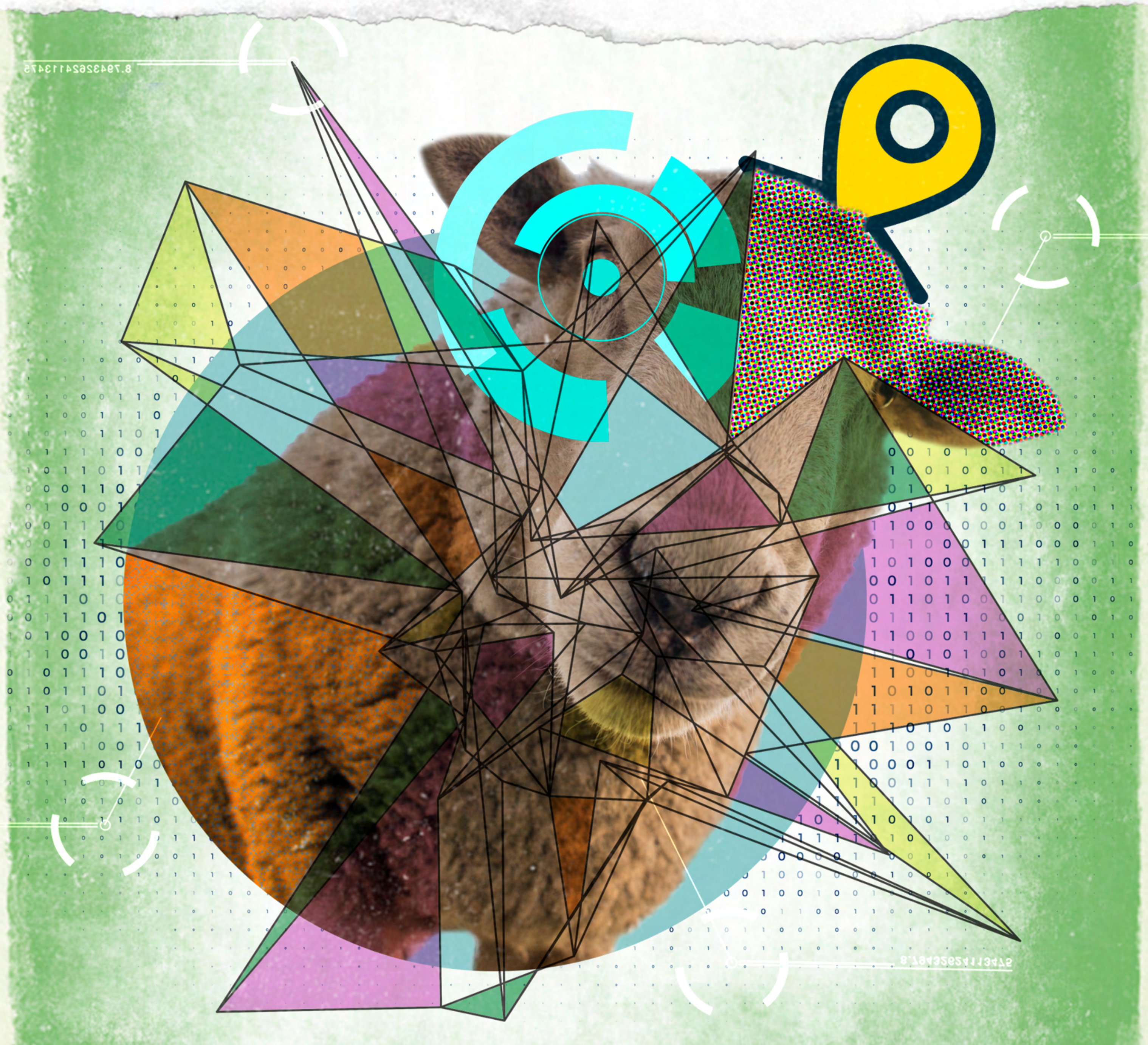
REMOTE CONTROL AND PEASANT INTELLIGENCE



On automating decisions, suppressing knowledges and transforming ways of knowing

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Friends of the Earth Europe
Rue d'Edimbourg 26
1050 Brussels, Belgium

FIAN International
Willy Brandt Platz 5
69115 Heidelberg, Germany

Centre for Agroecology, Water and Resilience at Coventry University
Wolston Ln, Ryton on Dunsmore
Coventry CV8 3LG, United Kingdom.

Authors:
Mute Schimpf, Philip Seufert and Barbara Van Dyck

Illustrations and layout: Kiko Romero and Maria Romero Blasco
Editing: Cass Hebron

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CHAPTER 1

Digital technology is often seen as a silver bullet. Presented as a necessary tool for innovation and tackling multiple global challenges, the truth is far more complex. Promoters of new digital technologies sometimes use this narrative of being indispensable in order to propel corporate and political agendas and consolidate economic and political power. Technologies are not mute objects. Their development, sale and use are inextricably tied up with economic and political interests, cultural meaning, different knowledges and human relationships. We now see this playing out in agriculture as biodigital technology entrench themselves as an essential resource for farmers in Europe (and elsewhere) and shape key decisions over farming. In the process, the truly necessary things may be lost: peasant autonomy and the valuable knowledges and ways of knowing in peasant farming and agroecology risk being erased in favour of simplistic data-driven processes.
In this briefing, we examine how Big Tech is making its footholds in agriculture and the friction of new digital technologies with peasant autonomy and agroecological practices in Europe[1].

Big Tech has officially entered agriculture. Powerful agribusiness and Big Tech companies are working together and the use of big data and biodigital technology[2] in agriculture is on the rise, in Europe and worldwide.
From the use of so-called Artificial Intelligence (AI) to Automated Decision Making (ADM), policy makers, corporate interests and some researchers claim that the digitalisation of agriculture is necessary to make farming more productive, efficient, and sustainable[I3].

Digitalisation is already being used and discussed in policies for sustainability and climate action. For example, it is used to tie measures for climate change mitigation and biodiversity conservation to financial market mechanisms like carbon credits and offsetting.

However, in agriculture, the promoters of digitalisation may use this transformation to further undermine food sovereignty and peasant agroecology.

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[1] We refer to peasants, peasant farmers, peasant autonomy. Recognising that they are not a homogenous group, the choice for this terminology is the drive for autonomy (or keeping control over farming resources, be they land, labour, knowledge, technology, seeds or cattle breeds) and their friction with the power geometries in which biodigital technologies are embedded. Further reflection on peasants´ entanglement in industrial agriculture and re-peasantization as a struggle for autonomy, see Van der Ploeg, Jan Douwe, 2008. The new peasantries: struggles for autonomy and sustainability in an era of empire and globalization. Earthscan.
[2] The biodigital refers to the ongoing convergence of bioscience, biotechnology and related digital innovations. This biodigital convergence implies that complex ecologies may be subject to influence and manipulation that were hardly imaginable until recently. See Peters, Michael A., Petar Jandrić, and Sarah Hayes. "Biodigital philosophy, technological convergence, and post-digital knowledge ecologies." Postdigital Science and Education 3, no. 2 (2021): 370-388.
[3] In 2022, Macron referred to "digital, robots and biotechnology" as the pillars of agriculture in the French Plan de Relance 2030. He follows here the call from the World Economic Forum for a fourth industrial revolution. https://reporterre.net/Macron-veut-transformer-les-fermes-en-start-up-de-la-tech

The big picture

DATA IS POWER *and money*

The digitalisation of agriculture is, among other things, a mechanism for extensive data extraction. Digital data is an increasingly important economic resource and source of corporate profit.

Data and the infrastructure needed to collect, store, process, analyse, and use it, have become important means of production and extraction of rents, including in agriculture. Often unknowingly, through using new agriculture technology, peasant farmers and other food producers become data providers. Hence, they unwittingly contribute to their own dispossession.

Peasant farmers are incentivised to provide data through rewards, namely the promise of supposedly handy tools and useful information (e.g. milking robots, information about soil fertility, tracking of movements and health indicators of farm animals) and economic advantages, including price guarantees and new sources of income.

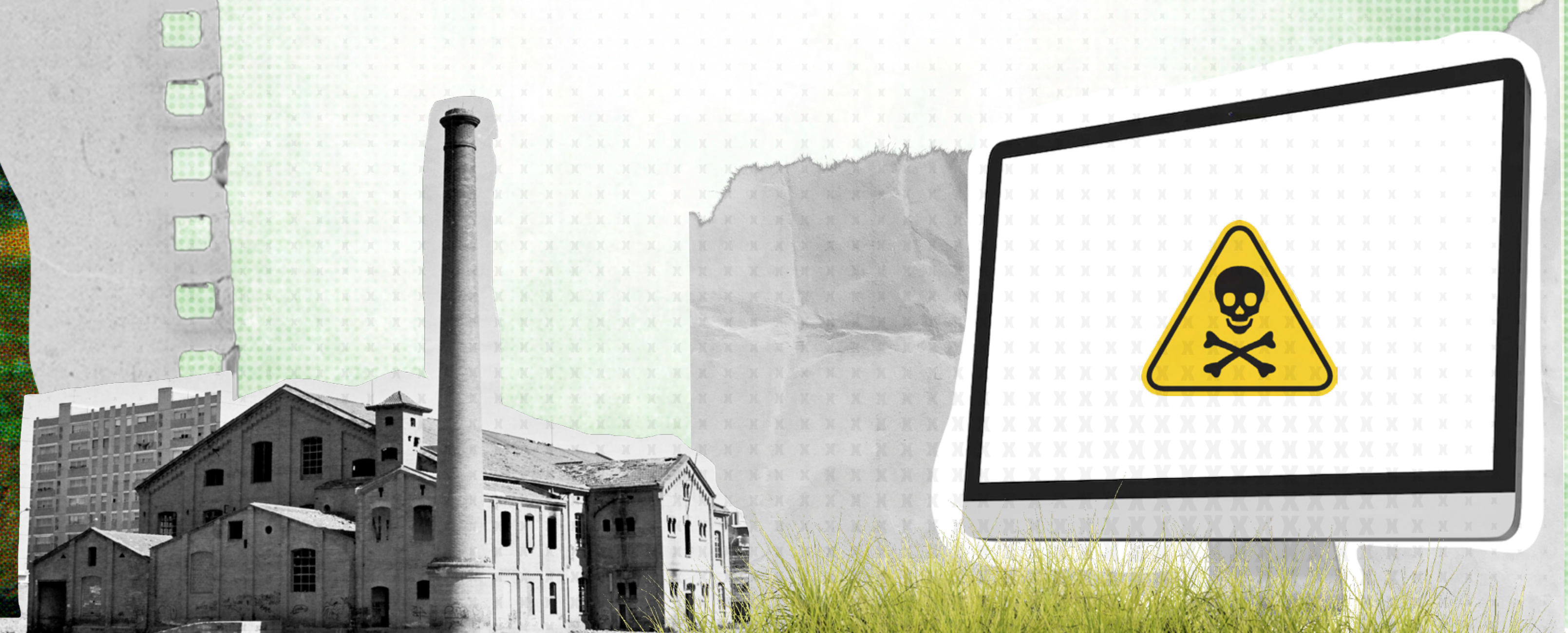
EXPANDING CONTROL

While agribusiness and tech corporations already have more direct control over industrialised agriculture, now they are trying to expand their control over small and medium scale farming. Accumulating huge amounts of digital data allows agribusiness and tech corporations to better consolidate control over food production and food systems.

Currently in Europe, use of digital tools in farming differs widely between sectors and countries. But globally, we see a trend of a few large technology corporations, that are either North American or Chinese, in a fierce battle to integrate peasant farmers in the global economy. The digitalisation of agriculture is part of a process where a hierarchy is created "between economies that contribute data and economies that create value-added products out of this data[II]". Global South countries, such as India[III] and Kenya[IV] seem to be stuck at the lower end of these value chains, further contributing to unequal distribution of wealth.

Data-driven and automated technologies are promoted as a means to make agriculture more predictable, controllable and, therefore, supposedly more productive and efficient. But their use often requires industrial farming landscapes suitable for these technologies and associated technology packages like chemical fertilisers, pesticides, and industrial or GMO seeds. Increasingly automated systems that use so-called AI are a case in point: today, big farms with industrialised farming models are much more likely to use digital devices and platforms. Computerising and controlling peasant farms and their complex ecological relations is much more difficult[V].

Consequently, the digital devices, data platforms and models are designed for farming models operating under set standards, and the prescriptions generated by AI algorithms are biased towards those same models.



RESHAPING THE ECONOMY

Expanding control over agriculture and food systems through data driven technologies is part of a bigger global picture. As capitalism is faced with multiple crises, corporations and investors rush to restructure economic activity to continue to extract profits[4].

Digitalisation is one strategy applied to do this. As growth rates in agricultural productivity decline[VI], controlling the digital sphere has become critically important for generating shareholder profits.

Digitalisation also deepens new conceptions of ownership. Firstly, a substantial (and increasing) part of the rents extracted by transnational agribusiness companies relies on patents and licensing agreements for the use of data or procedures, rather than selling physical resources such as seeds.

Secondly, the contracts that many farms have to sign when buying agrccultural machinery often include provisions allowing only spare parts and maintenance facilities from the machinery producer. On top of this, the digital devices running the machinery can be controlled from a distance, raising the question of who actually owns the machine[5].

Thirdly, comprehensive data and information about farms' land and soil quality, biological diversity, and other features, is key to speculate in the financialized bioeconomy[6] for example, for the trading of (soil) carbon credits.

As only large entities can afford the investments needed to create the necessary infrastructure to extract and use the huge amounts of data, the current reshaping of the economy serves to further intensify concentration of power and profits in the hands of a few companies[VII].

[4] Simultaneously, corporations continue seeking control over the materiality of production, including people, animals, land, water, seeds etc.
[5] The "right to repair" campaign of farmers in the US has campaigned against the limitations of their rights when purchasing agricultural machinery from companies like John Deere.
[6] The bioeconomy refers to an economic system that utilises renewable biological resources, such as plants, animals, and microorganisms, to produce a wide range of goods, services, and energy. It is part of the industry's response to the current global social, environmental, and economic crises. See Transnational Institute. The Bioeconomy. A Primer. 2015 https://www.tni.org/files/publication-downloads/tni_primer_the_bioeconomy.pdf.

CHANGING WORK RELATIONS

Digitalisation brings new machines (hardware), new programs, apps, algorithms (software) and new organisational structures, which deeply impact ways of working and where it is done.

Introducing technology to increase control over the labour process and workers is not new: labour saving technologies are a core part of the so called modernisation of agriculture. Digitalisation, particularly in the form of automation, robotisation, and so called AI, further renders workers redundant when they are no longer relevant for capital.

It transforms the nature of the remaining jobs and allows for closer workers' surveillance and the manipulation of their behaviour[VII]. Workers (willingly or not) become algorithm trainers through the data they produce and use at work, and an increasing part of labour involves analysing often-opaque information and implementing the suggestions generated by the data-based algorithms. Labour is also displaced, including to mines for the extraction of rare minerals, automated warehouses or data cleaning workers in low-income countries[IX]. These workers are subject to harsh working conditions and exploitation[X].

In the context of peasant farming, digitalisation focus on optimisation pushes farm labour and peasant farms closer to forms of production and organisation that are primarily concerned with economic performance over everything[XI].

Peasant economies are different from capitalist economies. They are complex and require striking a series of difficult balances (for example, managing the dynamics between the peasant family and waged workers).

They are also collective in character, where interaction between humans is integral to the peasant way of life. Peasant farms rely significantly on household labour, as well as sometimes on collective work organisations and mutual support outside the official service and payments system[7].

Digitalisation is an assault on this, albeit precarious, autonomy. Glen Stone captures it well noting that digitalisation includes "not only prediction" but also "manipulating behaviour", as well as that it "generates value from highly individualised interactions that may be incompatible" with peasant farming[XII].

CHANGING RELATIONS BETWEEN HUMANS AND THE MORE-THAN-HUMAN WORLDS

This is the next step in a historic process of exploiting ecologies for profit. While climate change, pollution and the rapid decline of biodiversity show how deeply entangled societies are with their ecologies, many technologies deliberately make us forget this simple truth.

In agriculture, digitalization turns farming into a set of machine driven interactions between peasant farmers and their land, without any thought to the importance of a peasant's relationship with the more than human worlds. This risks losing integral peasant knowledge, practices and innovations.

Moreover, digital technologies and their infrastructures rely on vast amounts of mineral extraction, high water and energy use[XIII]. Indeed, digitalisation is responsible for environmental pollution and degradation across the world[XIV].

[7] As explained by Jan Douwe van der Ploeg 2013, Peasants and the Art of Farming. A Chayanovian Manifesto, the peasant farm is part of the capitalist economy, but is, in itself, not a unity of production that is organised in a capitalistic way, in particular regarding the way in which labour is organised. "It is not grounded on a capital-labour relation. Labour, within the peasant farm, is not [primarily] wage labour." (p. 15). This way of organising production and labour is so central to peasant farming that it is one of the core elements defining peasants in UNDROP: art. 1.1: "[...] a peasant is any person who engages or who seeks to engage, alone, or in association with others or as a community, in small-scale agricultural production for subsistence and/or for the market, and who relies significantly, though not necessarily exclusively, on family or household labour and other non-monetized ways of organizing labour, and who has a special dependency on and attachment to the land."

A FOOD SOVEREIGNTY AND PEASANT AGROECOLOGY PERSPECTIVE ON DIGITAL TECHNOLOGIES

The use of digital technologies already has wide ranging implications for agriculture and will shape it even further in the future.
This poses challenges on how to approach the issue from the perspective of peasant farming, food sovereignty and peasant agroecology.

How can we make sure to identify and support the development and use of technology that supports food sovereignty and agroecology? How can we protect peasant farming, as well as the rights of Indigenous Peoples, peasants, and other small scale food producers to decide which tools they want and need?

To approach these questions, we propose to put decision making and peasant intelligence at the centre stage. Who and what informs decision making on the farm and who gets to make decisions, both at the farm level and in food systems more broadly, are fundamental to safeguarding self determination, peasant autonomy and food sovereignty.

The mainstream narrative around digitalisation presents the way forward as a natural evolution from decision making based on human experience towards automated decision making based on digital data and so called artificial intelligence. But reality is much more complex and many other pathways are possible.

Experiential decision-making	Data-driven decision-making	Automated decision-making	Artificial Inteligence decision-making
Decisions are made base on knowledge adquired through human observation and experience.	Decisions are made based on technology, which use data to generate a prescription.	Decisions are made by automated means (machines, algorithms) using large-scale data, with varying degrees of human oversight or intervention (incl. none at all).	Decisions are made by AI systems that proccess data from different sources and can learn and make decisions independently from human actions/interventions .

Figure 1: Mainstream corporate view of an alleged historical evolution in on-farm decision-making.

Placing big data and data-based technologies at the heart of decision-making processes is an expression of what has been described as a 'big data state of mind'[XV]. In this approach, the main – or rather, only – preoccupation is to gather as much data as possible, which is then fed into the systems that will process it and prescribe (or even execute) the required actions.

This perspective easily leads to tech-saviourism, in which technological fixes become the main solution to any given problem. The fact that the analysis and interpretation of data cannot be separated from politics is intentionally obscured. By refusing to acknowledge other solutions or ways of doing things, corporations impose their technologies and devices under the illusion of being the 'only' option and legitimise maintaining the status quo[XVI].

This goes against traditional methods of decision-making in peasant farming. The choices and decisions that farmers and other landworkers make are, to a great extent, based on knowledge acquired through observation and experience, which is passed on from generation to generation.

PEASANT INTELLIGENCE

Peasant farming is fundamentally subversive to simplistic capital driven ways of farming. Peasant agroecology relies as little as possible on external inputs and peasant farmers try to distance themselves in their farming practice from the dependency from financial and industrial capital. They aim to minimise the use of new chemicals, externally produced fodder and farm tools over which they have no control.

In their quest for autonomy, peasants seek to work with the land, animals, plants and people around them. This process is knowledge-intensive and calls for different kinds of skills and expertise, including the transmission of experiential knowledge[XVII].

Digital agriculture risks erasing the skills and knowledges that have allowed the very reproduction of life and take us towards radical and yet unknown changes in agriculture and society. The use of automation to make

farming decisions devalues farmers' skills, knowledge and identities.

The systematic annihilation and devaluing of knowledge systems has a name: epistemicide[XVIII]. Preventing the further degradation of peasant knowledge systems is an urgent task and calls for a careful and rights based approach.

Algorithms "view" the world based on the data sets it is trained with. Its range is limited to predefined views based on the criteria involved in the data collection. A wide range of sensitivities and factors associated with indigenous and peasant ways of knowing that do not fit the window and view of the sensors and algorithms at work are discarded. These knowledges and ways of knowing risk being partially appropriated and disappearing altogether from agricultural decision-making.

Importantly, peasant knowledges and ways of knowing are much more than the accumulation and processing of data points. They are tied to collective practices as well as the complex social and ecological relations peasant farmers are part of. Peasant intelligence, which relies on cognitive processes as well as on all human senses and intuition, finds its expression in peasants' agroecological practices and innovations.

Peasant food production has fed humanity for millennia. However, modern corporations fixated on big data and profit, as well as many policy makers and scientists, typically dismiss peasant life expertise as inferior, inaccurate, purely subjective or even arbitrary[XIX]. Despite this, corporations are very interested in this knowledge. For example, knowledge about the characteristics of plants and breeds selected by peasants and Indigenous Peoples have been pirated for scientific research and industry[XIX]. Because of their importance, peasants' knowledge and innovation systems, based on collective and tacit knowledge, and encompassing dynamic knowledge that is constantly enriched by peasant innovations, have been recognised and protected by international human rights law[XXI].

Instead of treating peasant farmers and other landworkers as mere data providers and end-users of products and decision-making services derived from the data, they have to be considered as rights holders whose knowledge and innovation systems could provide responses to many of today's global challenges.

In the following chapters, we focus on the introduction of milking robots, digital technologies in pastoralism, and digital platforms in agriculture in Europe as well as which new rules are set for so-called digital farming. Critical issues posed by all these tools is their use for the extraction of data, as well as the way that the processing of information and decision-making is increasingly being delegated to machines and algorithms.

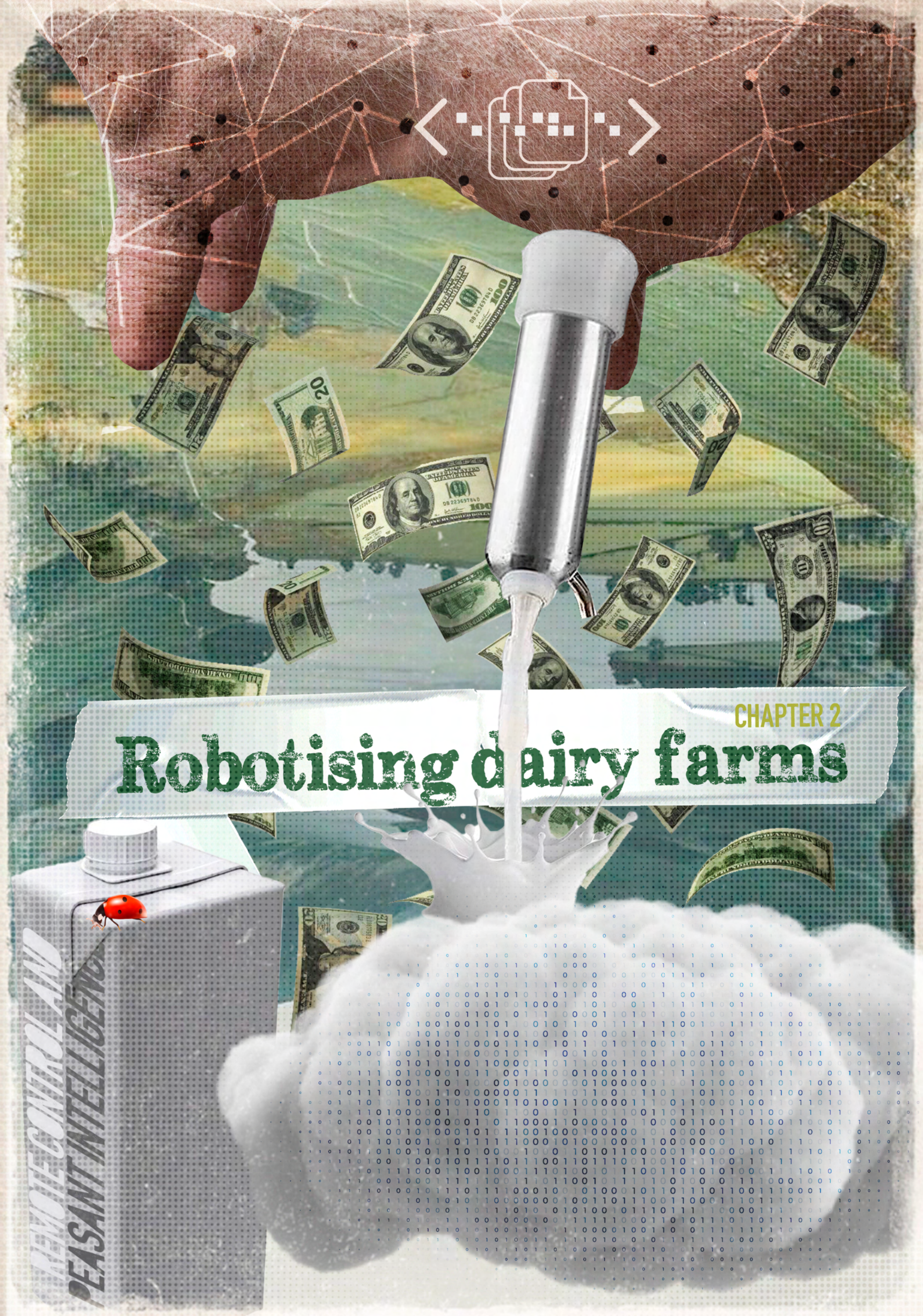
QUESTIONS FOR CRITICAL REFLECTION

Digital technologies pose several questions for peasant farming and agroecology. It is important that the food sovereignty movement collectively reflects about the implications and possible responses. To contribute to this process, each of the following chapters will end with a few questions for critical reflection. The following are some overarching questions:

- What are the implications of digital technologies for peasant farming, including data aggregation and the capturing and undermining of peasant knowledges and autonomy?
- What are possible strategies and ways to creatively resist corporateled digitalisation of peasant farming and food systems?
- Could data and digital technologies enhance the knowledge, innovations and experiential decision making by peasants, and if so, under what conditions?
- What legal frameworks are needed to guarantee the rights of peasants, Indigenous Peoples, food workers and other people working in rural areas, including their knowledge and innovation systems, and ensure their technological self determination?
- What are some entry points to challenge the corporate-led technology model and advance towards the use of data to support food sovereignty and peasants' self determination?
- What alternative narratives and collective imaginaries do we want to create for the agricultural worlds we envisage, and how?

The big picture

[I] In 2022, Macron referred to "digital, robots and biotechnology" as the pillars of agriculture in the French Plan de Relance 2030. He follows here the call from the World Economic Forum for a fourth industrial revolution. https://reporterre.net/Macron-veut-transformer-les-fermes-en-start-up-de-la-tech
[II] 2021. Big Tech and the global economy. A primer. Focus on the Global South. https://focusweb.org/publications/big-tech-the-global-economy-a-primer.
[III] GRAIN, 2019. Digital control How Big Tech moves into food and farming. 2021. https://grain.org/en/article/6595-digital-control-how-big-tech-moves-into-food-and-farming-and-what-it-means
[IV] Gianluca Iazzolino, "Harvesting data: Who benefits from platformization of agricultural finance in Kenya?" https://developingeconomics.org/2019/03/29/harvesting-data-who-benefits-from-platformization-of-agricultural-finance-in-kenya/
[V] For further reading on modernist technology and the fallacy of control see Arora, Saurabh. "Admitting uncertainty, transforming engagement: Towards caring practices for sustainability beyond climate change." Regional Environmental Change 19 (2019): 1571-1584.
[VI] Recent research indicates that anthropogenic climate change has contributed to a 21% loss in agricultural productivity since 1961, equivalent to seven years of productivity growth. See Ortiz-Bobea et al. 2021, Anthropogenic climate change has slowed global agricultural productivity growth. Nature Climate Change 11, 306–312 (2021). https://doi.org/10.1038/s41558-021-01000-1.
[VII] ETC group, 2022. Food Barons 2022. Crisis Profiteering, digitalisation and Shifting Power. https://www.etcgroup.org/files/files/food-barons-2022-full_sectors-final_16_sept.pdf.
[VIII] For a theorization of surveillance capitalism and shifting labour relations in agriculture, see: Stone, Glenn Davis. "Surveillance agriculture and peasant autonomy." Journal of Agrarian Change 22, no. 3 (2022): 608-631.
[IX] UNCTAD. 2021. Digital Economy Report. https://unctad.org/en/pages/PublicationWebflyer. aspx?publicationid=2466.
[X] Crawford, Kate, 2021. The atlas of AI: Power, politics, and the planetary costs of artificial intelligence. Yale University Press,
[XI] E.g. https://digital-strategy.ec.europa.eu/en/policies/digitalisation-agriculture ; https://www.yara.com/digital-farming/; https://www.syngenta-us.com/thrive/production/optimizing-the-digital-farm.html
[XII] Stone, Glenn Davis. "Surveillance agriculture and peasant autonomy." Journal of Agrarian Change 22, no. 3 (2022): 608-631.
[XIII] Shift ProjecT, 2019. Lean ICT. Toward digital sobriety. Report of the working group directed by Hugues Ferreboeuf. https://theshiftproject.org/en/article/lean-ict-our-new-report
[XIV] Duporte, Alexandre, 2021. Environmental impacts of digitalisation: what to bear in mind. Policy Unit AEIDL. https://www.aeidl.eu/wp-content/uploads/2022/10/AEIDL-PolicyUnit-Environmental-impacts-of-digitalisation-AD-v4.pdf
[XV] Kempeneer, Shirley. "A big data state of mind: Epistemological challenges to accountability and transparency in data-driven regulation." Government Information Quarterly 38, no. 3 (2021): 101578.
[XVI] www.the-syllabus.com/ts-spotlight/right-climate/conversation/benedetta-brevini.
[XVII] IAASTD, 2009. Agriculture at a Crossroads: Synthesis Report; International Assessment of Agricultural Knowledge, Science and Technology for Development. Washington, DC: Island Press.
[XVIII] Fricker, Miranda, 2007. Epistemic injustice: power and the ethics of knowing. Oxford University Press.
[XIX] Anderson, Colin, Christabel Buchanan, Tom Wakeford, Marina Chang, and Javier Sanchez Rodriguez, 2017. Everyday experts: How people's knowledge can transform the food system. Coventry University.
[XX] Shiva, Vandana, 2016. Biopiracy: The Plunder of Nature and Knowledge. North Atlantic Books.
[XXI] Key references are: Convention on Biological Diversity (CBD), art. 8 (j); United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP), art. 20.2; General Comment No. 25 on science and economic, social and cultural rights, by the Committee on Economic, Social and Cultural Rights (CESCR), paras. 64 and 65.



Robots are task-performing machines. The machines are computer-programmed to carry out a series of actions automatically in many spheres of social life, ranging from Amazon warehouses to car factories, from greenhouses to hospitals. In a large number of the European dairy barns, robotics have been introduced to carry out tasks including the milking, feeding and observation of cows, scraping manure or pushing fodder.

Robots are often thought of in relation to their autonomy from humans. The automated autonomous machines are supposed to react to their outside world with minimal human intervention. How does the aspiration of minimal human intervention then interfere with the ambition of peasant farmers to increase their autonomy and reduce dependency on external inputs[I]?

DAIRY FARMING IN EUROPE

In monetary value, dairy is the second biggest agricultural sector in Europe after the vegetable & horticulture plant sector[II].

In 2020, it was estimated that European farms produced around 160 million tons of milk, Germany being the biggest producer with 33 million tons for the same year.
According to a 2023 study from INRAE, most of the 438,000 dairy farms found in Europe are family farms that combine grassland for livestock grazing and fields for crop production to feed people and livestock. The size of the herds on family farms varies considerably. While many family farms work with 60 – 80 cows, others have up to 1000 animals[III].

Around 20% of the total production (value of 22 billion EUR/year) and about 50% of the manufactured production is exported to third countries. The consequences of the import-export agricultural model are grave. Oxfam and others have repeatedly criticised the practice of exporting CAP-subsidised milk powder to West Africa.

Farmers and processors in the affected regions are pushed out of business, which in turn reinforces a vicious circle of dependency[IV].
Meanwhile, dairy farmers in Europe are pushed into the mantra of big, bigger, biggest. They are forced into cyclically adopting new economies of scale, install labour-saving technologies, including various generations of automated milking systems, and embrace ever more expensive external inputs. Not surprisingly, many dairy farmers in Europe accumulated debts and disappeared in the last decades or face economic hardship[8].

ROBOTIC MILK EXTRACTION:
ALTERING LABOUR RELATIONS AND SKILLS

Milking robots, also referred to as fully automated milking systems, are a common feature on many dairy farms in Western Europe and elsewhere[9]. They are a further technologization of an already partly automated process with machines extracting the cow's milk.

On family farms, a farmer or other landworker herds the cows into a room twice a day to guide the milking process. During the process, workers clean the cow's teats and attach the cows to the milking machines. While the human actions can vary according to the milking system, a human is always part of the milking process.

Robotic milking, in contrast, does not require the direct involvement of people. The cow and machine interact through sensors to decide on the moment of milking. In most robotic milking systems, the cows have access to the robot 24 hours a day. The robot is placed within the cattle barn in a way that the cows have access to the robot on one side. To incentivise cows to enter the robot, milking is combined with the provision of a tailored food portion.

[8] According to an EU briefing on the dairy sector "From 1983 to 2013, the number of farms with dairy cows decreased by 81 % in the ten (initial) EU Member States, a reduction that was sharper than that registered for all types of farms". https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/630345/EPRS_BRI(2018)630345_EN.pdf
[9] It is difficult to give exact numbers as companies do not make this data available, but the milking robot market was valued at 1.25 billion $ in 2019 https://www.fortunebusinessinsights.com/infographics/milking-robots-market-102996

The farmers access the robots from the other side and have no direct visual or tactile contact with the cows. The machine cleans the teats and places the milking cups on the udder.

This system also increases the number of times a single cow can be "voluntarily" milked daily, hence boosting the production. For example, one of the main robot manufacturers Lely, claims that "dairy farmers with a Lely Astronaut realise on average 9,6% more milk compared to milking parlours"[V].

In conversations with farmers[10] working with fully automated milking systems, they brought up the changes in working rhythm the robot allows for. The two traditional milking sessions, one early in the morning and one in the afternoon, dictates the rhythm on dairy farms 365 days a year. The desire to break away from these fixed milking times, and the difficulty of finding, and working with, good (human) milkers drive some farmers to invest in robots. Some of them also mentioned that the robots spark an increasing interest from their children to continue the family business.

In any case the productivity push, the reduction in labour costs, substantial governmental subsidies for the purchase of milking robots, and the prospect of dealing with fewer udder infections or mastitis make robots seem worth the financial investment for a substantial number of family farmers in Europe.

However, the promises that robotisation of milk farming brings do not all come true.

In the US, farmers are pursuing an ongoing class action suit over robots. Farmers claims include allegations about the robots failing to adequately clean and dry each teat, missing quarters due to cup attachment failures, and subsequently causing bacteria-contaminated milk droplets that are bad for cow health, productivity and milk quality[VI].

Robots promise to reduce on-farm labour. This labour, however, does not disappear. It is displaced elsewhere - such as in the labour in manufacturing plants, software programming, robot repair and maintenance - and this transformation shifts the role of farm workers. They need to become quasi data analysts and are expected to adapt their practice in response to the data that the robot collects[VII].

[10] This chapter is based on on-farm interviews with a limited number of dairy farmers in the UK and Belgium in 2022 and 2023, a review of the promotion material of robot producers. It does not claim to provide a representative overview, but offers some reflections on the key aspects that emerged from these conversations and explorations

As mentioned in the previous section, this transformations risk reducing the complex decision-making work of a farmer into the executor of machine-made decisions. There is a lot more to milking cows than just capturing cow's milk for human consumption. It is a moment of interaction where the farmer checks on the cows, not just visually but also checking important indicators such as smell, touch, sound, the ways cows move and behave. The removal of such interactions is part of the deskilling of landworkers, including the suppression of their knowledges and ways of knowing.

AUTOMATING DECISIONS

The automated decisions that the milking robots introduce don't stop at milking. Milking robots make a number of decisions, without the involvement of the farmer. When a cow enters the robot, those automated decisions include: Will the cow receive food? How much and what kind of food? Will the cow be milked? Is the milk used or discarded?

For this system to work, each cow has a tag that allows the machine to identify her. The robot is equipped with sensors to continuously collect data from each cow. Data about her age, when she last calved, her feeding pattern, her lactation pattern, information about the quantity and the quality of her milk, her movements or the number of times she chews her cud a day.

Computer models analyse the farm data against pre-programmed models to make automated decisions, such as milking yes or no, or sending alerts about a cow´s health if mastitis is detected. If programmed to do so, these alerts could trigger further automated decisions. Alerts about a cow in heat, for example, can be sent directly to the insemination service provider.

While automated decision-making is routinely presented as a source of support for farm workers, its impact on reducing stress loads is ambiguous at best[VIII]. In conversations we had with farmers, it appeared that they didn't necessarily understand well how the robots work, and in particular how they use and process data. In addition, in the robot's maintenance contract, farmers cannot and are not allowed to fix, tinker or modify them[11]. The possibility of a robot failing, the constant data flows, and the alerts appearing on the farmers phones even caused potential extra stress for family farmers.

[11] Specialised software is needed to repair devices (phones, laundry machines,...) and vehicles (cars, tractors,...). The companies owning that software thus have control over them. https://www.vice.com/en/article/a34pp4/john-deere-tractor-hacking-big-data-surveillance

DATAFICATION OF COWS AND FARMS

Reliance on big data analysis is gradually becoming indispensable for dairy farms to remain competitive - but turning cows and farming into sets of data comes at the expense of peasant knowledges and intelligence.

The way that robots work depends on the datafication of agriculture and fixed procedures. For example, the robots show farmers overviews of each individual cow's performance - from highlighting 'no shows' when a cow has not come for milking and feeding, to 'refusals' when the robot does not milk a cow that entered the robot, to insights on the milk quality (including cell count, fat and protein) and productivity.

The idea, according to the robot producers, is that the data collection allows for individualised cow care and for farmers to focus on the cows that require attention. The detailed information also assists decision-making with regard to more efficiently selecting cows for breeding. This datafication of agriculture is supposed to help farmers to be more competitive. A woman farmer in the UK remembers: "the robotic installer told us not to show the overviews to anybody."

Access to big data analysis thus becomes indispensable to family dairy farms wanting to remain competitive in the market - as does reliance on other external farm inputs, including financial capital, fossil fuels, pesticides or machinery. Farms depending on this data analysis rely on extensive computing infrastructure beyond the farm - infrastructure that in itself relies on the large-scale extraction of rare minerals, huge energy-devouring data centres and fresh water for cooling[IX].

The analysis of large datasets is supposed to generate 'expert' advice. This is yet another step towards the devaluation of peasant knowledges and ways of knowing. But machine intelligence is fairly limited.

While the machines struggle with uncertainty, the knowledges and ways of knowing or peasant intelligence that farmers have built up over generations is much more complex than what robot sensors can capture. Restoring and protecting these knowledges is likely to be a wiser strategy than accustoming farmers to fully rely on algorithmic advice.

We also have a worrying lack of clarity over how the milking robot producers govern the data they collect. How is it shared with third parties? Transparency over how the data is used to inform the economic agenda of powerful actors in an increasingly vertical value chain is essential for autonomy, food sovereignty and peasant agroecology.

IT'S NEVER JUST ONE ROBOT

Milking robots shape decisions not just about the cows but also on the whole farm operation and structure, further undermining peasant autonomy. The milking set-up is crucial in the physical layout of the farm and is deeply connected with other practices, including grazing, lineage selection or herd size.

For example: the cows need permanent access to the robot, which is often hard to combine with grazing if that is not in the immediate vicinity of the robot. This leads to zero grazing regimes, "with feed being brought to the cows rather than the cows going out to graze in the fields"[X].

As well as requiring the redesign of the barn and flows of movement, the installation of one or more robots is also a serious financial investment that often involves the need for external capital, further increasing external dependency. It even governs decisions over the size of the herd, as common milking robot units work best with around 60 or 70 cows.

It doesn't end there. The robot will also be an important factor in selecting cows for further breeding. Their size, and udder composition needs to be compatible with the robot. Cows that show too many signs of rebellion to work with the robot are not selected.

Detailed individualised data on cow productivity is used to make selections over breeding based on 'efficiency' criteria, often labelled as 'sustainability.' The problems of 'optimising' animals to the needs of the cattle industry have been extensively demonstrated by prior research[XI]. This selection process has contributed to ever-shrinking biodiversity and subsequent weakened farm animals.

QUESTIONS FOR CRITICAL REFLECTION

- How can technology help peasant farmers reconnect people, animals and living organisms?

- In peasant agroecology, connection with the land and nature is critical. What are the implications of automated milking on developing nourishing and complex ways of working with nature? What happens to the knowledges that farmers have been building over generations?

- What do societies lose when peasant intelligence erodes?

- If automated decisions are programmed from a distance, how do we prevent moving into 'remote control' agriculture?

[I] For a more detailed analysis of this question Stone, Glenn Davis. "Surveillance agriculture and peasant autonomy." Journal of Agrarian Change 22, no. 3 (2022): 608-631.
[II] https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/630345/EPRS_BRI(2018)630345_EN.pdf
[III] INRAE, 2023. Dairy cows grazing to the future. Agroecology ressources dossier, INRAE. https://www.inrae.fr/en/reports/dairy-cows-grazing-future/dairy-farming-current-practices
[IV] Gérard Choplin, 2016. Europe's dairy sector has its eyes on West-Africa. Oxfam Solidarité & SOS Faim.
[V] https://www.lely.com/ , accessed 25 May 2023
[VI] https://lelya4robotsettlement.com;https://www.stuevesiegel.com/what-cases-lely-astronautA4-robotic-milker-failure-law-suit
[VII] Holloway, Lewis, Christopher Bear, and Katy Wilkinson. "Re-capturing bovine life: Robot–cow relationships, freedom and control in dairy farming." Journal of Rural Studies 33 (2014): 131-140.
[VIII] Lunner-Kolstrup, Christina, Torsten Hörndahl, and Janne P. Karttunen. "Farm operators' experiences of advanced technology and automation in Swedish agriculture: a pilot study." Journal of Agromedicine 23, no. 3 (2018): 215-226.
[IX] https://www.datacamp.com/blog/environmental-impact-data-digital-technology
[X] Holloway, Lewis, Christopher Bear, and Katy Wilkinson. "Re-capturing bovine life: Robot–cow relationships, freedom and control in dairy farming." Journal of Rural Studies 33 (2014): 131-140.
[XI] Brito, L. F., Nicolas Bédère, Frédéric Douhard, H. R. Oliveira, M. Arnal, F. Peñagaricano, A. P. Schinckel, Christine Francoise Baes, and F. Miglior. "Genetic selection of high-yielding dairy cattle toward sustainable farming systems in a rapidly changing world." Animal 15 (2021): 100292.

Automated herding: helping or hindering pastoralism?

CHAPTER 3

The use of digital technologies in animal farming is usually promoted under the label of "precision livestock farming". This concept is gaining ground in industrial livestock farms and the dairy sector. Targeted efforts are underway to apply these technologies for extensive livestock rearing, where animals are raised on grazing lands or open pasture.

Pastoralism is a form of animal farming, which often operates in challenging contexts and takes advantage of variability and uncertainty. How does digitalisation play out in pastoralism and how does it affect pastoralists' autonomy and knowledge systems?

THE RISE OF DIGITAL TECHNOLOGIES FOR EXTENSIVE LIVESTOCK REARING

The global livestock monitoring market, which includes various technologies and devices to track and monitor the health and behaviour of farm animals, was valued at US$ 5.2 billion in 2022. Europe accounts for US$ 372.6 million and the sector is expected to grow significantly over the next years, globally and in Europe[I].

Broadly speaking, the technologies being promoted address two aspects: animal supervision (the practices and techniques used to oversee the behaviour and well-being of animals) and pasture management (the practice of managing grazing lands and other forage resources to ensure their productivity and sustainability).

This is a non-exhaustive list of technologies that are being promoted for extensive livestock systems:

• Electronic animal identification (EID)

Electronic identification was introduced in livestock farming in the 1980s and made mandatory in the European Union (EU) in 2004 to identify all sheep and goats[II]. It involves the use of electronic devices, such as ear tags, bracelets, or implanted microchips, to provide a unique identification number for each animal. This technology is used, among others, to keep track of and record animal health, movements, and behaviour. The introduction of mandatory EID has been challenged by European livestock farmers and shepherds because of the cost[12], additional workload, how impractical it is (especially in difficult-to-access areas) as well as concerns regarding animal welfare, control over data and loss of autonomy[13].

• Geographic information systems and satellite imagery

Global navigation satellite systems, such as GPS, can locate and track animals wearing a specific collar or ear tag. They record animals' geo-location at regular intervals to detect if they are moving or resting and to identify grazing and other behavioural patterns. Combined with satellite images, which provide information on grazing lands (for example vegetation cover), they can be used to support pasture management

• Virtual fencing

Virtual fences replace physical fences with electronically placed boundaries. When an animal approaches the virtual boundary of an area, the system emits a warning signal or mild electrical shock to make the animal turn back. The main argument for the use of this technology is that it can reduce the need for physical fencing, saving time and labour associated with fence installation, maintenance, and repair.

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[12] In addition to the cost of the microchip and its installation, additional costs arise from reading devices as well as software and information systems.
[13] In France, for instance, the peasant organisation Confédération Paysanne has successfully mobilised against compulsory electronic chipping and for animal farmers' right to choose the identification method that is most suitable for them. See www.confederationpaysanne.fr/sites/1/articles/documents/4_pages_ide_et_voie_male_bd.pdf.

Automated herding: helping or hindering pastoralism?

• On-animal sensors

Sensors applied on the individual animal are one of the key tools of precision livestock farming. They can record an animal's movement to a precise timescale, as well as closely monitoring its health status by measuring pulse rate, temperature, blood pressure, rate of respiration and other functions. The use of on-animal sensors is increasingly widespread in industrial livestock farming. Whereas identifying illness is currently the main use, some researchers have argued that the technology can be used to "find out what animals want" and thus improve overall animal wellbeing[III].

• Drones

Drones, or unmanned aerial vehicles (UAV), play a major role in the pro-technology discourse around extensive livestock farming. Proposed uses range from counting the number of animals to locating them, monitoring diseased animals and unusual animal behaviours, checking if feed and water are available to ensuring the security of the farm[IV]. For many of these tasks, drones are equipped with cameras, thermal scanners, and other sensors. Drones can also be used to move herds or individual animals, using devices installed on them that emit sounds.

TOWARD "AUTOMATED HERDING"?

Research and projects are underway to combine the technologies to create more automated herding processes. Virtual fencing, for example, is already a combination of different technologies, using GPS tracking, mapping software and sensors that detect the position of the animals in real time. Combining this with information on vegetation cover and/or water availability obtained from satellite imagery could create systems that automatically move the virtual fence.

Automated systems could also process information provided by on-animal sensors to identify a problem, such as an injury or disease, and generate a prescription for a certain treatment, while sending out drones to find the animal (with the help of GPS) and move it to the herder. The treatment could even potentially be executed automatically by a robot, thus putting in place a (largely) "automated herding" system[V].

SILVER BULLET OR THE END OF PASTORALISM?

Promoters of digital technologies for extensive livestock farming promise more precise and effective management decisions, inputs and treatments, reduced labour, improved productivity, better animal health and nutrition, and improved sustainability, among other things[VI]. However, European pastoralists' views on the proposed technologies paint a very different picture[14].

Although some pastoralists use digital tools – either because they are obliged to, as in the case of EID, or because they hope that they can respond to specific challenges they face[15]– there is a defiance among them in the face of these technologies. In our conversations with pastoralists from around Europe, many of them voiced a strong conviction that pastoralism requires a human element. The close contact with their animals and their territories is at the core of many pastoralists' identity and pride.

Negative experiences with technologies, such as the inaccuracy of Light Detection and Ranging (LIDAR) technology to identify forest and shrub areas that are used as pastures[16], intensify the scepticism, while also revealing the discrepancy between the promised benefits of the proposed technologies and their actual capacities.

However, the example of EID shows that European pastoralists may have no other choice than to use certain technologies. Some worry that the use of GPS tracking devices may be tied to subsidies under the EU's Common Agricultural Policies (CAP), which most pastoralists depend on. They are also concerned with the control over the collected data and how the state and other actors may use it.

Some researchers of these technologies acknowledge that pastoralists' and shepherds' roles are essential in the use of extensive livestock farming systems, and that technological devices should be considered as specific aids, to be integrated into a broader management strategy[VI]. However, even in this case, it is important to be critical of the notions of 'usefulness' and 'convenience'. Useful and convenient for who?

[14] The following paragraphs are based on interviews and group discussions with pastoralists from different European countries. They do not claim to provide a representative overview, but offer some reflections on the key aspects that emerged from these conversations.
[15] Some Saami reindeer herders, for instance, use drones to locate and move their animals. See www.mirai-port.com/en/people/847.

Firstly, all the mentioned technologies collect data, raising the question of who can access and use it, for what purposes, and who gets the benefits of such use, including economic benefits. Data collection is particularly sensitive in the context of peasant farming (including pastoralism), where the line between personal and non-personal data is often blurred.

Secondly, adopting one technology usually entails the use of other tools, such as specific software and/or hardware, which will ultimately require pastoralists to modify their practices and management systems.

Furthermore, the infrastructure to run digital technologies is largely owned by a few corporations globally. As a result, the adoption of digital technologies implies handing over decision-making power over farming and many spheres of life.

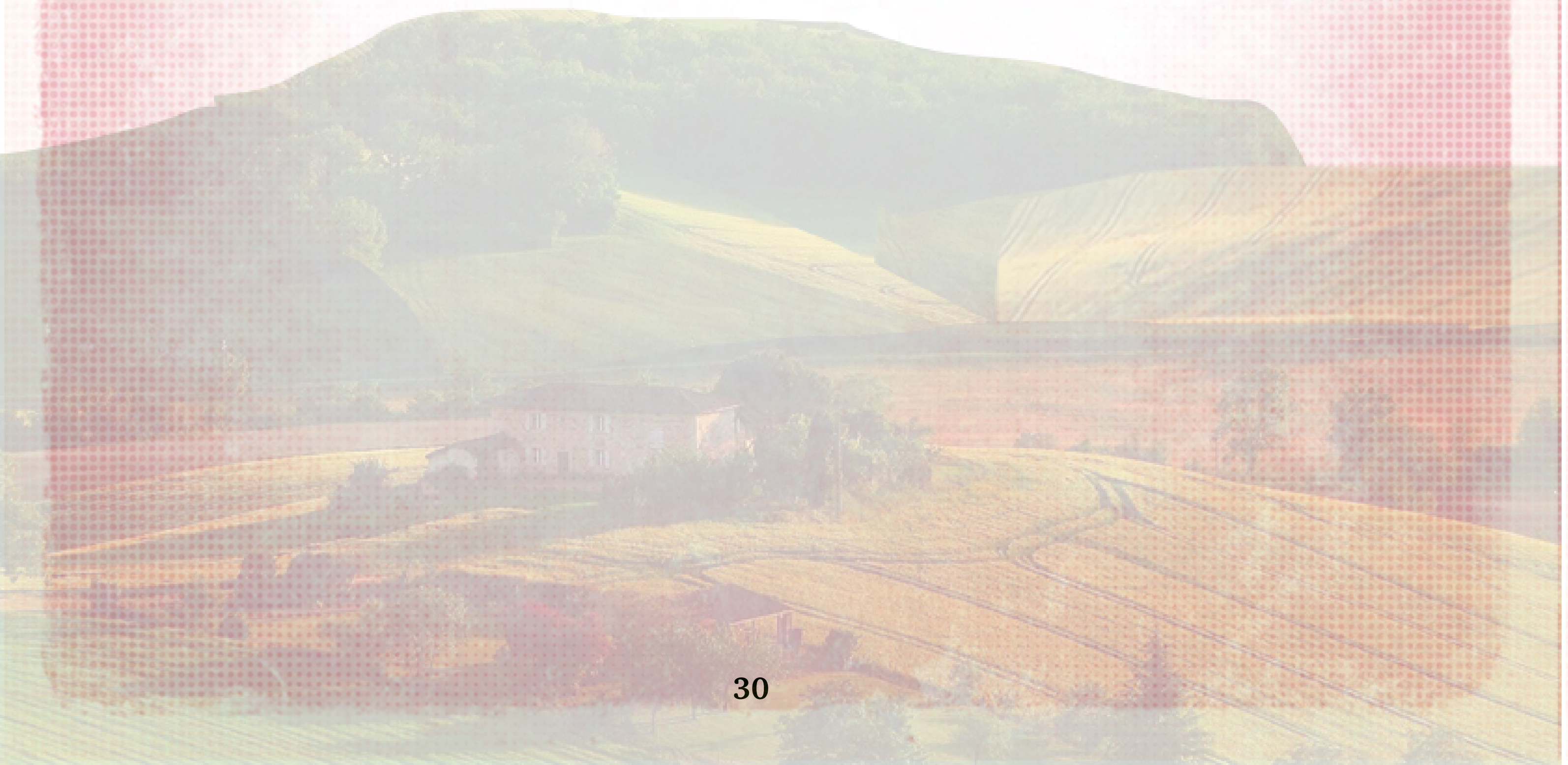
It is legitimate that pastoralists seek tools that can make their life easier, but the supposed or actual 'convenience' of digital tools is a main strategy of capitalism to ensure that its technologies penetrate all aspects of people's lives, forcing them to adapt to a predefined development path, creating new dependencies, and reproducing patterns of exploitation and domination. To put it in the words of a French pastoralist woman: "All these technologies are proposed to us by corporations and institutions. They do not come from a need articulated by us pastoralists"[VIII].

A surprising argument put forward by some proponents of digital technologies is that they are necessary to maintain pastoralists' traditional knowledge and the important ecological functions that pastoralism provides[IX]. It argues that pastoralism is so challenging that young people are unlikely to choose to become pastoralists or shepherds unless helped by a set of digital technologies.

However, this is a delusion. Peasant knowledges exists only within the context of the complex interrelationships with their animals and territories as well as their cultural practices - not in datasets. As recent research emphasises, one key aspect of shepherd knowledge and intelligence is the ability to live with and harness uncertainty. Indeed, "pastoralists are livestock-keepers who specialise in taking advantage of variability [...]"[X].
One central strategy to manage uncertainty is mobility: "Movement offers opportunity and hope, and

[16] LIDAR is a remote sensing technology that uses laser pulses to measure distances and create detailed three-dimensional maps of the surrounding environment. In Europe, LIDAR technology is being used in livestock production, including to map the topography and vegetation cover of grazing lands.

with this flexibility, responsiveness and the ability to navigate a complex world." Mobility is tied to shepherd knowledge as it is a social, cultural and political process, which "requires a spatial knowledge of conditions, combined with strong networks of relations[XI]." It is difficult to imagine that these complex abilities can be carried out by technologies or machines, let alone if this is desirable.



THE CHALLENGE OF ASSERTING PASTORALISTS' AUTONOMY IN THE FACE OF DIGITAL TECHNOLOGIES

Despite the push to scale up the use of digital technologies in extensive livestock farming, their deployment is still at an early stage. Looking past the corporate narratives of silver bullet farming technologies, the failures and stark limitations of the technologies show that the application of fully automated, AI-based herding systems is still a vision (or dystopian picture) of the future. The promises have yet to materialise, if they do at all.

But whether this future is possible is less interesting than the question of whether it is desirable, considering the implications for food sovereignty and agroecology. If we scrutinise the corporate visions of agriculture from this perspective, cracks begin to appear.

The digital technologies that are being promoted have been developed for industrial livestock farming settings. Pastoralism is arguably a sector, with limited prospects for profit. Moreover, the particular challenges that characterise pastoralism make digitalisation complicated. For example, the labour-intensity of rearing animals on open pastures and maintaining infrastructure; and the frequent use of mountain regions or shrubby areas, make digitalisation impractical.

These features of pastoralism have contributed to its marginalisation. This reality provides an entry door for further digitalisation narratives, presenting digital technologies and so-called AI systems as one (if not the only) way to maintain pastoralists' knowledge and practices as well as pastoralism's multiple functions – economic, social, ecological, and cultural. However, this argument is wrong in at least two ways.

Firstly, it takes for granted the idea that pastoralists will continue to be marginalised and normalises this, without examining the political and economic structures that create this exclusion.

Secondly, it fails to grasp the nature of pastoralists' knowledge and intelligence, which is intrinsically tied to their ways of life and fundamental to their very identity. Rather than preserve this, the advancement of corporate-led digitalisation is more likely to lead to further marginalisation.

The ways pastoralists have developed to manage challenges, uncertainty and variability in their work form the core of peasant agroecology and food sovereignty. These knowledges and ways of knowing constitute the basis of their autonomy and self-determination. As climate change results in increasing variability, adversities and uncertainties, pastoralism offers incredibly creative and innovative ways to manage these challenges and more.

Using the challenges that pastoralists face as a pretext to replace them with limited technologies fails to address the root causes of this marginalisation. The discussion around the use of any given technology should begin by asking whether its use risks undermining or losing necessary pastoralist knowledge and autonomy. Such an approach does not preclude personal or collective choices regarding the use, tweaking or refusal of specific technologies and tools but puts the focus on how to better support pastoralists' knowledges, ways of knowing and life, including through.

QUESTIONS FOR CRITICAL REFLECTION

- **How do the specific characteristics and challenges of pastoralism make this form of agriculture vulnerable to the impacts of digitalisation?**
- **In what ways do currently proposed technologies undermine pastoralists' knowledges, ways of knowing and autonomous decision-making?**
- **What do societies lose when peasant intelligence erodes?**
- **What technological features could potentially provide responses to challenges faced by European pastoralists, while keeping them on the land and maintaining their knowledges, ways of knowing and autonomy?**
- **What can be learnt from pastoralism and its strategies to deal with uncertainty for the transformation of food and farming systems to agroecology?**

[I] Council Regulation (EC) No. 21/2004.
[II] Dawkins MS, 2021. Does Smart Farming Improve or Damage Animal Welfare? Technology and What Animals Want. Front. Anim. Sci. 2:736536. doi: 10.3389/fanim.2021.736536.
[III] Barbedo, Jayme Garcia Arnal, Luciano Vieira Koenigkan, Thiago Teixeira Santos, and Patrícia Menezes Santos, 2019. "A Study on the Detection of Cattle in UAV Images Using Deep Learning" Sensors 19, no. 24: 5436. https://doi.org/10.3390/s19245436.
[IV] As an example of the kind of research that is currently being conducted, please see www.bbc.com/future/bespoke/follow-the-food/drones-finding-cattle-where-cowboys-cannot-reach.html.
[V] See, for instance: Suresh Neethirajan, Bas Kemp, Digital Livestock Farming, Sensing and Bio-Sensing Research, Volume 32, 2021, 100408, https://doi.org/10.1016/j.sbsr.2021.100408.
[VI] Francois, Bocquier & N., Debus & Lurette, Amandine & Maton, Cyriane & G., Viudes & Moulin, Charles-Henri & Jouven, Magali. (2014). Élevage de précision en systèmes d'élevage peu intensifiés. Productions Animales -Paris- Institut National de la Recherche Agronomique-. 27. 97-110. 10.20870/productions-animales.2014.27.2.3058.
[VII] Interview conducted on May 9, 2023
[VIII] See, for instance: Javier Plaza, Nilda Sánchez, Carlos Palacios, Mario Sánchez-García, Jose Alfonso Abecia, Marco Criado, Jaime Nieto. GPS, LiDAR and VNIR data to monitor the spatial behaviour of grazing sheep. J. Anim. Behav. Biometeorol., vol.10, n2, 2214, 2022. http://dx.doi.org/10.31893/jabb.22014.
[IX] Scoones, Ian (2021). Pastoralists and peasants: perspectives on agrarian change, The Journal of Peasant Studies, 48:1, 1-47, DOI: 10.1080/03066150.2020.1802249.
[X] Ibid.

CHAPTER 4
Extracting data to steer farmers decisions

Digital platforms have transformed economies and people's behaviour in a short timespan. Think of Uber that connects drivers directly with passengers, Airbnb that links guests with house owners, Amazon that gives booksellers access to large numbers of potential customers. These platforms disrupt entire city economies. The platform owners do not employ the drivers, nor do they own the Airbnb-houses or Uber-cars. As disputes with Deliveroo couriers in Europe show, these companies often use legal loopholes, disregard existing labour laws and other service provider regulations or customer protections that have been built up over decades[I]. The platform owners also decide who can sell or buy via the platforms. Facebook and Apple have both been put under pressure for selling only the apps they develop.

Digital platforms in these sectors have proven the perfect tool for the accumulation of corporate wealth. Not surprisingly, digital platforms also make their way into agriculture. The corporate platforms create direct connections between farmers and corporations by offering farmers the service of 'decision-making assistance'. What does this mean for peasant agroecology?

Facebook has entered the farming scene. ETC group[II], GRAIN[III] and others have exposed how the ***GAFAM companies [Google (Alphabet), Amazon, Facebook, Apple, and Microsoft) of Silicon Valley now own, process, store, trade and benefit from the data that farmers collect for them.*** *And the more data extracted, the greater the influence of the companies that own and trade in data[IV]. By allowing and enabling tech companies to collect and trade agricultural data to "optimise decision-making" in agriculture, power accumulation is facilitated. How does this work in practice?*

FARM MACHINERY AND FARMERS AS DATA GENERATORS

To collect data, most new farming machinery incorporate sensors. The sensors collect farm information about temperature, humidity, visual observations, movements and anything that can potentially be measured. This means that agricultural equipment is built “to be interconnective and to scoop up data”[V]. AI or machine learning is then used to combine the data from many different farms with other (often public) data such as weather forecasts or soil maps.

To get an idea of the extent of the data extraction: in 2022, Bayer’s Fieldview was in use on over 36 million hectares (ha) globally, and in 2 million ha in Europe where tractors, drones and other data collecting sensors seek to capture as much data as possible. Multinational fertiliser producer company Yara claims to cover “tens of millions of cropped hectares” in over 60 countries and has the ambition to “reach 150 million hectares actively monitored annually – approximately 10% of all arable land worldwide”[VI].

Based on this data, the probability of certain diseases and state of the crops on particular farms is identified and transformed into “optimal advice” about spraying, fertilising, irrigation and more. Via the farm apps, the farmers receive individually adapted prescriptions on what to do to optimise productivity and environmental management practices.

As in all these new corporate-owned digital technologies, this begs the question, optimal for whom or for what? Companies that produce pesticides, genetically modified crops or chemical fertilisers such as Bayer or Yara have clear benefits in prescribing the farmers to apply their products. Importantly, they get access to ever increasing amounts of information that allows them to make strategic forecasts, such as yield estimates. This information is extremely useful to devise investment strategies, influence prices and increase market shares[VII].

ASSISTING FARMERS TO MAKE ‘BETTER’ DECISIONS?

Digital agricultural platforms, including Bayer’s Fieldview or Yara’s TankMixIT, make bold claims about their role in assisting farmers to make better decisions in running their farms. On its website, Bayer promises to optimise input use and increase yields thanks to Fieldview’s prescriptive field management advice for arable crop farmers on seeding and nutrition rates[VIII]. Many apps to ´optimise´ decision-making are being developed.

Bayer’s Fieldview platform relies on sensors that collect drill, spreader and spray information, alongside information on yield to assist farmers in their decision-making on variety, product, timing or application rates of inputs like fertilisers. This means that Bayer gets access to many different types of data, including machinery set up, public data on soil quality and the behaviour of farmers.

While Fieldview is presented as a tool to help farmers in making better decisions, in reality it may be before anything a tool to help Bayer, and its partner Amazon Web Services, to get access to detailed information including about how and when farmers sow, what products they apply, what machinery they use etc[IX].

Similarly, Yara collaborated with tech company IBM to provide farmers with knowledge and decision-making insights with the promise to increase “yields, crop quality and incomes in a sustainable way.” Research in India and the Sub-Sahara has already shown how the delivery of farm decision-making assistance via mobile phones led to the increased application of certain externally purchased products[X]. Alternative strategies to enhance peasant autonomy and ecological resilience, including mixed cropping or integrated pest management in contrast is not advised for.

In many cases, use of decision-making assistance tools becomes de facto automated decision-making (ADM)[XI]. Contracts for these tools require farmers to commit to the application of the advice for access to guaranteed price-taking, such as is the case for the Bayer Value Service. Reduced prices on inputs - cutting out middlemen and shops selling these products - are another incentive to implement the big data generated advice.

COMPUTERISED SUSTAINABLE AGRICULTURE?

The advice is routinely framed as enhancing farm sustainability - which is also defined by corporate algorithms, not the farmer. What does sustainable agriculture mean to corporations that depend on big data collection, pesticide sales and energy-intensive computational infrastructure? Sustainable for who?

The same major agribusiness corporations driving use of these data technologies are the ones responsible for drenching soils worldwide with toxic chemicals and driving a rapid decline in biodiversity[XII]. Now they aim to own the algorithms to shape the foundation of agriculture. This transformation has worrying implications for food sovereignty. A wide variety of local knowledges, social justice, and diversity on all levels (genetic, crop varieties, types of farms, landscape) is fundamental to building resilient food webs[XIII].

The platforms first gain information about farmers behaviour to then shape it. The incentive to use the platforms is the ease for farmers of having all their information in one place, and being fed with insights to help them run their farms. But using the platforms, also fills up the databases for the creation of digital agricultural markets.

Extracting data to steer farmers decisions

By assisting the farmers in decisions on how to run their farms or what products to apply, the platforms effectively manipulate the professional behaviour of farm workers[XIV]. Instead of relying on fragmented information and markets, corporations now have direct oversight on all information at once. A larger transformation of markets is underway that facilitates further concentration of power in the exchange of agricultural goods, services and information.

Learning from the history of agricultural advisors and their role in shaping farm modernisation trajectories[XV], it's easy to see how digital platform-mediated prescriptions could play a substantial part in making and remaking agriculture on a massive scale and model it further according to corporate visions of industrial computerised agriculture.

By informing decisions on the basis of a series of bits and bytes, it is assumed that all on-farm decisions are made with the logic of expanding control and optimising efficiency. This stands in contrast with the goal of reinforcing peasant skills and ways of knowing in agroecology's goal to give space to interconnected plants, animals and other living organisms to express themselves.

RECLAIMING DATA AS A MEANS OF PRODUCTION

Localised information from farm activities is a precious resource. It has become a means of production that corporate interests accumulate and value. It's not the ownership of machines or land, but user data that the digital platforms are after.

In many spheres of everyday life, individuals are already, often unknowingly, providing information through use of mobile phones, GPS, and social media which corporations use for financial gain. In an economic context of extreme inequality and corporate control, the accumulation of data by these companies will further entrench their power.[XVI]

How does peasant autonomy fit into this picture? Farmers are organising to collectively reclaim their means of production - including land, seeds, fertilisers or technologies. It is now time to think how the struggles for food sovereignty and peasant agroecology could develop strategies and

alliances to counter the growth of data expropriation. Grassroots organisations such as CLOC Via Campesina on just and digital sovereignty are advocating for democratic, open and decentralised digital technologies to support justice, redistribution of wealth, decolonisation and sovereignty.[XVII]

QUESTIONS FOR CRITICAL REFLECTION

- **What worlds are digital agricultural platforms born from? What agricultural worlds may they birth?**
- **What is the experience of farm work when decision making is outsourced to so-called artificial intelligence? What may be lost in the haste of shaping agricultural decision-making by computer models?**
- **What would food look like in societies where the skills and knowledges for cultivation become proprietary domain of technology corporations?**
- **How to reclaim data as a peasant resource?**

[I] IPS. Work and digitalisation. Ukrainian refugees also deserve decent work. 22.05.2022 https://www.ips-journal.eu/work-and-digitalisation/ukrainian-refugees-also-deserve-decent-work-5910/ , accessed May 2023.
[II] ETCgroup, 2022. Food Barons 2022. Crisis Profiteering, digitalisation and Shifting Power. https://www.etcgroup.org/files/files/food-barons-2022-full_sectors-final_16_sept.pdf.
[III] GRAIN, 2021. Digital control. How Big Tech moves into food and farming (and what it means) https://grain.org/en/article/6595-digital-control-how-big-tech-moves-into-food-and-farming-and-what-it-means
[IV] Maschewski, Felix, and Anna-Verena Nosthoff, 2022. “Big Tech and the Smartification of Agriculture: A Critical Perspective.” The State of Big Tech.
[V] https://www.vice.com/en/article/a34pp4/john-deere-tractor-hacking-big-data-surveillance
[VI] https://www.yara.com/digital-farming/ , accessed May 2023.
[VII] Sadowski, Jathan. “When data is capital: Datafication, accumulation, and extraction.” Big data & society 6, no. 1 (2019): 2053951718820549.
[VIII] https://cropscience.bayer.co.uk/fieldview/ accessed May 2023.
[IX] GRAIN 2021. Digital control. How Big Tech moves into food and farming (and what it means) https://grain.org/en/article/6595-digital-control-how-big-tech-moves-into-food-and-farming-and-what-it-means
[X] Fabregas, R., Kremer, M. & Schilbach, F. Realizing the potential of digital development: the case of agricultural advice. Science 366, 13038 (2019)
[XI] Thomas, Jim, 2020. The biodigital power grab: data as industrial input and resource for the next agribusiness assault. Chapter in Agroecology & Digitalisation. Traps and opportunities to transform the food system. IFOAM ORGANICS.
[XII] Ibid.
[XIII] Pimbert, Michel. P., Nina Isabella Moeller, Jasber Singh, and Colin. Anderson, 2021 “Agroecology.” In Oxford Research Encyclopedia of Anthropology
[XIV] Glenn Davis. “Surveillance agriculture and peasant autonomy.” Journal of Agrarian Change 22, no. 3 (2022): 608-631.
[XV] For example in the so-called Green Revolution. Siegel, Benjamin Robert. Hungry nation: Food, famine, and the making of modern India. Cambridge University Press, 2018.
[XVI] GRAIN, 2021. Digital control. How Big Tech moves into food and farming (and what it means) https://grain.org/en/article/6595-digital-control-how-big-tech-moves-into-food-and-farming-and-what-it-means
[XVII] CLOC VC, 2022. Una agenda de 20 puntos hacia un futuro digital justo y soberano. https://cloc-viacampesina.net/una-agenda-de-20-puntos-hacia-un-futuro-digital-justo-y-soberano

Regulating the digitalisation of agriculture? Not now, apparently

CHAPTER 5

The European Union (EU) is setting up a complex package of new laws to govern digital markets and digital services. Although many of the laws, particularly the Data Acts, are relevant for farming, as of spring 2023, most of the new laws don't include specific rules for the farming sector. The law-making happened with hardly any attention from agribusiness lobby, nor from agriculture-focused civil society organisations. The Artificial Intelligence Act sets rules for so-called 'high risk' artificial intelligence (AI) like facial recognition, but not for other sectors.

This chapter presents a preliminary summary of the different digital laws and does not deliver a critical assessment of them.

THE EU'S POLITICAL DEBATE ON NEW RULES FOR DATA AND SO-CALLED ARTIFICIAL INTELLIGENCE

Between 2020 and 2023, the EU institutions have been negotiating a set of rules for the digital environment. The Personal Data Directive (2018) sets high standards for citizens' rights to decide what happens with their personal data. Now the new legislative package tackles digital data sharing, data platforms and data markets and artificial intelligence with a set of 'acts'. But besides the data acts, the other acts on digital markets or artificial intelligence don't regulate what is happening on farms.

The 'acts' are based on three main justifications. First, the EU wants to define its own European regulation framework on data access. Secondly, the EU seeks to speed up in what they see as a global competition (with China and USA). This includes setting digital standards as well as making European Companies more competitive internationally. Thirdly, the alleged European Digital Age is presented by the EU Commission to create more value for the European economy and societies.

In political communication, ´digital farming´ is routinely presented as a source of magic solutions for managing the impacts of the climate crisis, reducing pesticide and fertiliser use, and improving farmers income, among other benefits[I]. These debates fail to address concerns about how digital spaces increase corporate control in the farming sector.

NOTE ON THE METHODOLOGY FOR THE ASSESSMENT

For this report, we have limited our analysis to a critical reading of publications from the European Commission and the European Parliament.

Data privacy organisations and the European consumers organisation have completed comprehensive assessments for most of them[II]. Although none of these assessments have focused on agriculture, food sovereignty and very little on the environment, they expose that intense lobbying by Big Tech and other interests turned potentially interesting legislative approaches into empty tools.

We recognise that our analysis is only the seed for much-needed further scrutiny. This is also a call to researchers and civil society organisations to join forces to continue this critical analysis.

WHICH RULES ARE SET IN THE DIGITAL MARKET ACT?

This new legislation establishes EU rules for online platform gatekeepers, including Google, Amazon, Apple, Meta and Microsoft, and entered into force in November 2022. The Act aims to limit "the power to act as private rule-makers" of these online platforms and counter the potential for this power to "result in unfair conditions for businesses using these platforms and less choice for consumers"[III].

Interestingly, **the law is not yet designed for online platforms set up by Bayer, Yara or other global corporations active in the agriculture sector**, because their market shares of digital tools are still very little. Their future economic power in other farming sectors could be seen as a gatekeeper[17] for GMO seeds, pesticides, fertilisers. But during the legislation process, none of the classical agribusiness lobby groups participated in the relevant consultations. Depending on future developments, in years or decades to come, the big agribusiness corporations may fall under the rules of the Digital Markets Act.

Our interpretation is that so far, the real market relevance for online digital platforms in farming is still in an infant phase.

WHAT RULES ARE SET BY THE ARTIFICIAL INTELLIGENCE ACT?

The debate about so-called AI has been dominated by optimism and its potential to change our societies, including through more environmentally-friendly farming. However, investigative journalists and researchers have raised concerns on how so-called AI can manipulate public and political debate and even pose severe existential risk issues[IV]. This has led to more support for clear rules for AI in the EU. Recently, the European Commission also began discussing international rules for AI systems[V].

[17] Definition of a gatekeeper company has a significant impact on the internal market; provides a core platform service which is an important gateway for business users to reach end users; and an entrenched and durable position, in its current or near future operations. https://www.eu-digital-markets-act.com/

In 2021, the Commission published a draft of the Artificial Intelligence Act. As of spring 2023, this draft was in the middle of the voting process with the Parliament and Council[VI] before a final text will be agreed between the three institutions[VII].

Whilst the definition of AI systems is broad and also includes farming systems, the Act itself has a very narrow scope and sets rules only for 'high risk' AI systems. These high-risk AI systems, such as facial recognition and biometric mass surveillance, raise concerns especially with regard to security and fundamental rights protection[VIII].

For all other AI systems, the EU Commission and Council propose keeping them unregulated and relying on industry assessment of self-compliance. This is highly problematic for such fast-developing technologies; lawmakers should think midterm and anticipate also upcoming needs to regulate other areas of AI systems.

In May 2023, the relevant committee in the European Parliament voted to include at least voluntary principles[IX] for governing all AI systems that should ensure that AI systems can:

A) be controlled by humans;
B) be robust in case of unintended problems and be resilient against attempts to allow unlawful use by malicious third parties;
C) protect privacy and make humans aware that they are communicating or interacting with an AI;
and
D) be developed and used in a sustainable and environmentally-friendly manner as well as in a way to benefit all human beings[18].

These principles are not binding and the draft AI Act still lacks serious rules to assess the environmental and climate impacts of AI systems[X]. Heavy lobbying from Big Tech is also influencing the EU rules to water them down[XI]. This draft regulation means for example that farmers and authorities won't get transparency about the algorithm used, who developed them, with which objectives and aiming for what?

PROBLEM: THE VALUE OF DATA LIES IN ITS USE AND RE-USE

Currently, a small number of Big Tech firms hold a large part of the world's data. In spite of the economic potential, data-sharing between companies has not taken off at significant scale. The Commission argues the main reasons are a lack of economic incentives, lack of trust between economic operators that the data will be used in line with contractual agreements, imbalances in negotiating power, and a lack of legal clarity on who can do what with the data.

The high degree of market power resulting from the 'data advantage' can enable large players to set the rules on the platform of Internet of Things devices and unilaterally impose conditions for access and use of data or, indeed, allow leveraging of such 'power advantage' when developing new services and expanding towards new markets.

DATA GOVERNANCE ACT

The aim of the Data Governance Act is to foster data sharing to increase the reuse of public data (like soil, weather and geospatial data), including agriculture data, and encourage the sharing of data for altruistic purposes[XII]. The Act came into force in June 2022[XIII,XIV,XV]. It sets up common European data spaces in strategic domains, such as health, environment, energy, agriculture, mobility, finance, and public administration.

The Act also sets out rules for data intermediaries to make sure data is shared in a transparent way in which companies or individuals keep control over their data. Data intermediaries will function as neutral third parties that connect individuals and companies on one side with data users on the other and cannot monetise the data. The EU Commission presents this act as an European alternative model for big tech platforms.
At this stage, we can't assess if the act will contribute to reverse the development of corporate control platforms in the farming sector and support independent data sharing among peasants.

[18] The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

DATA ACT
(AND AGRICULTURE DATA ACT)

The Data Act concerns the actual rights on the access to and use of data. The Act[XVI] sets rules for fairer access to data, particularly data produced within the Internet of Things[19], from connected devices and various data held by companies. **The idea is that users should have the right to access and share the data they contribute to.**

Importantly for the farming sector, it also makes it easier to switch between data processing services. The imbalance in bargaining power is explicitly mentioned in the act[20].

The Data Act aims to facilitate access to and the use of data by consumers and businesses as well as put in place safeguards against unlawful data transfer without notification by cloud service providers. The Act also proposes that the user should be informed about the data being produced by a connected device and how they can access it, in a clear and comprehensive way.

After intense Big Tech lobbying, the Council weakened some elements of the legislation and limited the rights of users and therefore also farmers, to get their data back. The reasons given were trade secrets and intellectual property rights[XVII].

[19] The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.
[20] Recital 14 of the data act explicitly mentions sectors with unbalanced bargaining power and underlined that especially in farming, collection of data from a farm shall not be used to derive insights about the economic situation of the user. eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022PC0068&from=EN

QUESTIONS FOR CRITICAL REFLECTION

- How can regulation help prevent monopolies of digital giants in agriculture?

- Will peasant farmers and other food producers get transparency on how algorithms are set up? Which data sets are they based on and who is accountable for them? For example, to enable their use to reduce pesticide use?

- What does the lack of rules for the farming sector means in practice for data sharing and access to data?

- What could be the uses of massive data collection from European pastoralists, peasant farmers and other food producers, for example how collected data are used for control schemes in the context of the Common Agricultural Policy?

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[I] https://cropforlife.com/ai-in-agriculture-toward-a-sustainable-farming-future/
and https://blogs.microsoft.com/eupolicy/2023/03/29/ai-sustainable-farming-future-agriculture-green-deal/
[II] https://edri.org/our-work/?topic=artificial-intelligence, EDRi, 2021. https://edri.org/our-work/civil-society-calls-on-the-eu-to-put-fundamental-rights-first-in-the-ai-act/
and here https://edri.org/what-we-do/policy/; BEUC. https://www.beuc.eu/general/artificial-intelligence?page=1#publications; BEUC, 2021. https://www.beuc.eu/publications/beuc-x-2021-120_eu_principles_for_a_fair_safe_and_sustainable_digital_society.pdf; BEUC, 2022. https://www.beuc.eu/sites/default/files/publications/beuc-x-2022-039_protecting_consumers_from_the_risks_of_ai_-_a_consumer_checklist.pdf
[III] https://digital-strategy.ec.europa.eu/en/policies/digital-services-act-package;
https://ec.europa.eu/commission/presscorner/detail/en/ip_23_2413
[IV] www.safe.ai/statement-on-ai-risk
[V] https://www.reuters.com/technology/eu-tech-chief-calls-voluntary-ai-code-conduct-within-months-2023-05-31/
[VI] https://data.consilium.europa.eu/doc/document/ST-7413-2023-INIT/en/pdf
[VII] https://data.consilium.europa.eu/doc/document/ST-14954-2022-INIT/en/pdf;
https://emeeting.europarl.europa.eu/emeeting/committee/en/agenda/202305/LIBE
[VIII] https://edri.org/our-work/civil-society-calls-on-the-eu-to-put-fundamental-rights-first-in-the-ai-act/
[IX] https://www.beuc.eu/sites/default/files/publications/beuc-x-2022-039_protecting_consumers_from_the_risks_of_ai_-_a_consumer_checklist.pdf
[X] https://digitalisation-for-sustainability.com/wp-content/uploads/D4S_DigitalReset_Web.pdf
[XI] https://corporateeurope.org/en/2023/02/lobbying-ghost-machine
[XII] https://digital-strategy.ec.europa.eu/en/policies/data-governance-act
[XIII] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R0868&from=EN
[XIV] https://digital-strategy.ec.europa.eu/en/policies/data-governance-act-explained
[XV] https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690674/EPRS_BRI(2021)690674_EN.pdf
[XVI] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022PC0068&from=EN
[XVII] See point 3 page 3 https://data.consilium.europa.eu/doc/document/ST-7413-2023-INIT/en/pdf