# Cultivating Resilience: Harnessing Diversity in Biobased Production Systems.

Transition to a Circular Bioeconomy

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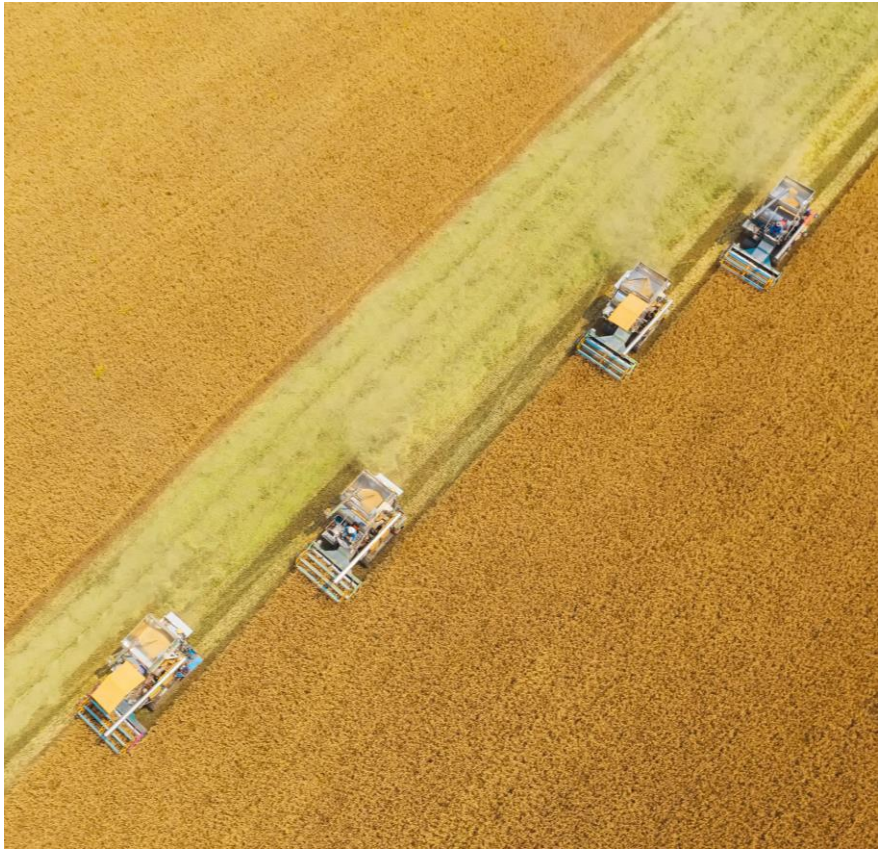
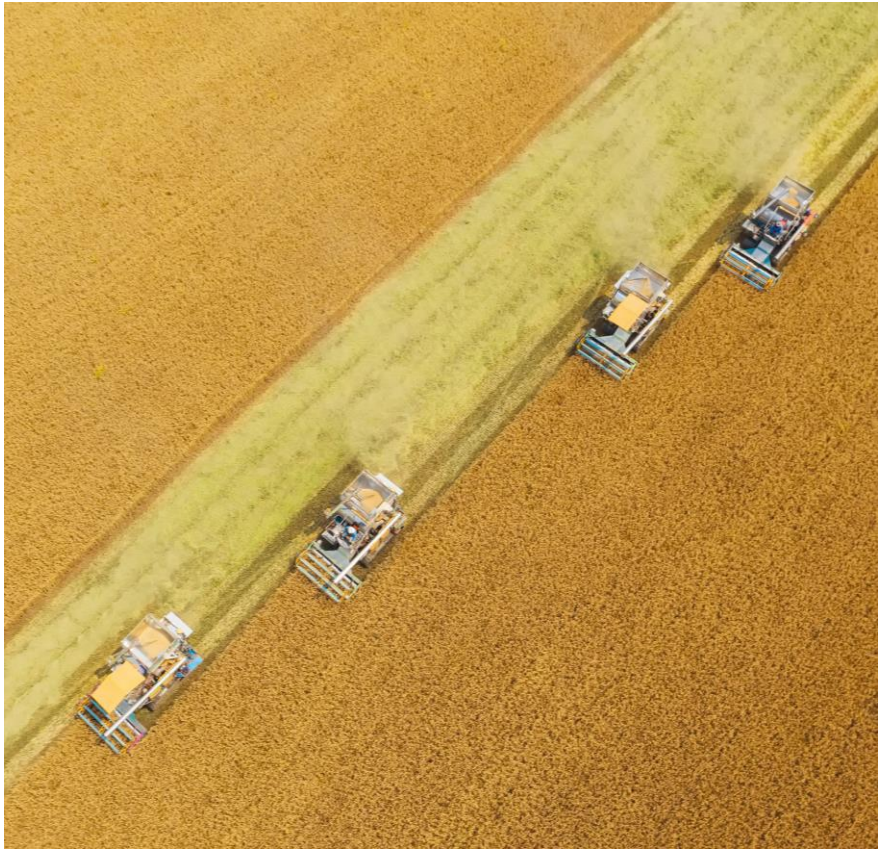
# Push for uniformity

- Increased yields
- Ease of management
- Ease of harvest
- Increased profits



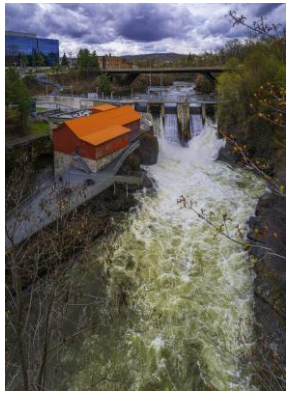
# Push for uniformity

- Increased yields
- Ease of management
- Ease of harvest
- Increased profits
- Environmental sensitivity
- Nutrient intensive
- Poor ecosystem services



# Uniformity breeds risk






- Climate sensitivity
  - Maladaptation
- Disease spread
- Nature under stress

- **Uniformity leads to poor resilience**

# Re-diversifying our production systems

Increasing genetic and species diversity in production systems contributes to higher resilience

However, this depends on:

- System requirements
- Local context
- Production environment
- Interactions at inter- and intra-specific levels

# Diversity research requires diverse teams

KB 34 New system requirements for breeding for resilient production - Modelling functional species and intra-specific interactions at production system level

**Crops (field/GH)**

- Martina Huber
- Anna Edlinger
- Maarten van der Meer
- Rene Smulders
- Peter Bourke
- Pieter de Visser
- Anja Dieleman
- Mark van Hoogdalem
- Andries Temme

**Forestry**

- Jorad de Vries
- Joukje Buiteveld
- Mart Jan Schelhaas

**Livestock**

- Gerbrich Bonekamp
- Sipke Joost Hiemstra
- Jan ten Napel
- Lianne Alderkamp
- Aart van der Linden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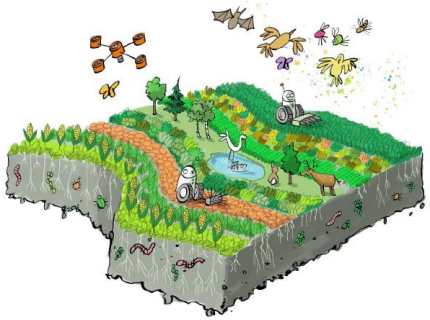
# Program for this session



1. Crop diversity
*Andries Temme*

2. Forest diversity
*Jorad de Vries*

3. Livestock diversity
*Gerbrich Bonekamp*

4. Interactive discussion

(Illustrations Hiemstra et al 2022)

# Diversity in crops is diverse…

CropMix

Strip cropping

*cropmix.nl*

Agroforestry

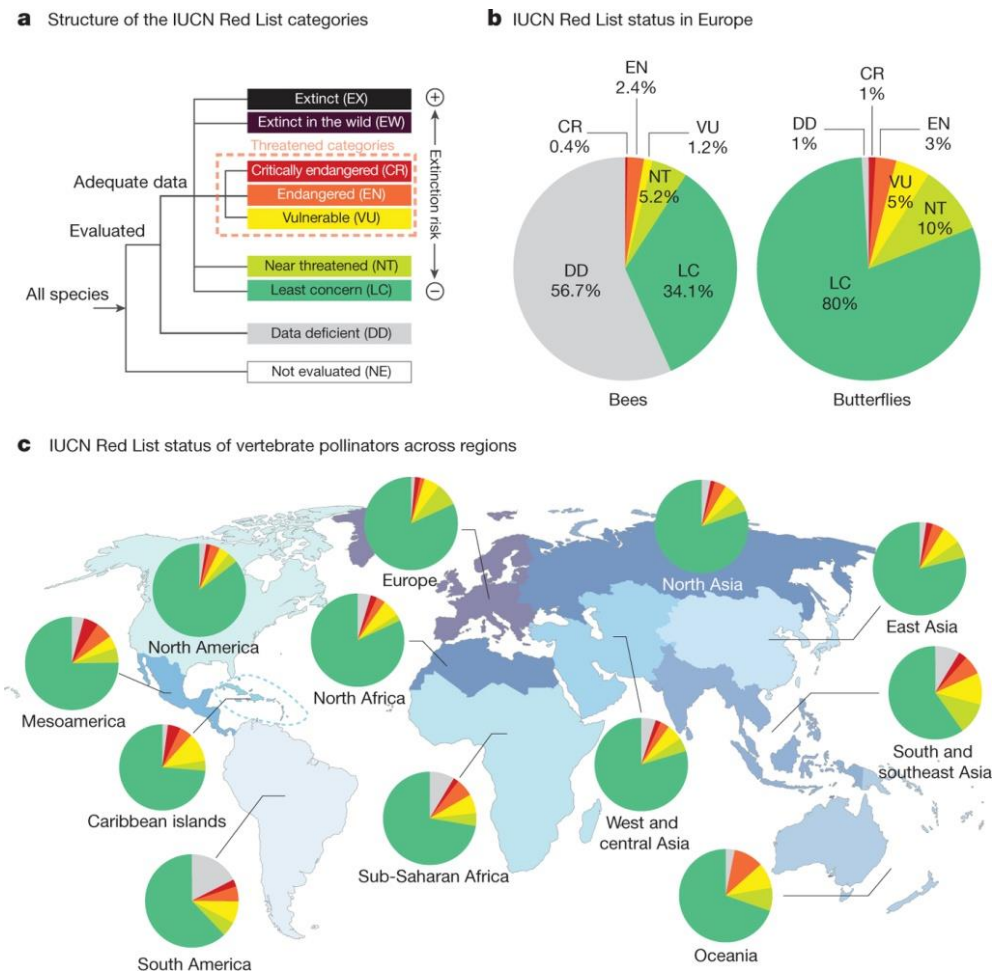
*agroforestrynetwerk.nl*

Diversity within crops

# The value of diversity within crops

# Pollinator decline

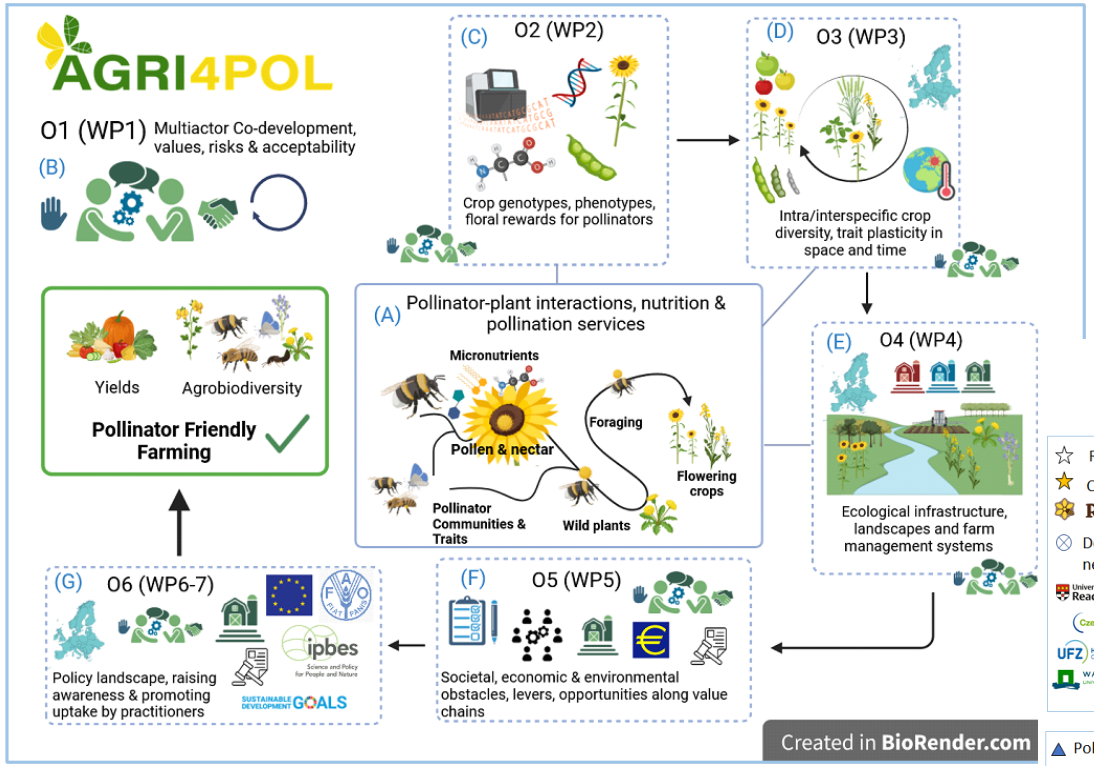
- Large segment of agricultural productivity depends on pollinators
- Pesticide use, habitat loss, **monocultures**, other farming practices contribute to the decline of pollinators
  - Especially in Western Europe





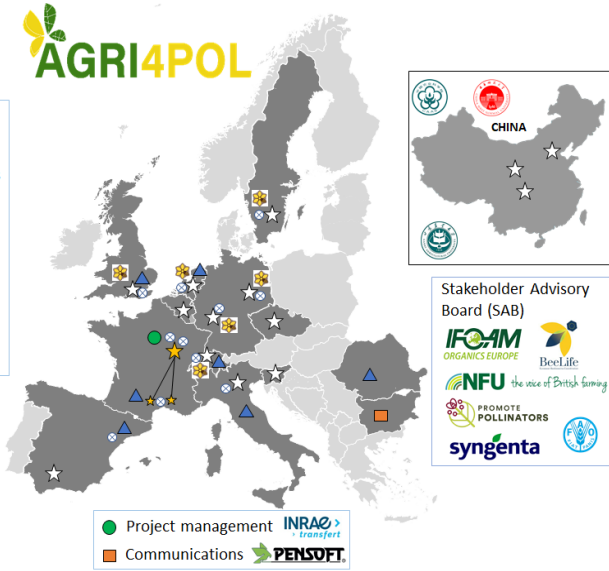

S G Potts *et al. Nature* 1–10 (2016) doi:10.1038/nature20588

# New research on pollinator inclusive agriculture




WUR partners:

- Andries Temme
- Luisa Trindade
- David Kleijn
- Thijs Fijen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# Trade-offs and synergies in diversified flowers

## Can we breed for a win-win scenario?

**Costs & benefits of diversity**

- Pollinator attractiveness (visual, chemical)
  - Chemical attractiveness vs pest deterrence?
  - General or specific pollinators (bumblebees, bees, hoverflies, moths, etc)
- Phenology (duration and timing of flowering)
  - Harvest uniformity
- Nectar/pollen nutritional value
  - Energy investment, pollination success
- Complex morphological, physiological suite of traits
  - Pleiotropy with other traits?
  - Abiotic stress, disease tolerance, yield quality

(Sunflower: A. Temme, Faba: Chloë Raderschall (SLU) )

# A conversation between partners

(GenAI: DALL-E 3 “Farmer and bee negotiating”)

- **Roadmap for pollinator inclusive agriculture**
- Understand phenotypic variation and integration of flower traits in sunflower and faba bean
- Showcase synergies and trade-offs in breeding for pollinator/pollination services
    - Floral traits vs stress tolerance vs yield vs quality
- 4-year programme (**start 2025**)

# A value of diversity within crops

- Halted decline in wild-pollinator communities
- Safeguarding of key pollination services in landscape
- Increase in pollination robustness

AGRI4POL

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