

MATER

marc lathuillière + agnès desolneux



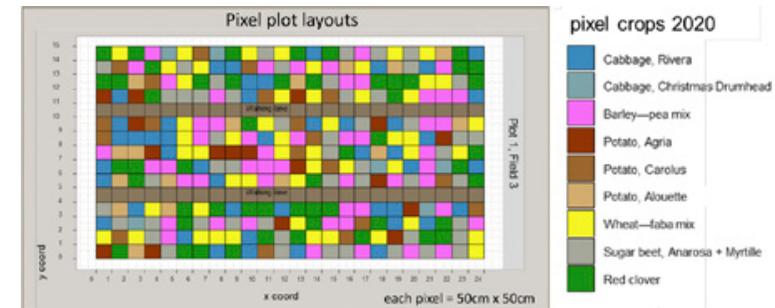
/ mater

Mater is an art research project combining ecology, science and imaging. Conducted in collaboration with Agnès Desolneux, a mathematician at ENS Paris-Saclay, it aims to explore how photography and agriculture, both of which are now driven by artificial intelligence, are changing our relationship with the Earth.

Mater is inspired by new permaculture robots developed by a Dutch start-up, Pixel Farming Robotics: multitasking, these robots learn through images to cultivate different symbiotic plants in checkerboard fields imitating the pixels of digital photographs. This approach, while attempting to reconcile yield and ecology, also raises questions about the rupture of our links with the environment.

To translate it, Marc Lathuillière and Agnès Desolneux, a specialist in image processing, design algorithms altering the pixel structure of portraits of farmers in transition taken by the artist in the Netherlands (Noord-Brabant) and in France (Ardèche). Mixing words and numbers, these scripts interpret permaculture programmes, including those of the Pixel Farming robots. Under the influence of these agricultural fictions - associations of different crops, interventions of diseases, pests or auxiliary insects... - each portrait is reconfigured into several successive images. In the resulting sequences, prints and video animations, landscapes and farmers progressively disappear behind increasingly complex webs of pixels. The representation of the Western peasant in painting - from the Limbourg brothers to the pointillists - is here revisited, as is the role of the grid in the birth of abstraction.

Mater is supported by the Innovation 2020 grant of the Diagonale Université Paris-Saclay and by the Association des Amis de la Fondation Seguin in Annonay.



Source: Lenora Ditzler, Farming Systems Ecology Group, WUR

+ pixel farming

Made highly visible by its presentation in *Countryside, The Future*, Rem Koolhaas' exhibition at the Guggenheim New York in 2020, pixel farming is an experimental concept developed in the Netherlands by an agrotech start-up, Pixel Farming Robotics, in conjunction with the team of agro-ecologist Lenora Ditzler at Wageningen University. It attempts to solve a contradiction: how can agriculture continue to feed the planet without exhausting its ecosystems? The solution explored is the automation of permaculture.

With Pixel Farming, a field is divided into pixels like a digital image: on each square of the grid a plant grows in symbiosis with that in the neighbouring squares, thus reducing the need for fertilisers and pesticides. These grids are meant to enable Pixel Farming robots to perform tasks such as watering and weeding. The robots are inspired by digital presses: a gantry supports heads that move over the surface to be treated. Four hundred years after Descartes invented analytical geometry on the Dutch plains painted by Ruysdael at the time, it is digital imagery that is reshaping the environment of tomorrow.



Robot 0
Photograph Peter van Trijen, courtesy Pixel Farming Robotics



Robot One - weeding a field of beans
Photograph Marc Lathuillière, 2021



Pixel Farming experiment, Vrienden Van Velhorst, Lochem, 2020
Photograph courtesy Pixel Farming Robotics



/ marc lathuillière

Since 2004, multi-faceted artist, Marc Lathuillière has been developing a deconstructive approach to documentary photography. Shaped by his studies in Political Sciences, his works often show anthropological contents, exploring the representation of contemporary worlds in their relationship to time and the environment. Origin of this approach, his main series, *Musée national*, has seen him shooting the portrait of about a thousand French people wearing the same mask for the last 15 years.

His work has been shown extensively in France and abroad: Sorbonne ArtGallery (2020), Photoszene in Cologne (2018), Lyon Biennale at Le Creux de l'enfer in Thiers, La Friche La Belle de Mai with anthropologist Marc Augé in Marseille (2017), Paris Photo and the Strasbourg Museum of Modern and Contemporary Art (2017), Kolga Tbilisi in Georgia (2016), Austerlitz Station in Paris (2015), *Ithaque* in four museums of La Rochelle (2012), Museum Siam in Bangkok (2011), French May in Hong Kong and Palais de Tokyo in Paris (2004).

Also involved in theoretical writing, Marc Lathuillière enjoys collaborating with authors. In 2014, for the Mois de la Photo in Paris, he organized a double exhibition with Michel Houellebecq, who wrote the preface to his photo book *Musée national* (La Martinière). Represented by the Galerie Binome (Paris), his work is included in important collections: Bibliothèque Nationale de France (BnF), Neuflyze OBC bank, FRAC Auvergne, Musée français de la photographie and Vera Michalski collection.

site <https://www.lathuilliere.com/en/> **instagram** lathuillieremarc



/ agnès desolneux

Trained at the ENS rue d'Ulm in Paris, mathematician Agnès Desolneux is currently CNRS Research Director at Centre Borelli and a professor attached to the Department of Mathematics of the ENS Paris-Saclay (<http://desolneux.perso.math.cnrs.fr/>). She has worked on mathematical modelling of visual perception, and co-wrote the book *From Gestalt Theory to Image Analysis: a probabilistic approach* in collaboration with Jean-Michel Morel and Lionel Moisan, published by Springer. She specializes in mathematical processing of images, with a particular interest in questions of stochastic modelling, as well as problems of image synthesis (such as textures) under statistical constraints. She regularly conducts research courses at various levels, from L3 to PhD.

publications <http://desolneux.perso.math.cnrs.fr/publis.html>

phase 2 / FARMING IMAGES / 2021-2022

Alteration of portraits of farmers through the development of algorithms reinterpreting the rules and processes of pixelated permaculture. For each image, Marc Lathuillière writes a script, then translated into Matlab code by Agnès Desolneux in order to generate pixel grids (G). These, in successive actions (A), are applied to the portraits, producing variations ranging from one to twenty images.

Generate a grid

```
nlabel = 6;
% give a color to the labels
c=zeros(nlabel,3);
c(1,:)= [255,0,0]; %red
c(2,:)= [255,127,0]; %orange
c(3,:)= [0,127,0]; %green
c(4,:)= [255,255,0]; %yellow
c(5,:)= [0,127,255]; %blue
c(6,:)= [149,86,40]; %brown

% create the grid of labels and of colors
nm=12;
Cg=zeros(ceil(mA/nm)*nm,ceil(nA/nm)*nm,3); %colors
Cl=zeros(ceil(mA/nm)*nm,ceil(nA/nm)*nm); %labels
Cr=zeros(ceil(mA/nm)*nm,ceil(nA/nm)*nm); % random numbers

for k=1:ceil(mA/nm)
    for l=1:ceil(nA/nm)
        lab=randi(nlabel);
        Cl(l+(k-1)*nm:k*nm,l+(l-1)*nm:l*nm)=lab;
        Cg(l+(k-1)*nm:k*nm,l+(l-1)*nm:l*nm,1)=c(lab,1);
        Cg(l+(k-1)*nm:k*nm,l+(l-1)*nm:l*nm,2)=c(lab,2);
        Cg(l+(k-1)*nm:k*nm,l+(l-1)*nm:l*nm,3)=c(lab,3);
        Cr(l+(k-1)*nm:k*nm,l+(l-1)*nm:l*nm)=rand(1);
    end
end
Cl=Cl(1:mA,1:nA);
Cg=Cg(1:mA,1:nA,:);
Cr=Cr(1:mA,1:nA,:);

figure; imagesc(uint8(Cg));
```

Interaction Grid and Image

```
test=(A(:,:,2)-5)>max(A(:,:,1),A(:,:,3)); % test green
%test=(A(:,:,1)>(2*A(:,:,3))); % test brown
figure; imagesc(test);

% choose a plant : 1=red; 2=orange; 3=green; 4=yellow; 5=blue;
```



Abstract of a Matlab algorithm and corresponding pixel farmed grid (test #1)
Agnès Desolneux, 5.10.2021



*Charline Priet, organic vegetable farmer, Jardins du Héron, Ardoix (Ardèche)
/ Action Test #AG34 - implanting radishes, onions and green cabbages in green lettuce*



*Charline Priet, organic vegetable farmer, Jardins du Héron, Ardoix (Ardèche)
/ Action Test #AG33 - implanting radishes, onions and green cabbages all over*



*Jennyfer Montagne, organic vegetable farmer, Peaugres
/ Action #AG21 - blooming (courgettes and borage flowers) in green courgette*



*Johannes Straver, conventional, sustainable and organic farmer, Almkerk
/ Action #Aa6 - cabbageworms, tansy, wormwood, celeriac in red cabbages*



*Winy Van Buuren, organic farmer, Lochem
/ Action #3-Z1 - Colorado beetles, aubergines, blue linen in potatoes*



*Cédric Mary, peasant baker, Saint-Julien-Molin-Molette
/ Test Action #AGB3-3 - fighting wheat bunt, rotating red clover, rivera cabbage*



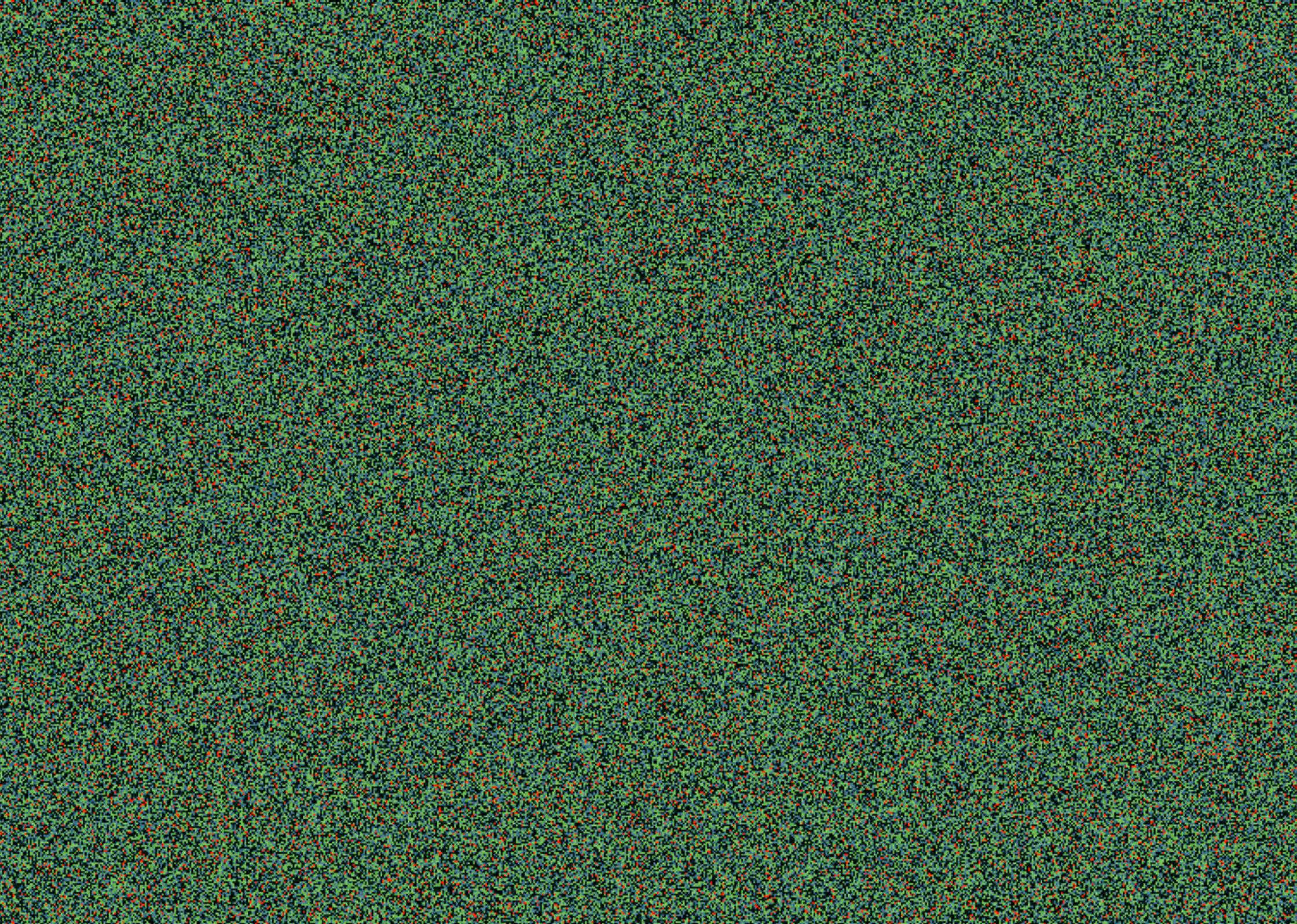
*Julien Weste, organic market gardener, Saint-Julien-Molin-Molette
/ Action #G5-A11Z12 - spider mites, courgettes, aubergines, carrots in the beans*



*Sébastien Desseux, cattle raiser and fodder farmer, Peaugres (Ardèche)
/ Action #A5Z1 - ragwort flowers and seed weewils grow in the clover*



*Gaëtan Molard, organic market gardener, Vernosc-lès-Annonay
/ Action #A5Z1 - tomatoes, red cabbages in the beans
/ Action #A8Z13 - aphids in the beans, tomatoes and red cabbages
+ next page / Action #A12Z4 - aphids, cabbage whites, in the beans, tomatoes, red cabbages and nasturtiums*





Action #A12Z4 - aphids, cabbagworms, in beans, tomatoes, red cabbages and nasturtiums



Adrien Fourel and Charline Priet, organic market gardeners, Jardins du Héron, Ardoix (Ardèche)

/ Action #G5A11 - implanting grid G5 in Zone 1+2+3+4, progressivity

+ Next page / Grid G5 : current 35 %, blister rust 5 %, aphids 5 %, wormwood 22 %, marigolds 8 %, nasturtiums 5 %, borage 10 %, comfrey 10 %, radom



pixel farming card / crop 2

RED CURRENT / Adrien Charline

Portrait of Adrien Fourel and Charline Priet, Jardins du Heron, Ardèche

MaterArdecheCharlineAdrien047

SCRIPT

A red current crop becoming an hyper diverse garden, with a large array of useful flowers and insects

Blister rust spreads in the currant green from Zone 1 to Zone 2

Invasion of grey aphids in Zone 1 then in Zones 2 and 3

Wormwood is implanted in Zones 1+2 up to Z 3

Blister rust and aphids decline but wormwood invades up to Zone 4

Alternative implantation of flowers to repel aphids (nasturtiums, marigolds) and foster pollination (Borage, Comfrey) in all the zones

Auxiliary and pollinators population grows (lacewings, ladybirds, hoverflies) up to Zone 4

Red current grow up to Zone 4 then all over the image

An hyper diverse environment is obtained

GRIDS (G)

Full image, high def, 2832x4256 pixels, 300 dpi

5 x 5 Megapixels = P5

All colours with a gradient of 60

COULEURS

Current, foliage, dark green 759061 = R117 V144 B97

Blister rust, ginger f2663e = R242 V102 B62

Aphids, dark grey brown 554e3e = R 20 V31 B25

Wormwood, pale grey-green, 9ec294 = R158 V194 B148

Nasturtiums dark orange-red da3a22 = R233 V109 B45

Marigolds, yellow orange fdb75c = R 253 V 183 B 92

Borage, blue mauve, 849efa = R132 V158 B250

Comfrey, purple 93328b = R147 V50 B139

Delphastus Pusillus ladybirds, reddish black 1f0002 = R31 V0 B2

Mouche syrphes, brun chaud 643e11 = R100 V62 B17

Lacewings, apple green afe164 = R175 V225 B100

Red current, red fruits f1374f = R241 V55 B79

GRIDS AND ACTIONS

Progressivity rules : unless specified, all progressivity takes place inside the zones

Grid G1

AdrienCharlin-Groseil-G1-P5r60

80 % current, 20 % rust, random

=> Actions A

Note : in the image, current bushes are to the left side of Adrien. The green of current foliage (R117 V144 B97) should include areas of grass and trees

AdrienCharlin-Groseil-G1-A1Z1-P5r60

Implant grid G1 in a gradient of green based on the current bushes, in Zone 1, progressivity

AdrienCharlin-Groseil-G1-A2Z2-P5r60

Implant grid G1 in a gradient of green based on the current bushes, in Zone 1+2, progressivity

AdrienCharlin-Groseil-G1-A3Z2-P5r60

Implant grid G1 all over Zone 1+2, progressivity

////////

Grid G2

AdrienCharlin-Groseil-G2-P5r60

60 % current, 20 % rust, 20 % grey aphids taken from the current, random

=> Actions A

Note : the following Actions must be executed with the last image obtained: **AdrienCharlin-Groseil-G1-A3Z2-P5r60**

AdrienCharlin-Groseil-G2-A4Z1-P5r60

Implant exclusively the aphid grey of grid G2 all over Zone 1, progressivity

(....)



*Evelyn Szakacs, farm worker, Natuurlijktomaat organic farm, Dongen
/ Test Action #AG32- garlic, marygolds, beans in tomatoes*



*Robot One, farmbot, Pixel Farming Robotics, Noord-Brabant
/ Action #A6Z2 - tomatoes and cucumbers in the beans attract aphids*

phase 1 / PORTRAITS / summer 2021

A series of 30 portraits of farmers taken by Marc Lathuilière during the summer of 2021 in the two European countries most involved in agronomic research: the Netherlands, with a particular interest in North Brabant, a province with diversified agriculture where the Pixel Farming Robotics company is located, and France, with shots taken in the Ardèche, thanks to a residency in Annonay with the Friends of the Seguin Foundation for Innovation. The people photographed are all in the process of transition or reflection towards agro-ecological methods, either using advanced technologies or, on the contrary, advocating for decarbonised techniques.



Adrien Fourel and Charline Priet, organic market gardeners, Jardins du Héron, Ardoix (Ardèche)



Jacob Van den Borne, farm entrepreneur, Reusel (Noord Brabant)



Vincent Perrier, cattle raiser and organic fodder farmer, Vernosc-lès-Annonay (Ardèche)



Robert Vof Houtepen, conventional and organic farmer, De Moer (Noord Brabant)



Johannes Straver, conventional, sustainable and organic farmer, Almkerk (Noord Brabant)



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 **PIXELFARMINGROBOTICS**