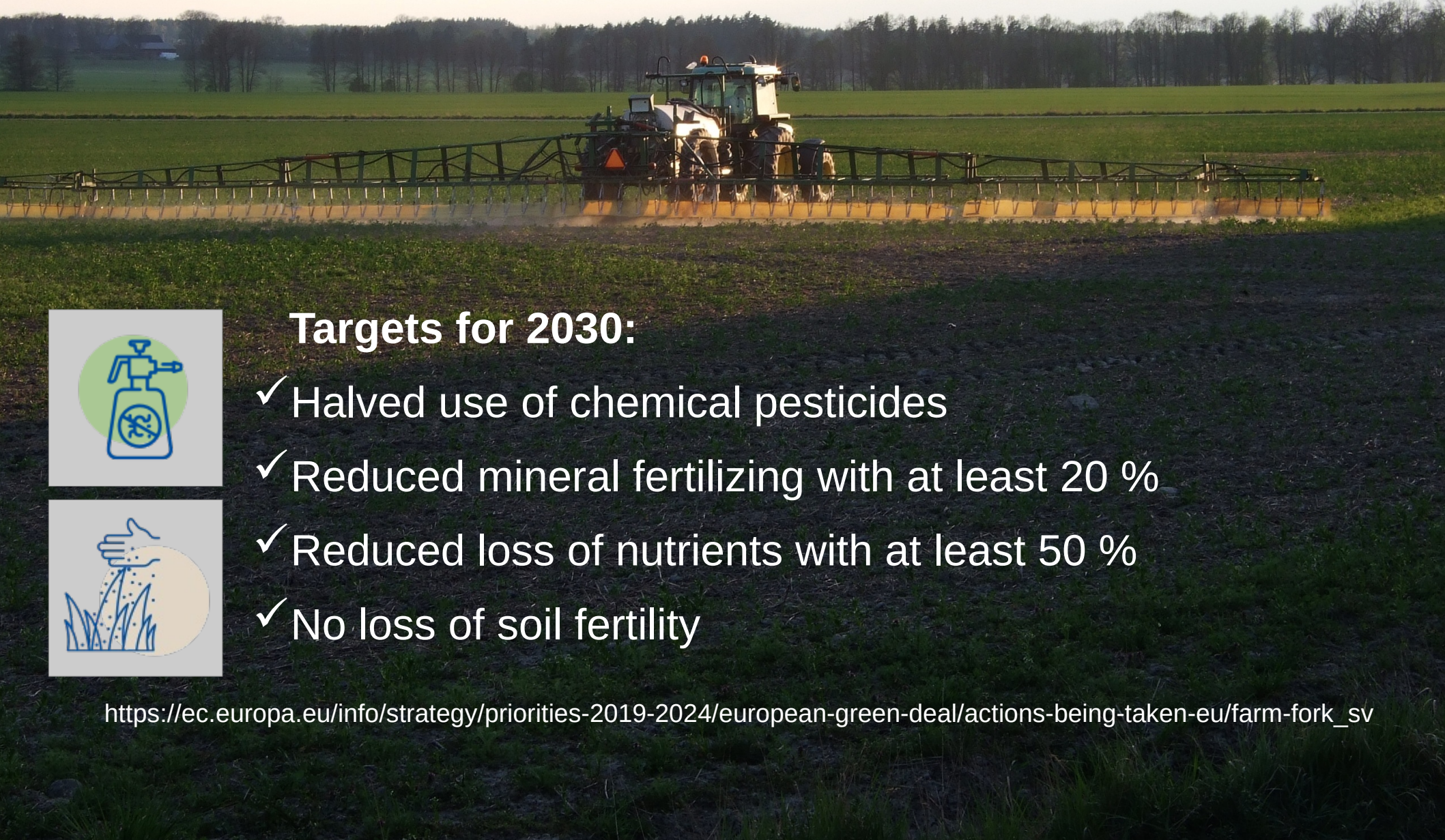
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EU Green Deal

Area 6: Farm to Fork



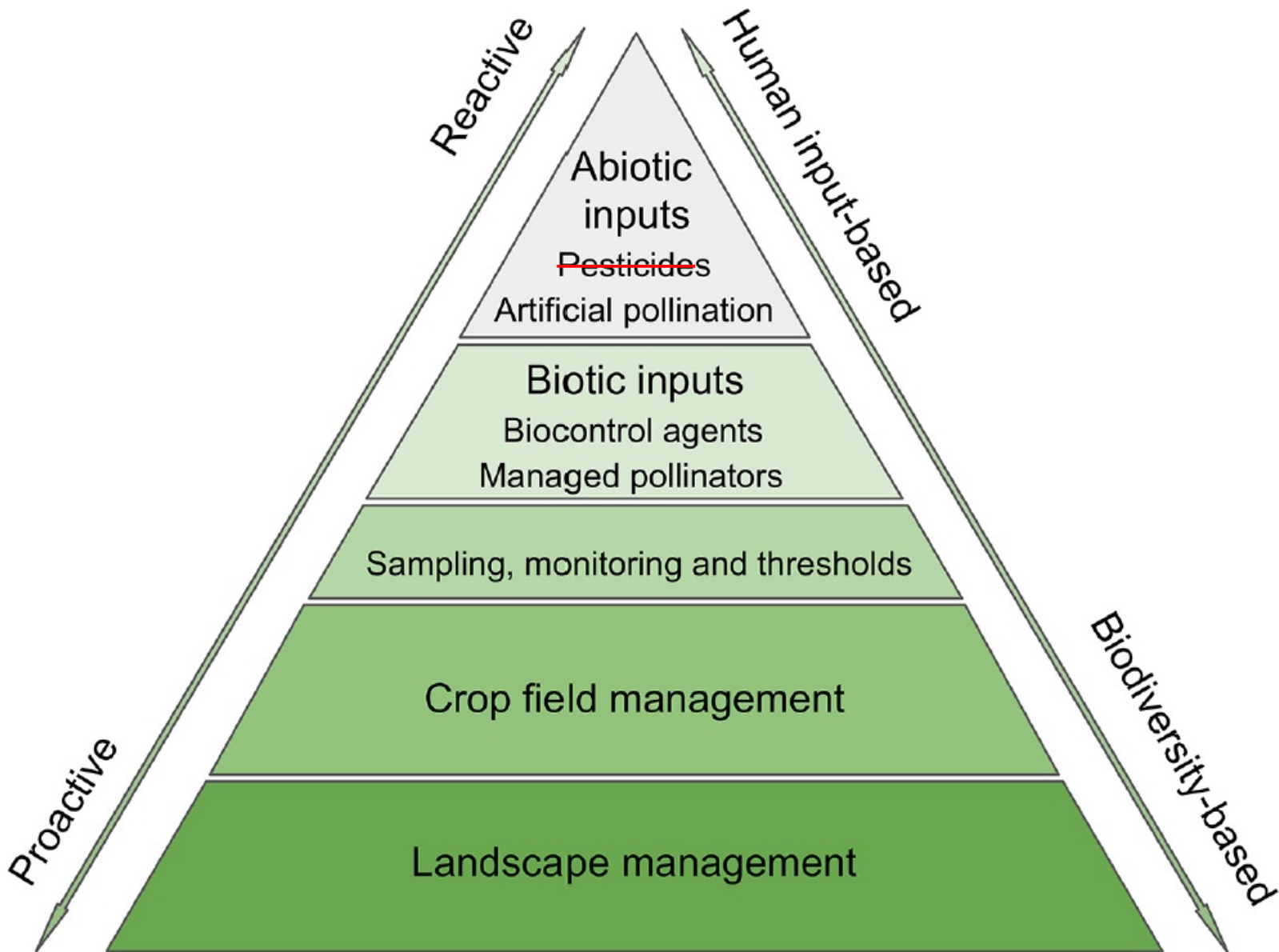
Targets for 2030:



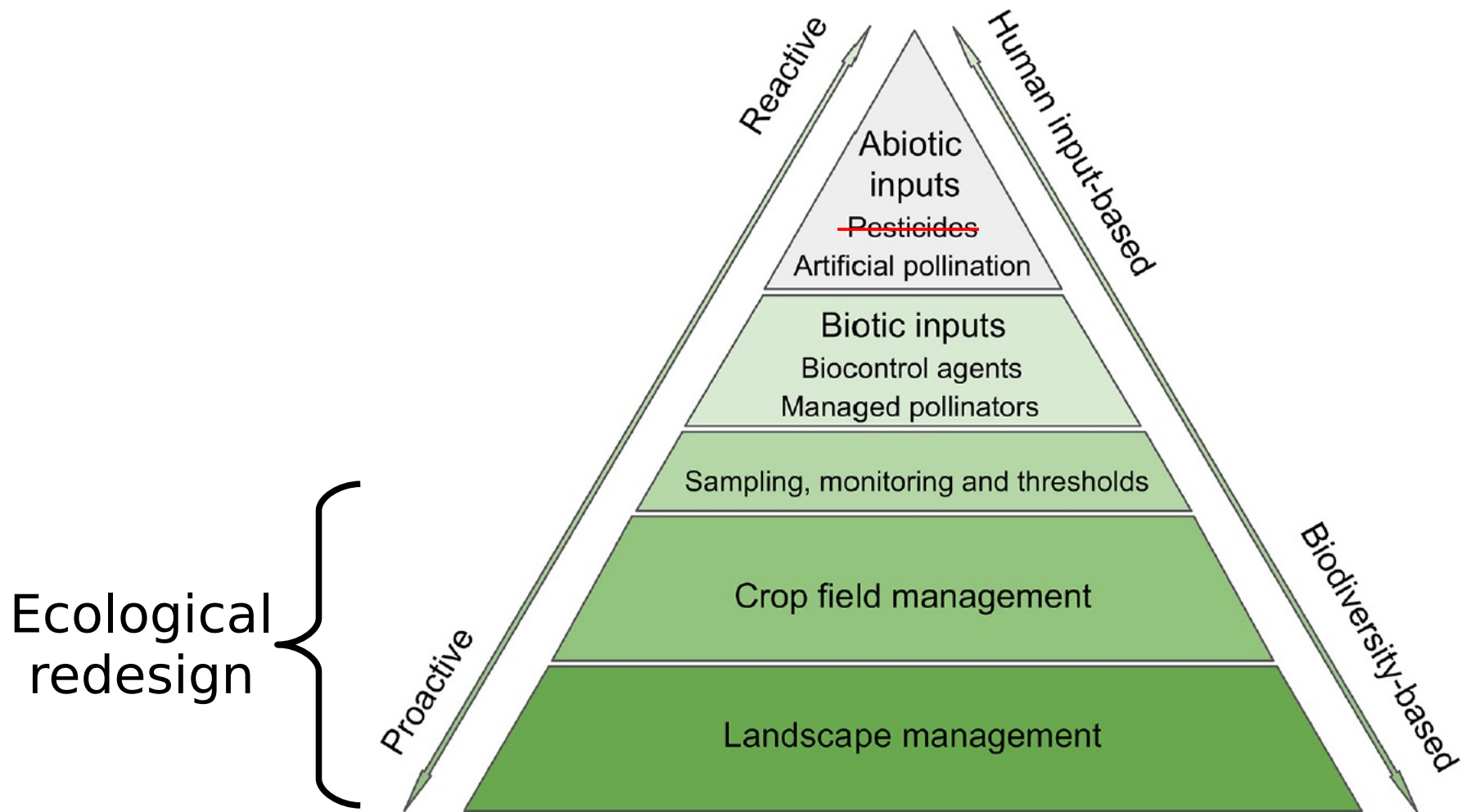
- ✓ Halved use of chemical pesticides
- ✓ Reduced mineral fertilizing with at least 20 %
- ✓ Reduced loss of nutrients with at least 50 %
- ✓ No loss of soil fertility



Integrated Pest (and Pollinator) Management



Ecological redesign - beyond eco-efficiency and input substitution



Cropping systems redesign aims

Work *with* biodiversity (not replace it)

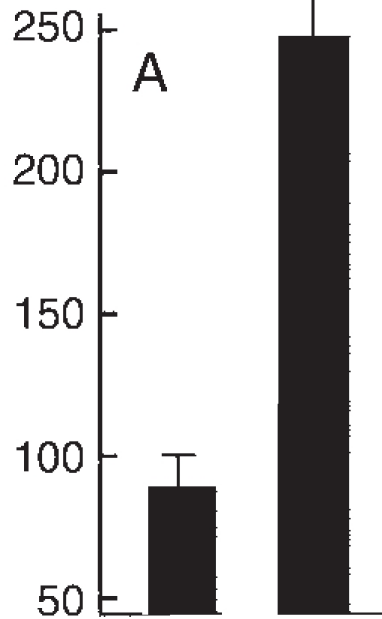
...to strengthen ecological functions

...to increase capture and use efficiency
of on-farm resources

...to enhance stability, reduce risk
and environmental impact

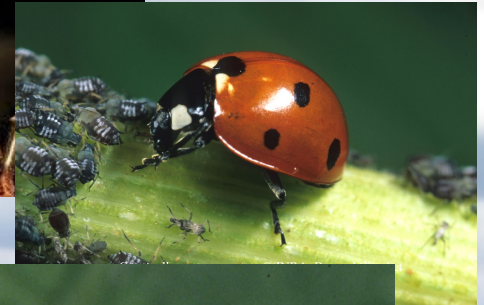
Aphid density
(number/100 shoots)

A



Control

Predators excluded



Thies et al 2011 Ecological Applications
Rusch et al 2016 Agriculture Ecosystem Environment

Ecological characteristics to strive for

- Less disturbance
- More biodiversity
- More perenniality

Crop field management



Lundin 2017, 2020 Crop protection
Lundin 2019 Agriculture Ecosystems Environment

Redesign the crop field

Crop field management



Relay cropping



Perennial cropping



Cover the ground



Diversified cropping and weed management



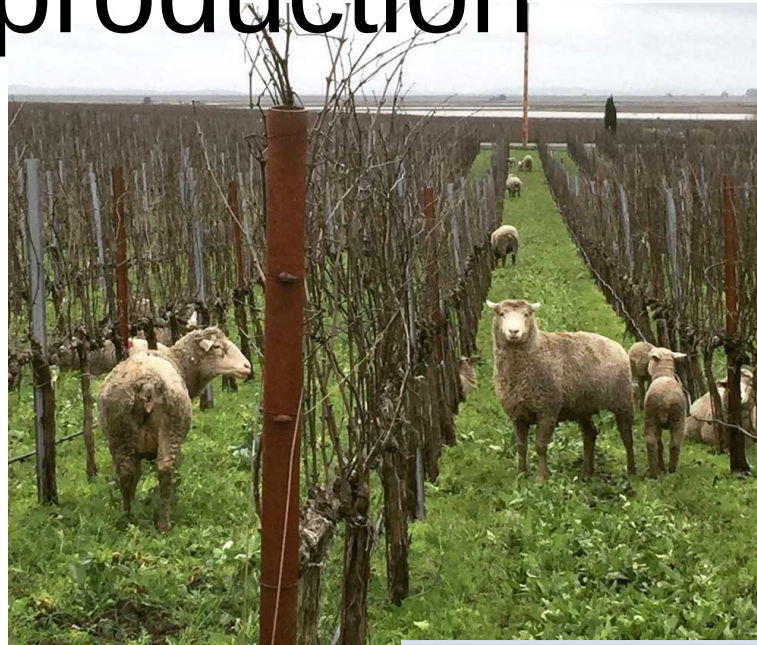
Diversified crop genetics



Biological pest control (eg push-pull)

Integrate crop and animal production

Crop field management



Organic fertilising

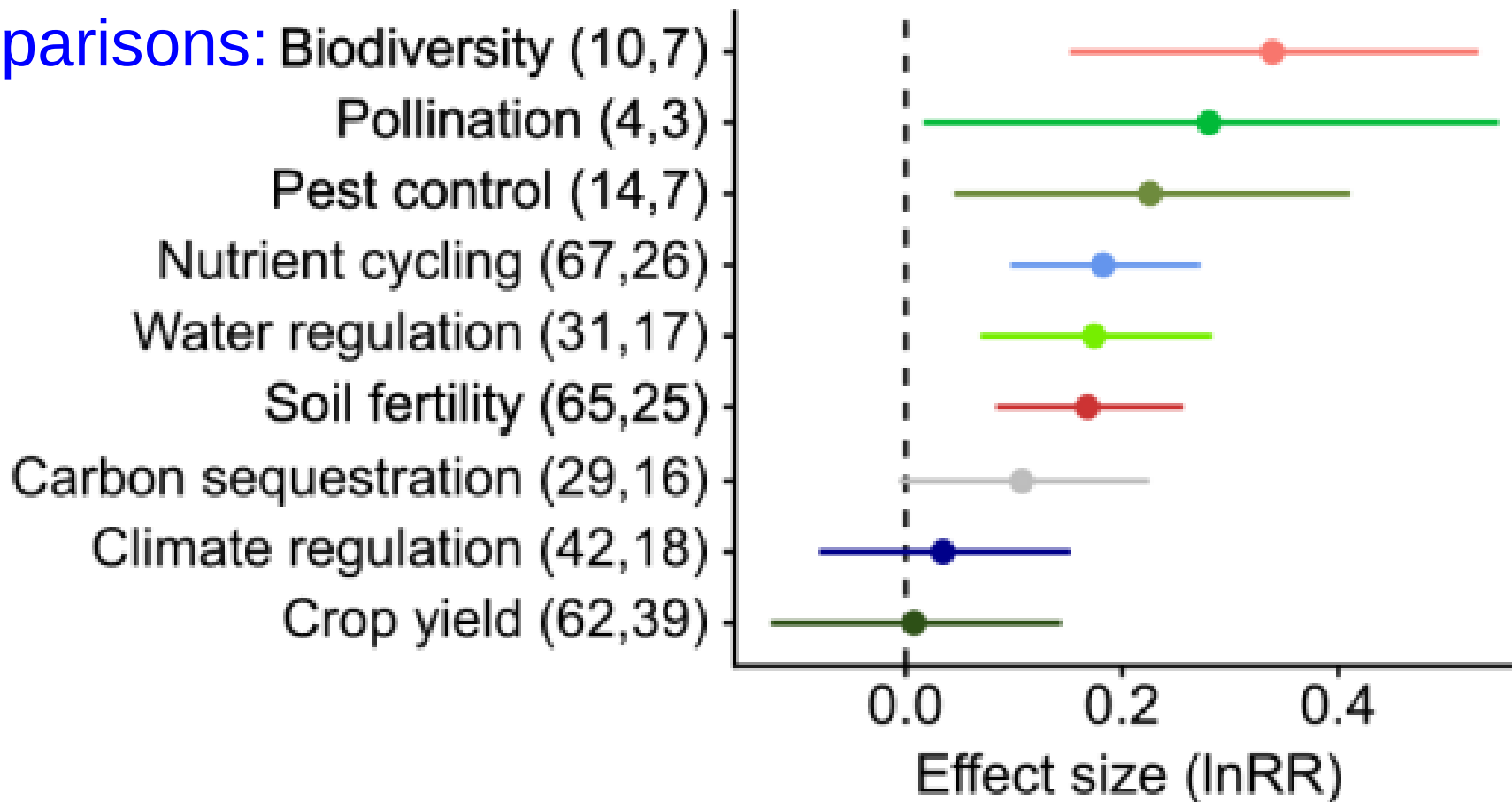
Redesign the landscape



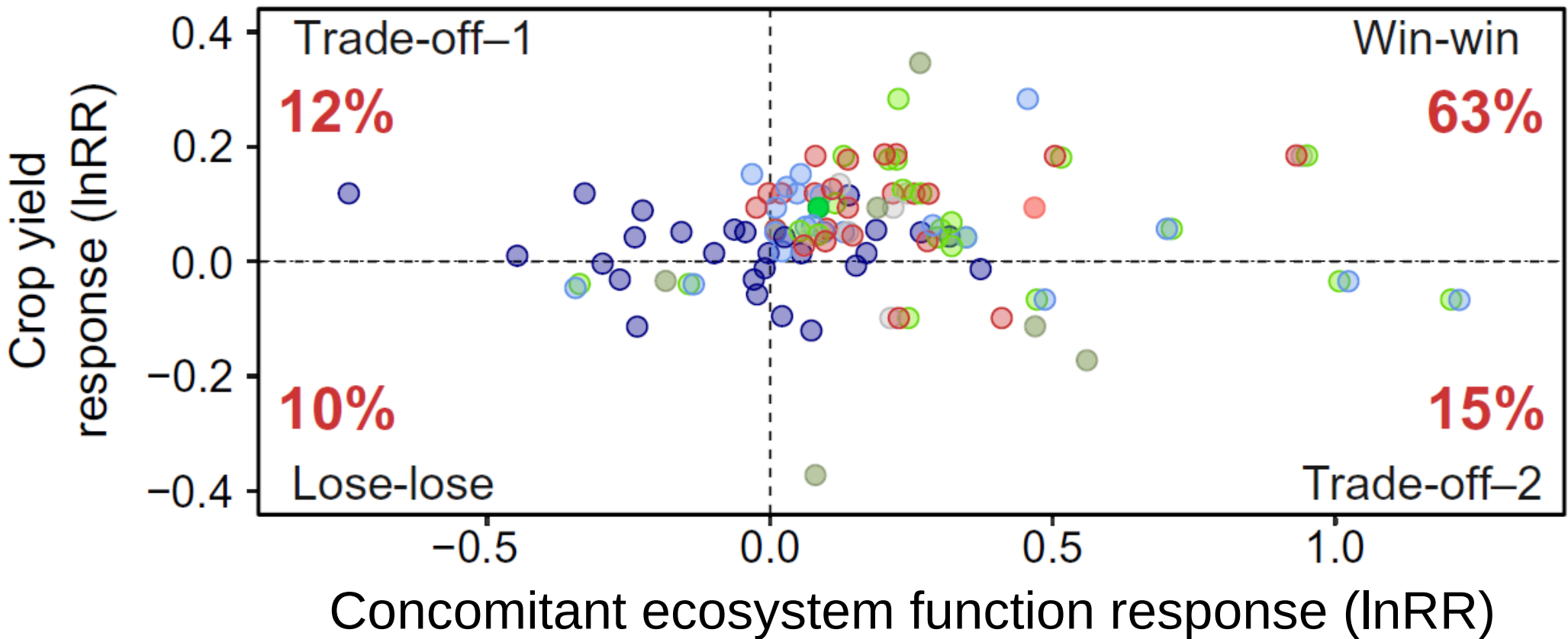


Diversification gives multifunctional crop ecosystems

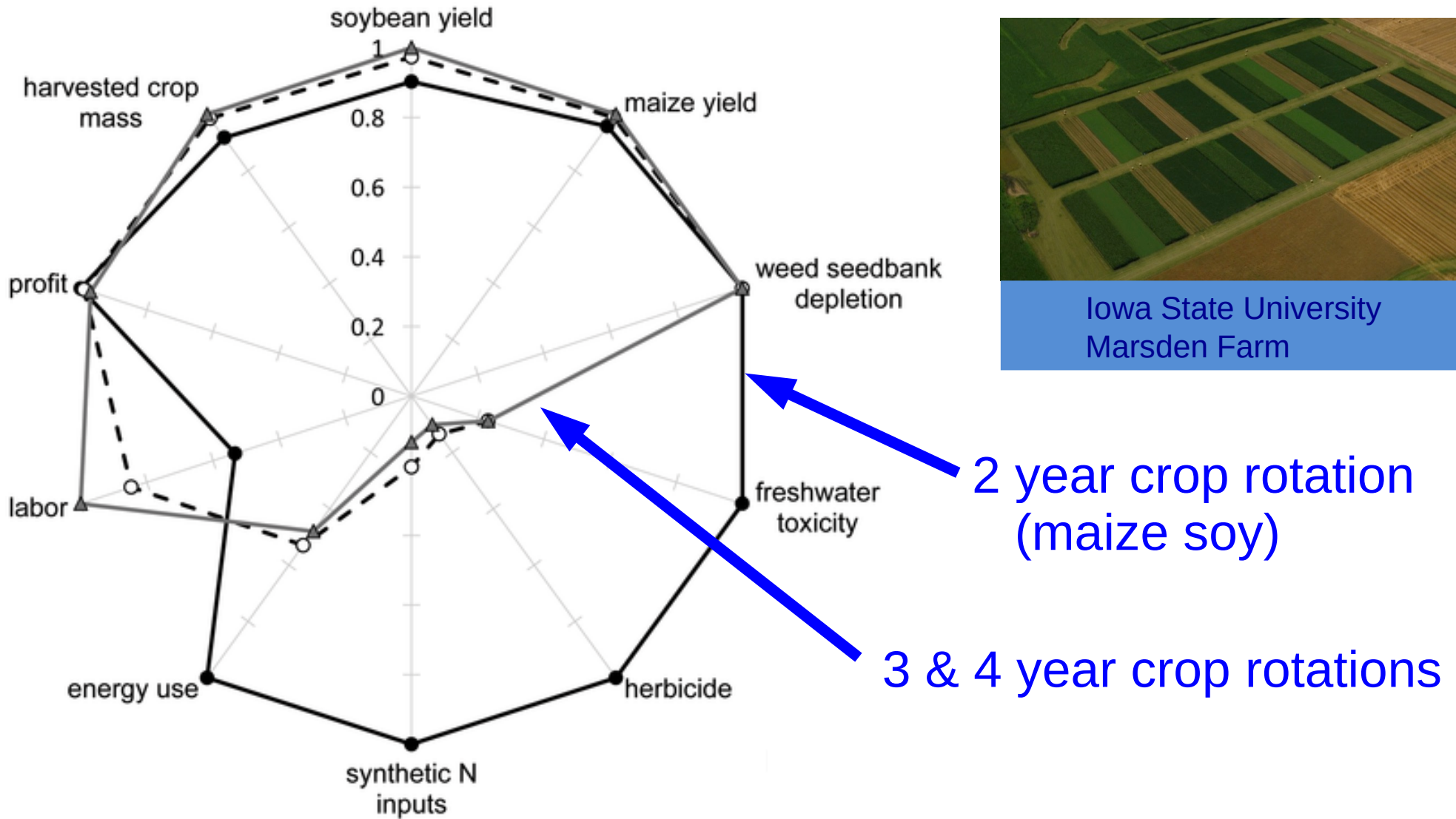
Meta-study based
on ~42000
comparisons:



Diversification-crop yield can trade-off but win-wins dominate



Multidimensional follow-up



2 year crop rotation
(maize soy)

3 & 4 year crop rotations

Added benefits

- Builds fertility long-term
- Reduces dependence on fossil inputs
- Spreads risks
- Shortens vulnerable supply chains
- Less dependence on few commodity crops
- Jobs



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