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





PBL Netherlands Environmental Assessment Agency

"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













Lopez-Ridaura et al. (2021)

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Premier Issue, 1997

Robot farmers are the future of \$6.00 agriculture, says government PrecisionAg

Small

Welcome to the Fourth Agricultural Revolution

Intelligence

Action

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 weedzapping robot, Dick. Photograph: Peter Flude/The Guardian

n 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. AGROINTELLI 2,606 followers 6d • 🕲 ...

"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

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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 <u>aftermarket add-ons</u> 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)



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).

How to make a farming robot without a monocultural mindset?

- What are the requirements of a pixel cropping robot?
- How to integrate these functions into a design?

- \rightarrow Assumption of full automation
- → Emphasis on ecological complexity of the system, need for robot to handle that
- ightarrow Technology isn't there yet

 What kind of robot do we need? (Again, but this time with <u>design students</u>)

- \rightarrow No robots!
- \rightarrow Simple hand tools
- \rightarrow Functional today

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

 How does it go? What do we learn?

- \rightarrow Robot shortcomings led to collaborative work modes
- ightarrow Automation is not necessarily at odds with agroecological care
- ightarrow 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

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