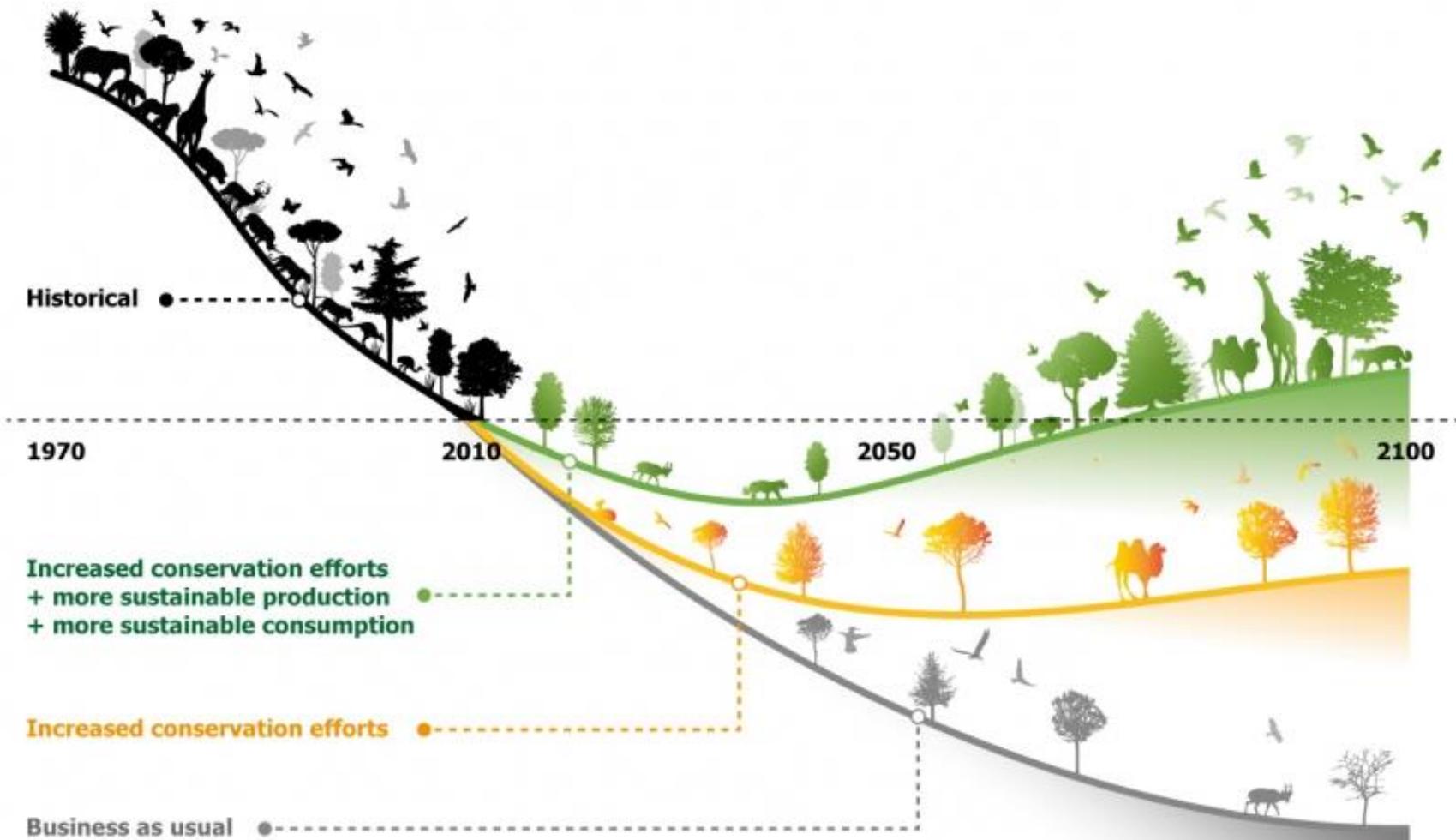


Automating agroecology?

How to design a farming robot without a monocultural mindset?

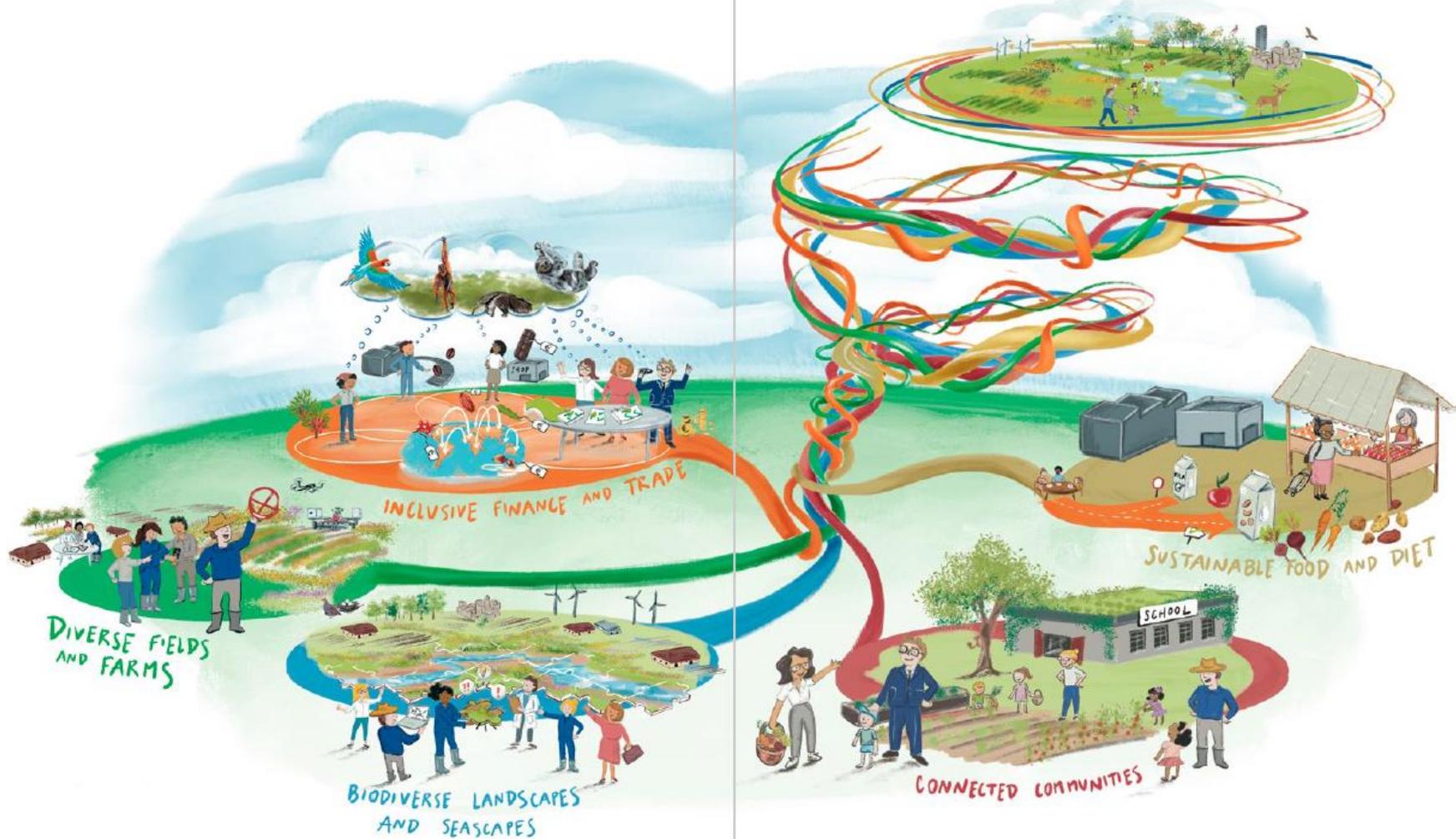


Dr. Lenora Ditzler, *Farming Systems Ecology Group*
Wageningen University & Research
March 16, 2024



“Making nature-positive food the norm” The Ellen MacArthur Foundation (2021)





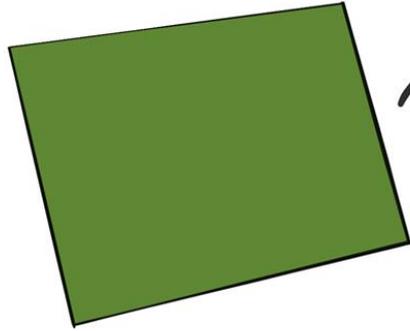
"Nature-positive futures: food systems as a catalyzer for change" Wageningen University & Research (2022)



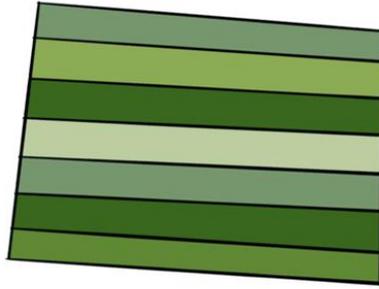


Diversified industrial agriculture?

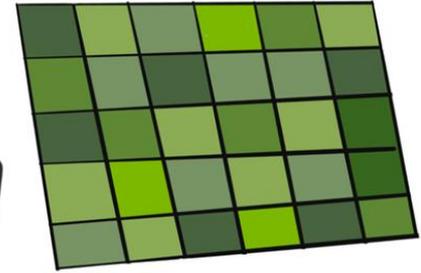
Diversified industrial agriculture?



MONOCULTURE



STRIP CROPPING



PIXEL CROPPING



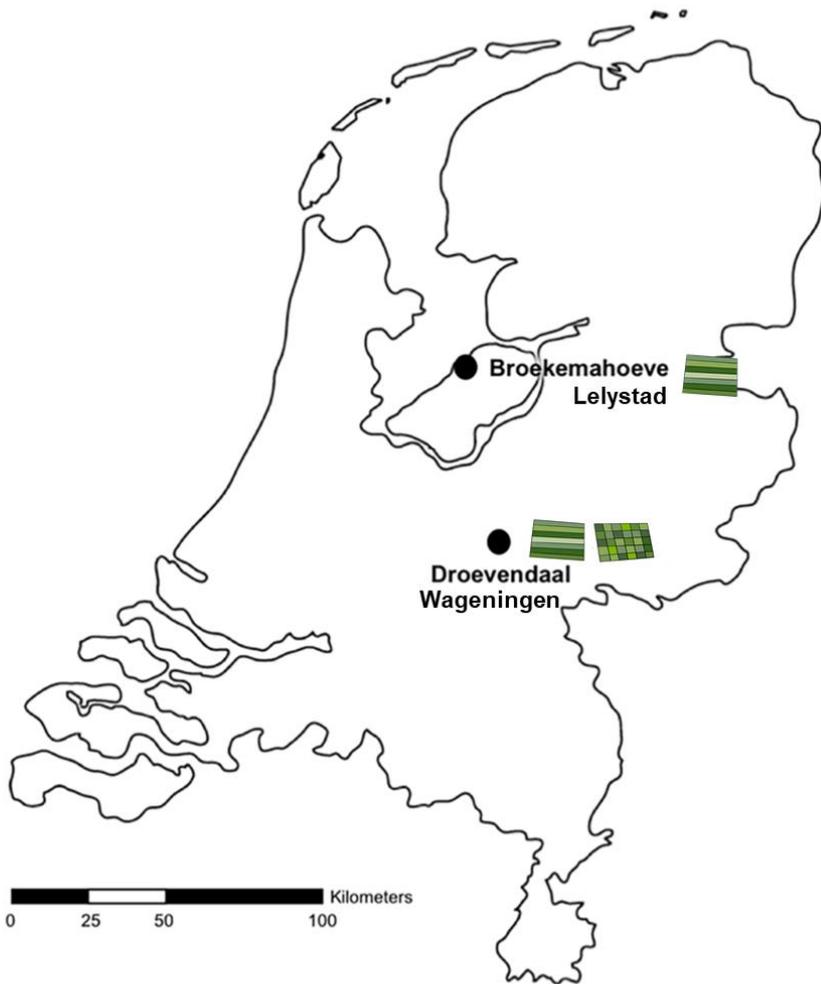
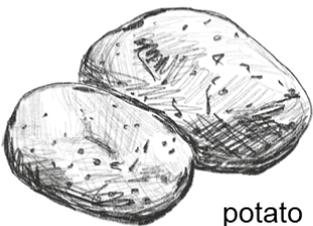
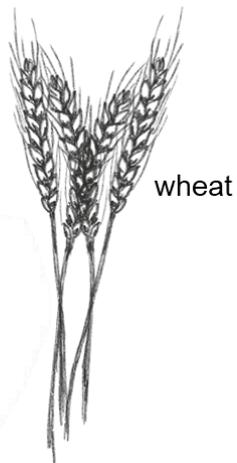
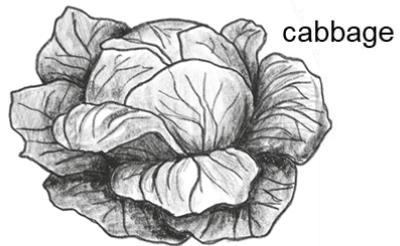
One field
One crop / variety
Homogeneous crop rows



One field
Two or more crops / varieties
Each crop in a narrow strip



One field
Many crops / varieties
Each crop in a small patch



Service

- Soil fertility
- Crop production
- Crop protection
- Biodiversity



An aerial photograph of agricultural fields. The left side shows several parallel rows of young green plants in a field with brown soil. The right side shows a field with alternating wide strips of green grass and brown soil. A central vertical strip of the field is also filled with young green plants. The text 'STRIP CROPPING' is overlaid on the left side, and 'PIXEL CROPPING' is overlaid on the bottom center.

STRIP CROPPING

PIXEL CROPPING







Barley

Fava bean

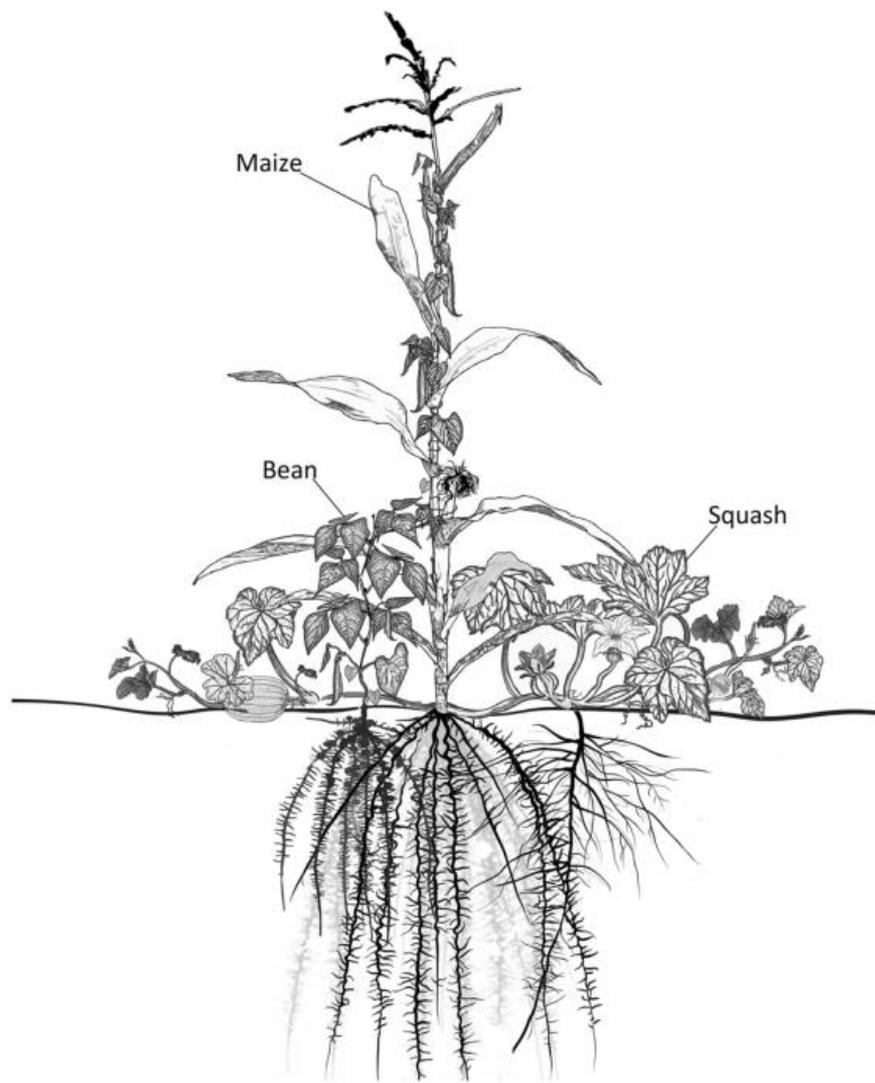
Wheat

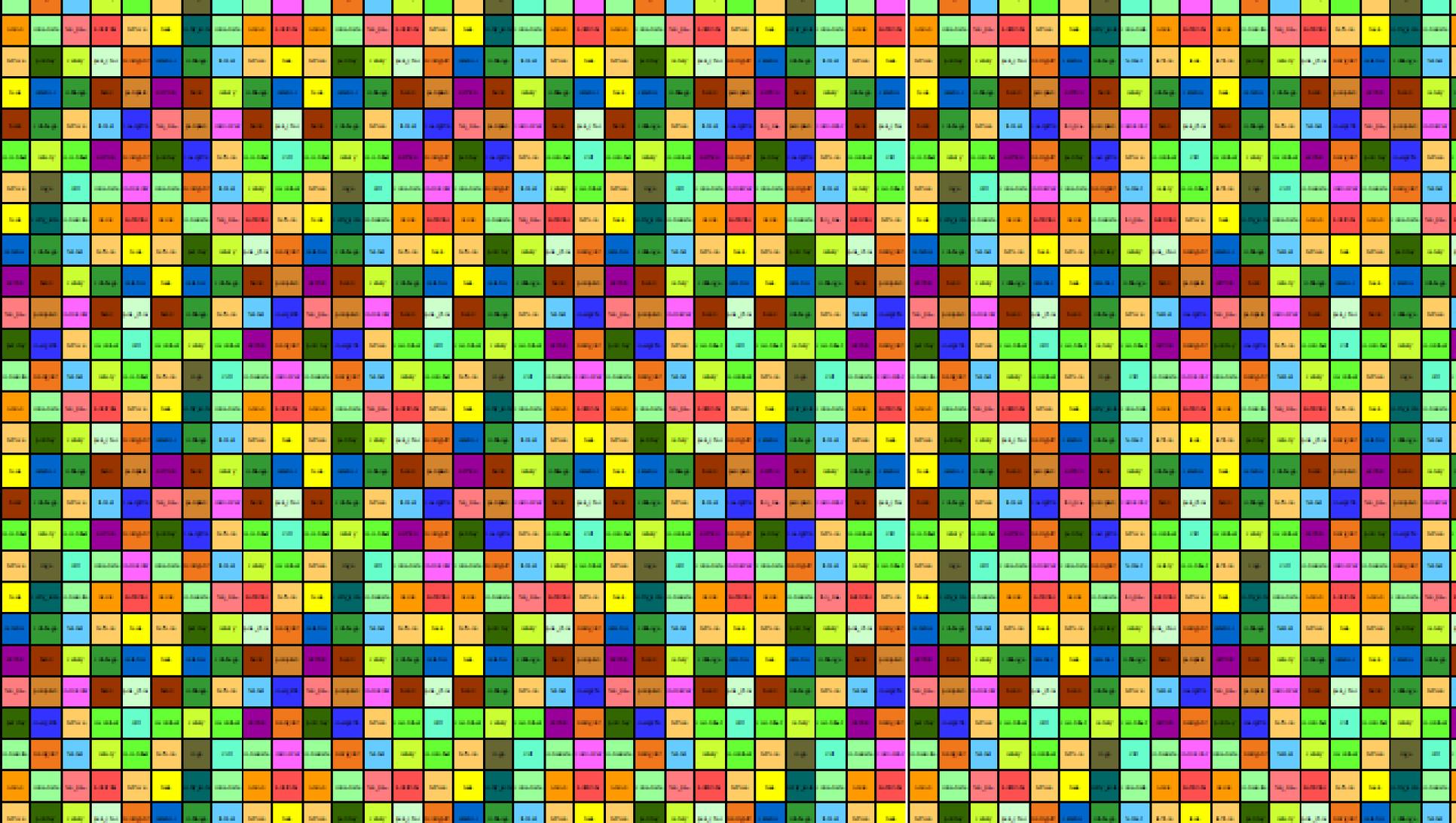
Cabbage

Clover

Sugar beet

Potato













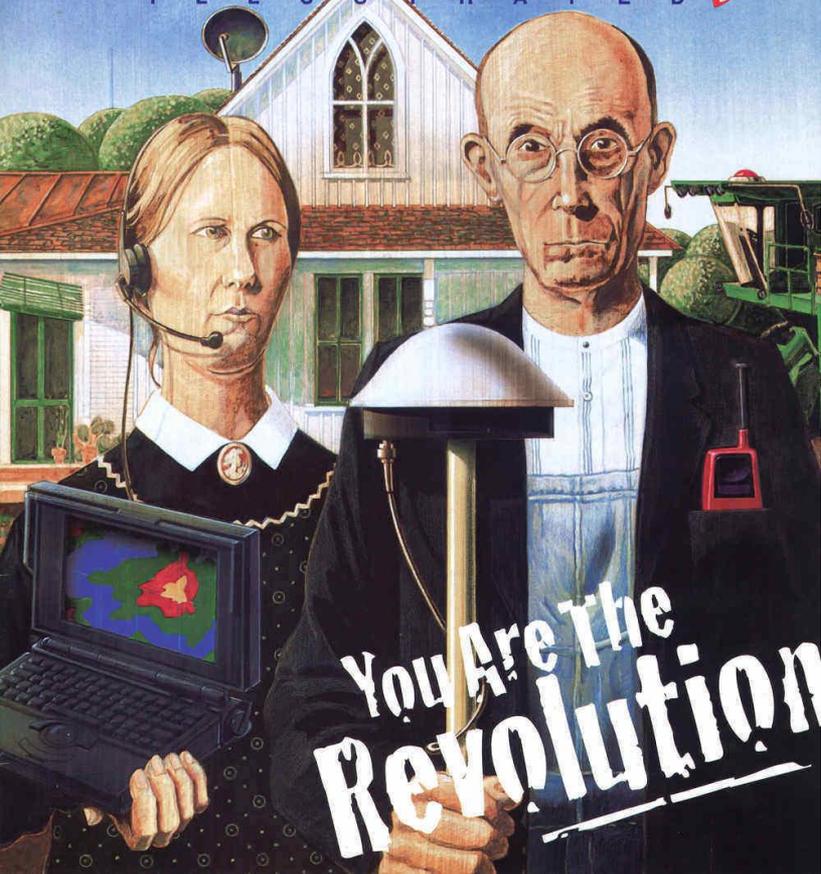
Robots are the future
of agriculture!

Premier Issue, 1997

\$6.00

Precision Ag™

I L L U S T R A T E D



You Are The
Revolution

Robot farmers are the future of agriculture, says government



Small
Robot Co

Intelligence Action

Welcome to the Fourth Agricultural Revolution

Small Robot Company is reimagining farming to make food production sustainable. Using robotics and artificial intelligence, we have created an entirely new model for ecologically harmonious, efficient and profitable farming. We call this Per Plant farming.

seen?

A new vision of robots patrolling the meadows and cornfields of the UK may seem dark and satanic to some, but according to farmers and the government it is the future, and will bring efficiencies and benefits, and an end to some of the most back-breaking jobs around the farm.

'We'll have space bots with lasers, killing plants': the rise of the robot farmer



▲ 'Simple, robust, unlikely to break': a space-inspired Earth Rover robot. Photograph: Bas Niemans

Killer farm robot dispatches weeds with electric bolts

Makers say machine could be part of an agricultural revolution of automation and sustainability



▲ Craig Livingstone, the manager of the Lockerley Estate in Hampshire, with the Small Robot Company's weed-zapping robot, Dick. Photograph: Peter Flude/The Guardian

In a sunny field in Hampshire, a killer robot is on the prowl. Once its artificial intelligence engine has locked on to its target, a black electrode descends and delivers an 8,000-volt blast. A crackle, a puff of smoke, and the target is dead - a weed, boiled alive from the inside.

"All we have to do is bring the device to the field, roll it off the cart and start it. Then we can enjoy Netflix, so to speak" - Han Hilbrands

"So no longer a farmer on the tractor, but two boys in jeans and a t-shirt who work the land armed with a laptop. Compare it with the transition from horse and carriage to tractor, or from the milking parlor to the milking robot" - Jeroen Wolters

<https://lnkd.in/di6Rakf>



Gronings bedrijf laat zelfstandig werkende robot akkers bewerken

rtvnoord.nl • 2 min read

👍 🌱 🍷 45

👍 Like 💬 Comment ➦ Share ✉ Send

Be the first to comment on this



“Agriculture has started to **add computerization and automation to the current machinery** with things like GPS based precision farming systems that can autonomously drive tractors, monitor yield, and apply fertilizer. However, these aftermarket add-ons are **built around the single most expensive and awkward part of the equipment. The person controlling the tractor.**”

(Trossenrobotics.com)



“Introducing See & Spray technology that enables a **world in which every plant counts.**”

(bluerivert.com)



This kind of farming
should not be automated.







Daum T (2021) Farm robots: ecological utopia or dystopia?
Trends in Ecology & Evolution 36 (9).



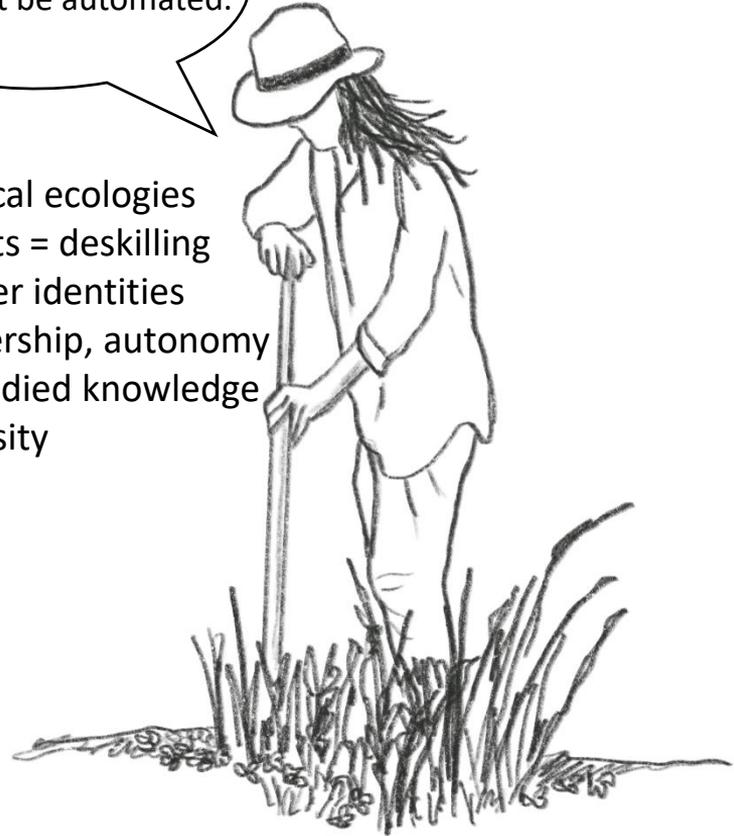


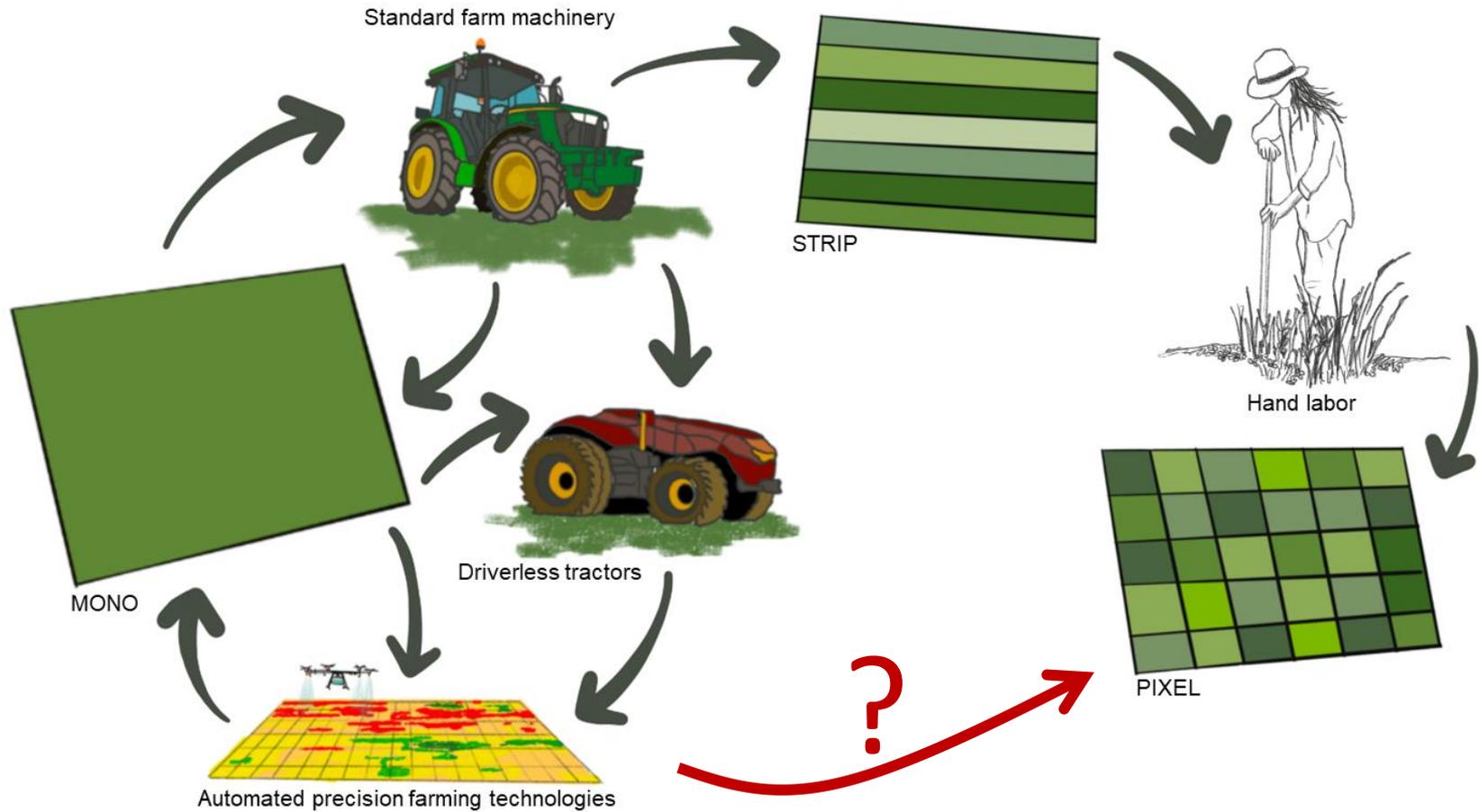
Robots are the future
of agriculture!

- Technology = progress
- Productivist
- Homogenization
- Data-mediated knowledge
- “If there’s a human doing the task, there’s a challenge we need to solve”
- ...

This kind of farming
should not be automated.

- Political ecologies
- Robots = deskilling
- Farmer identities
- Ownership, autonomy
- Embodied knowledge
- Diversity
- ...







Daum T (2021) Farm robots: ecological utopia or dystopia?
Trends in Ecology & Evolution 36 (9).

Farmer
AI developer
Agronomist
Robotics engineer
Artist
Mathematician
Designer
Software engineer
Architect
Writer
Organic farm advisor
Farm technology researcher
Economist
Precision Ag specialist
Agroecologist



How to make a farming robot without a monocultural mindset?

- *What kind of robot do we need?*
(Again, but this time with design students)

- No robots!
- Simple hand tools
- Functional today



A self-described agroecological farmer does commercial-scale pixel cropping AND tests a robot



- *How does it go? What do we learn?*

- Robot shortcomings led to collaborative work modes
- Automation is not necessarily at odds with agroecological care
- Room for community AND robots

How to design a farming robot without a monocultural mindset?

+ Technology is not there yet

- *need for non-dualist approaches to cultivation*
- *care & relationships vs. control*

+ Robots can work for agroecology, but we should make space for hybrid options

- *not either / or (farmer vs. robot)*
- *how to facilitate, not erase, farmers' embodied knowledge?*

+ Robots aren't one size fits all – context dependent

- *need for a diversity of tools (size, function, cost, etc.)*
- *not everyone will want a robot and that's ok!*

+ Non-linear design processes – feedback from farmers is essential

- *farmers know best*
- *but also non-agricultural designers help to expand imaginations*



Thank you!



GLOBAL NETWORK OF
LIGHTHOUSE FARMS



lenora1.ditzler@wur.nl



Ditzler & Driessen (2022) Automating Agroecology: How to Design a Farming Robot Without a Monocultural Mindset? *Journal of Agricultural and Environmental Ethics*