



Visit the Agroecology & Technology Fieldlab

Transition to new food production systems



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"The Fieldlab is the perfect place for conducting agroecological research, for seeking inspiration on nature-inclusive agriculture and for entering into a dialogue about the agriculture of the future."

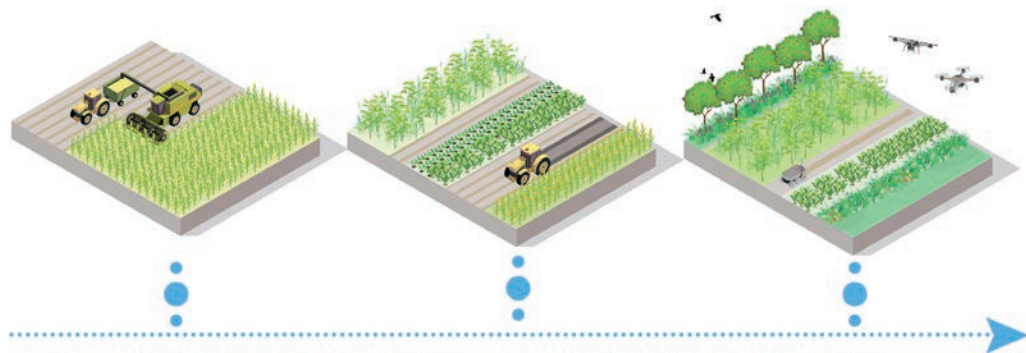
Wijnand Sukkel | Wageningen University & Research

Agroecology & Technology Fieldlab

The Dutch agriculture & food sector is facing a multifaceted and complex challenge. Biodiversity is decreasing, climate change is becoming tangible and the market positions and incomes of Dutch farmers are under pressure. The transition to a form of agriculture that can address these challenges is now underway.

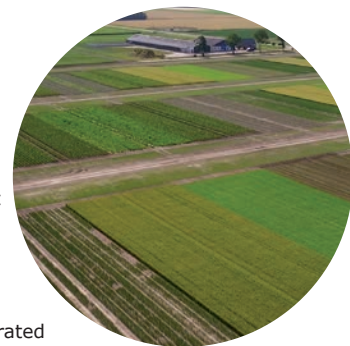
The Agroecology & Technology Fieldlab of Wageningen University & Research (WUR) facilitates multidisciplinary research aimed at developing nature-inclusive, regenerative and economically sustainable agricultural systems. On approximately 80 hectares of fertile reclaimed land, we not only create room for experiments, but also a meeting place where farmers, companies, governments, NGO's and education and research institutes jointly develop new plant production systems.

In this brochure you will find examples of the research projects and their experiments to get an idea of what is happening in the Fieldlab. Of course you will also find our contact details to ask your questions or make an appointment to see with your own eyes what the agriculture of the future looks like.



Transition to new food production systems

The Fieldlab wants to play a pivotal role in the development and application of agricultural knowledge, principles and smart technology. It also hopes to fulfil an important role in demonstrating, inspiring and encouraging the agriculture sector to develop innovative solutions for nature-inclusive agriculture. Achieving this type of agriculture calls for integrated research, in which all of the building blocks are designed and tested in mutual interdependence in order to create practice-based agricultural systems for the food production of tomorrow. The transition to a new food production system does not happen in one go. We have to join forces in order to change.





BASIS – Conservation tillage

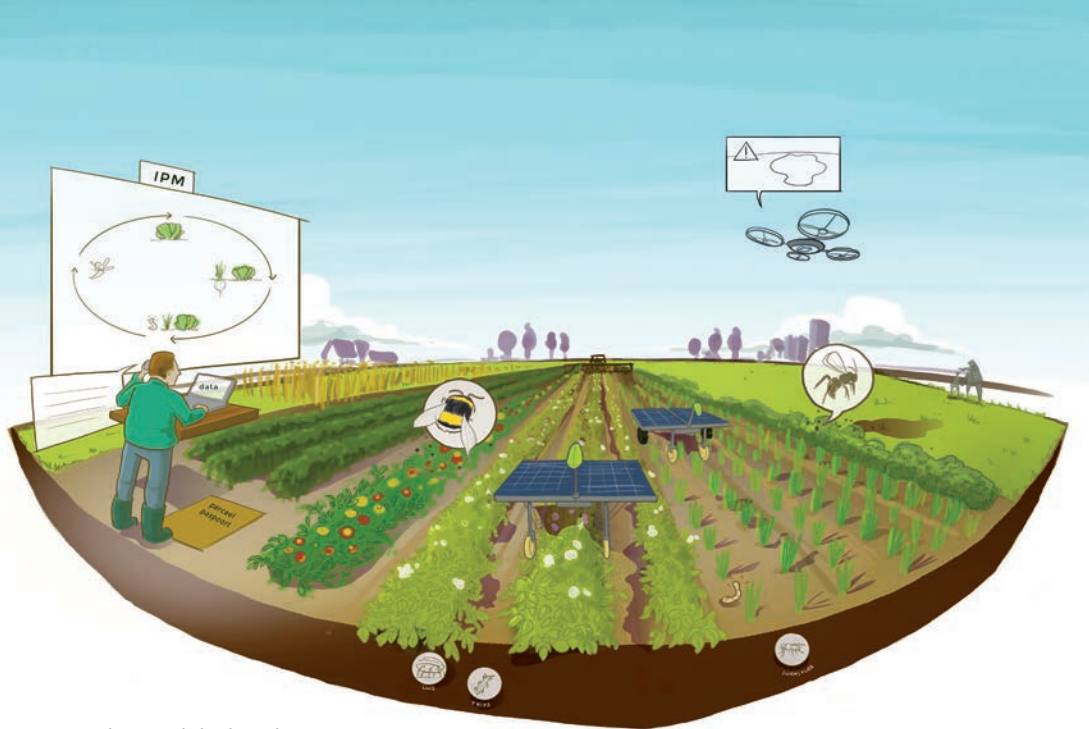
The Agroecology & Technology Fieldlab is home to several multi-year trials. Their purpose is to shed light on the long-term impacts on production, the soil and other ecosystem services. One of these multi-year projects is BASIS. In this project alternative tillage systems are tested and improved, in particular zero tillage and minimal tillage combined with controlled traffic farming. In less intensive tillage systems, organic materials break down more slowly. Soil organisms and root systems also help to maintain the structure of the soil. This has a positive impact on water balance, making the soil less vulnerable to extreme wet or dry conditions. The soil's bearing capacity also benefits. Less intensive tillage and the maximum possible use of cover crops is a way of encouraging greater biodiversity. Some cover crops are easier to break down than others. More research is needed to establish a good combination of zero or minimum tillage for this.





Strip cropping

The alarming decline of biodiversity and increase in extreme weather means there's an urgent need to develop resilient production systems. The Strip Cropping project is using new large-scale strip trials to see if crop diversity can fulfil its promise of creating a robust, plant-based food production system. The project is investigating the effects of three dimensions of crop diversity (time, space and genetics) on the delivery of ecosystem services. The trial design is based on past agricultural experience while also drawing on innovations in contemporary cultivation systems and future agro-ecological perspectives. The crop rotation trials are based on common crops in the Netherlands: grass-clover, cabbage, carrots, barley, potatoes, wheat, onions and sugar beets. The experiment is researching four crop pairs: cabbage – wheat, carrot – onion, potato – grass-clover, and barley – sugar beet. The framework of the system trial was defined through consultation with a wide group of scientists and farmers. The trials are located at two sites: in Lelystad and in Wageningen. A large-scale experiment is located at the organic arable farming company ERF, with all the crops alongside each other in different strip widths.



Agroecology with high tech support

Crop protection in 2030



Crop protection of the future focuses on a stack of measures in a so-called system approach. We alternate varieties with good competitiveness against weeds and good disease resistance with green strips. These green strips support natural enemies and provide food for pollinators. We also use alternative means and biological control agents. If it is necessary to use pesticides, we do not use pesticides with a high risk profile and which are administered using precision techniques. In Lelystad there is a large trial in which several strategies are combined. The trial is based on an eight-year rotation and alternates crops such as potatoes, sugar beet, carrots and onions with cover crops such as cereals, grasses and leguminous plants. This long term is important because changes in the soil take years. The aim is to provide tested prototypes of cultivation systems that take account of social concerns and the interests of growers.



Agroforestry: trees and agriculture on the same plot

Agroforestry is a system of cultivation in which trees and shrubs are deliberately combined with arable farming and horticulture, or pastures and livestock. An example would be combining fruit or nut trees with arable farming crops. Many other combinations are possible. This mixed cropping can deliver a variety of positive outcomes on biodiversity, soil fertility and the appearance of the landscape. However, more expertise and experience is needed on this specific topic in the Netherlands. WUR researchers are looking for answers to questions such as: How can agroforestry improve productivity and soil fertility? Does it influence susceptibility to disease and infestation? How can nature and biodiversity be integrated as part of a profitable enterprise? What are the risks and opportunities of different forms of agroforestry?





IWMPRAISE – weed management strategies

Integrated weed management (IWM) is the way to go for sustainable and resilient agriculture. The project IWMPRAISE aims to support and promote IWM in Europe. Weed management will become more environmental friendly if the concept of integrated weed management takes better hold on European farms. The project aims to demonstrate that IWM supports more sustainable cropping systems that are resilient to external impacts and does not jeopardise profitability or the steady supply of food, feed and biomaterials. The five-year project will run until May 2022. In the Netherlands in two experiments, the use of several weed management tactics, both mechanical, cultural and chemical are combined into weed management strategies for arable field crops.





SMARAGD: Smart Mechanisation Automation Robotics

There are benefits to cultivation systems in which different crops are combined within a single plot (through strip cropping, mixed crops, or pixel farming) as opposed to a single crop grown in a monoculture system. However, growing and harvesting different crops does also require different types of mechanisation. The aim of the SMARAGD project is to design a new concept of agriculture, one that is based on controlled traffic farming and suitable for the cultivation of high-yielding arable farming crops and field vegetables. Heavy, large-scale mechanisation is being replaced with light autonomous machines and tools based on innovative technologies. This reduces the deterioration of the soil structure and improves soil quality. It also helps to limit the use of crop protection agents and fertilisers, and can reduce the farm's carbon footprint through the use of electric power and battery systems.





ReMIX – mixed crops for resilient European agriculture



Mixed crops of “plant teams” can benefit soil fertility, the productivity of the “main” crop and the control of weeds, diseases and infestations. Mixed crops also offer opportunities for increasing biodiversity both above and below the ground. ReMIX is a European project which aims to develop successful mixed crops. It focuses on three types:

1. grain – legume combinations: harvested at the same time and intended for both human consumption and livestock feed.
 2. grain – green manure combinations: here the green manure can serve as an alternative to chemical inputs (artificial fertiliser, herbicides, etc.)
 3. undersowing of annual or perennial crops in a grain crop. Through this project, WUR is researching the influence of mixed crops on the control of infestations, diseases and weeds, and is seeking to determine the characteristics within particular strains that affect the performance of cultivars within a mixed crop system.
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maize | lupine

maize | sorghum

maize | pole green bean

DiverIMPACTS: More crop diversity in cultivation systems



Silage maize is one of the most common crops in the Netherlands. There are a number of challenges to growing it, such as maintaining organic material in the soil, the risk of soil compaction, and socio-environmental issues such as the levels of fertiliser application and the use of crop protection agents. DiverIMPACTS (Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains Towards Sustainability) is a European project in which WUR is working on the development of a resilient silage maize cultivation system in two ways:

1. growers, seed breeders, advisors and staff are working closely with our researchers to develop practical solutions for silage maize cultivation.
 2. researchers are testing different cultivation systems, such as mixed crops featuring maize, grass, peas, beans or sorghum. The effects on soil fertility, soil resilience, disease and infestations, weed control, biodiversity and productivity are analysed.
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LegValue: more protein crops in Europe

Many protein crops are grown outside of the EU. The EU would like to be less dependent on the import of these crops, not least because of the sustainability implications. Protein crops can also capture Nitrogen from the air, an important ecosystem service. WUR is working on two objectives as part of LegValue, a European project. One of them is to work with stakeholders to develop an understanding of the competitive position and environmental impact of protein crops in the Netherlands, not just for growers but also for the food and feed processing chains. Alongside that, Europe needs to make a transition into producing substantially more protein crops. In order to identify realistic and effective routes towards such a transition, we need an awareness of successful practical examples and we need to understand which transition routes are sufficiently robust in the context of a dynamic society.





Living Lab indicators

Wageningen University & Research is developing a system to evaluate the impact of measures taken for climate adaptation and circularity in agriculture and forestry practice in rural areas. Living labs are used to implement new practices and measures and to evaluate suitable indicators for circularity and climate adaptation. Indicators are jointly developed and tested for their applicability in practice with the stakeholders in the living labs, which will act as learning networks. One of the case studies on which WUR will work is the Agroecology & Technology Fieldlab. The results will be integrated in an evaluation tool, which can be used by policy makers from the local to the national level to take decisions about the desired level of circularity, and climate adaptation.





'Nature based solutions' in field crops

Fifty per cent of all biodiversity in the Netherlands is found in agricultural areas. There are strong signs that biodiversity has significantly declined over the past few decades. More diverse forms of agriculture are needed in order to safeguard the health of both people and planet. With this in mind, WUR has launched a number of different projects over the past 10 years around crop diversity. These have led to the introduction of more diverse cultivation methods, such mixed rows or strips, fully mixed crops, or various combinations of these. In annual crop combinations, these methods have repeatedly demonstrated benefits in terms of productivity (higher yields and product quality) and in terms of the efficient use of land, light, water and nutrients. Quantifying these effects on biodiversity means we can build up a biodiversity database with a store of knowledge on how to identify the most effective nature-based solutions in field crops.





Agroecology & Technology Fieldlab

The Agroecology & Technology Fieldlab is the perfect place for conducting agroecological research, for seeking inspiration on regenerative agriculture and for entering into a dialogue about the agriculture in the future. The Fieldlab is also intended as a meeting place. You can make an appointment to meet the researchers and receive on-site explanations about ongoing studies.

Per project:

- BASIS – Conservation tillage | Derk.vanBalen@wur.nl or Wiepie.Haagsma@wur.nl
 - Strip cropping | Wijnand.Sukkel@wur.nl or Dirk.vanApeldoorn@wur.nl
 - Crop Protection in 2030 | Marleen.Riemens@wur.nl
 - IWM PRAISE | Marleen.Riemens@wur.nl
 - Agroforestry | trees and agriculture on the same plot | Fogelina.Cuperus@wur.nl
 - SMARAGD | Smart Mechanisation – Automation – Robotics | Jan.Kamp@wur.nl
 - ReMIX – mixed crops for resilient European agriculture | Wijnand.Sukkel@wur.nl
 - DiverIMPACTS – More crop diversity in cultivation systems | Wijnand.Sukkel@wur.nl
 - LegValue – more protein crops in Europe | Chris.deVisser@wur.nl
 - Living Lab indicators | Janjo.deHaan@wur.nl
 - 'Nature based solutions' in field crops | Dirk.vanApeldoorn@wur.nl
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Contact

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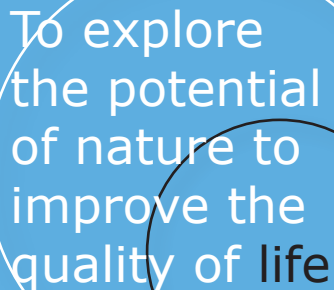
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www.wur.eu/fieldlab-agroecology

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The mission of Wageningen University & Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 12,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

More information at | www.wur.eu/fieldlab-agroecology



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