AI Agroecological Intelligence

Establishing criteria for agroecologically appropriate technology

A BIGGER CONVERSATION

Agroecological Intelligence
Establishing Criteria for Agroecological Appropriate Technology (Executive Summary)
Text Ayms Mason, Pat Thomas and Lawrence Woodward
Additional analysis Jane Ricketts Hein
© A Bigger Conversation, May 2024

WHAT DO AGROECOLOGICAL FARMERS THINK ABOUT AGRITECH?

Farmers have been innovating since before it was called innovation. For much of that time, innovation in agricultural systems and practices has been built around – and worked within – ecosystem boundaries. As the pace of technological development has sped up, the goals of innovation have become increasingly more controlling, disruptive and disconnected from these boundaries.

Debates about the place of technology in agriculture and the wider food system are not new. Farmers, scientists, scholars, civil society organisations, businesses and policymakers have been debating the applications and implications of technology use at the intersection of agriculture, environment and food for decades.

What has changed is the pace of technological development and the force of the 'hard sell'. The emergence of highly advanced agricultural technologies, or agritech, as a key driver of new markets has ramped up the level of conflict between the need for system change and the entrenched desire to maintain business more or less as usual for as long as possible.

What is more, lacking a real vision for the future of farming in the UK, the government's overarching, technology-focussed narrative of the Fourth Industrial Revolution, characterised by "a fusion of technologies – such as artificial intelligence, gene editing and advanced robotics – that is blurring the lines between the physical, digital and biological worlds" has become deeply influential across all aspects of policy, including farming and food.

Post-Brexit this narrative has promised that technical fixes can result in increased abundance, efficiency and sustainability and reduce the number of foreign workers needed in fields.

As a result, the growth of technology-focussed markets – research, innovation, intellectual property and capital generation – has been given priority status over the myriad needs of farming and food. Initiatives which purport to improve agricultural, horticultural and forestry productivity in a 'sustainable' way, are often thinly veiled initiatives to support technology development.

This new agritech landscape is changing rapidly and while the options may seem varied, it is, at heart, a combination of digital technology and AI (artificial intelligence) generated analysis and/or advice. It encompasses a range of machines and technologies including sensors, robots, drones and other devices to monitor crops, livestock, soil, ground temperature, water levels and weather.

These devices collect and transmit real-time data through mobile applications, network-linking edge devices or alternative channels. Most modern machinery is also connected to the internet and often remotely controlled.

These approaches, however, aim for limited change and accept – even reinforce – the existing social, economic, structural and cultural system of food and farming, built on an establishment and agribusiness view that the status quo, with its focus on increasing production and creating new global markets, can carry on indefinitely so long as it can be 'greened' through technology.

"I'm concerned that an awful lot of the tech that's being pushed towards us is essentially a product looking for a market and that it's of more benefit to the manufacturers and the retailers than it is to agriculture"
Pasture for Life Workshop

It is uncertain whether farmers themselves accept the Agriculture 4.0 narrative and agroecological farmers may be particularly vulnerable to its more damaging aspects.

Agroecology – rooted in cyclical systems, functional biodiversity, resilience and ecological efficiency; and built on values of justice, equity, knowledge sharing and community-based governance – has traditionally been seen as low-tech with no or limited external inputs. As such, the values on which it is based are distant and disconnected from those of Agriculture 4.0.

ABOUT THIS PROJECT

A wider discussion of agritech's place in the future of agroecology (especially one led by farmers) has been slow to get started, but is now emerging.

The Agroecological Intelligence project brought together agroecological farmers and growers in the UK for a series of in-depth discussions about the role of technology in their farming systems and the main factors at play when making their decisions.

It evolved out of an increasing awareness of the tensions, conflicts and inequities between the competing versions of the future of farming. These tensions are apparent across the board, but are particularly stark when it comes to agritech choices in agroecological systems.

"Those who are heavily promoting technology take the view that it's an answer to everything. They completely fail to see that without a properly functioning environment, everything else falls apart — and we are getting close to the point where that actually starts happening. More technology for its own sake is not the answer. There is technology that can be of use, but it's very much about why you're using it, what you're using it for, and the context in which you operate it — that's what we need to focus on from here on"
Pasture for Life Workshop

The project is UK-focussed, a relative rarity in agroecological discourse, and its definition of 'agroecological' was broad, encompassing farmers and growers from 'strands' such as the Biodynamic

Association, CSA Network, Food, Farming and Countryside Commission, Landworkers' Alliance, Nature Friendly Farmers Network, Organic Farmers & Growers, Organic Growers Alliance, Pasture for Life, Permaculture Network and Soil Association.

Initially we wanted to see if it was possible to develop a criteria for technology choice and use in agroecological farming

We also began with a couple of assumptions. One was that choices around technology are not values-neutral. The other is that while the agroecological 'umbrella', made up of these different approaches, provides a narrative canopy made up of language and concepts – such as natural, holistic, food sovereignty, social justice, equity, health, small-scale, co-creation and indigenous knowledge – strict allegiance to these concepts likely varies between the different strands, which might make consensus over technology criteria, choices and implementation difficult.

We were, therefore, interested to see whether, given the diversity of approaches that sit under the agroecological umbrella, it was possible to produce criteria for technology choice that were acceptable to all. In particular, we were interested to see what nuances might arise in relation to these different identities and their approaches to technology choice.

We also sought to identify what trade-offs, if any, might need to be made for agroecology to accept certain new technologies and what structures and processes these require. Aligned to this, we wished to understand what UK agroecological farmers and growers wanted and needed from technology developers and from the government

We did not find definitive answers to all these things. Nor was it possible to answer with any certainty whether agritech was a transition pathway or a 'Trojan horse'. What we did find an eloquent antidote to the agritech hard sell based on deeply held values and an interest in technology that serves those values, but little to no interest in technology that does not.

Over the 18-month course of the project – which produced 55 hours of transcripts – the discussion grew much larger. The farmers and growers we spoke to emphasised the importance of a more critical and context-specific approach to

Key Takeaways

- Project participants were not inherently anti-technology nor anti-innovation. But they were suspicious of top-down, developer driven technology which they perceived as removed from their interests and challenges.

- They were critical of the narrative that technology is the primary way of addressing sustainability challenges. They felt this narrative distracted from the wider reforms needed for a more sustainable, fair and resilient food system.

- Many participants were already using 'new' technology – such as smartphone apps, virtual fencing and data analysis – effectively. Since one of the goals of agroecological farming is to lower inputs of all kinds, this translated into a questioning, 'techno-minimalist' attitude, towards more complex high technologies.

- There was a strong belief that improvement to existing technologies and lower tech alternatives that can be repaired, reused, shared and/or re-purposed was important and should be considered "innovative".

- Participants were divided on whether technology was "values neutral" – though most leaned toward believing it was not. For many it was important to understand embedded values in any technology and whether these aligned – or not – with agroecological values.

- Most thought that policies and investment in technology was not values-neutral and not aligned to the needs of farming communities in general and agroecological farmers in particular. There was a concern that think tanks, developers and entrepreneurs have a disproportionate influence in shaping notions of innovation with potentially adverse implications for land use, rural structures, environment, food quality, labour and employment and farming communities, as well as democratic governance and the quality of public benefits and services derived from agriculture.

- Most believed that agritech developers had a responsibility to embrace whole systems, consider the appropriateness and the consequences of their innovations – and that this should involve input from agroecological farmers and growers at the earliest possible opportunity, preferably at or before the development stage.

- Basic criteria to help guide agroecological practitioners in their assessment of agroecologically appropriate technologies emerged from our conversations. These included practical considerations – whether it is needed and its footprint; philosophical considerations – *e.g.* whether it supports diversity and farmer autonomy; and political considerations - who benefits and whether it was made collaboratively.

- While it's true that there are technologies that can enhance agroecology, it is equally true that there are technologies or applications of technologies that may be so far removed from agroecological principles that they should not be allowed within the system. The agroecological movement needs to take responsibility for establishing where those red lines and exceptions lie.

- Consideration of appropriate technology revealed a pressing need for a discussion about whether agroecology as a whole would benefit from a consistent set of standards – such as those that govern organic – or whether the principles which guide it, which are largely voluntary and variously applied, are enough, particularly in relation to the growth and scaling of the whole movement.

- The UK would substantially benefit from an independent, transdisciplinary knowledge hub for agroecologically appropriate technology, established and run in collaboration with the agroecology movement and sector and universities, institutions and other centres of agroecological excellence and expertise. It should have an ongoing mandate to understand and provide information about technology within robust, ethical and sustainable agroecological systems and to devise "best practice" protocols for the co-creative development, implementation and post-release monitoring on agroecological farms and communities.

- Agroecology's emphasis on whole systems, on an equitable balance between ecological, social and economic aspects of farming and the wider food system presents a challenge for policymakers and complicates policy formation. Nonetheless, allowing agroecological values to inform technological development is both innovative and transformative. Failure to recognise this narrows the range of innovations being considered at a time when we need more, rather than fewer, options

- The UK government's agritech innovation drive is an existential threat to agroecology and its underpinning values.

technological innovation, one that involved creating and evaluating technology based on its compatibility with agroecological principles and practices.

The question of criteria within a values-based system of farming opened up other exchanges about the nature of agroecology in the UK and how participants saw themselves in relation to the wider movement, and how this influenced their approaches to technology.

In considering their criteria for appropriate technology, they also questioned the potential impacts on environmental sustainability, social equity and food sovereignty. Some went further suggesting that the assumption that technology is values neutral can marginalise and devalue traditional and indigenous knowledge systems.

All of these things were explored via a series of virtual and in-person workshops with a core group of 48 farmers and growers around the UK drawn from the various strands. We also conducted three open workshops – at the Organic Growers Alliance Organic Matters Conference 2022, Oxford Real Farming Conference 2023 and the Wales Real Food and Farming Conference 2023.

These discussions and the opinions expressed by the participants during the workshops form the bedrock of this report and are the basis for the questions that underpin our proposed criteria for technology choices and our framework suggestions for policy and development.

They also feed into separate recommendations for the agroecological movement and sector, for government and for agritech developers.

This is, to our knowledge, the first project to take a deep dive look at UK agroecological farmers and their needs, values and priorities in relation to agricultural technologies.

"The benefits of technology should not be overestimated, and technology should not be relied upon to help reduce either the cost of food or climate emissions. It is a false solution to each and it is this sycophantic belief in technological solutions that has caused both these issues in the first place"

Community Supported Agriculture Workshop

WHAT THE AGROECOLOGICAL MOVEMENT SHOULD DO

The rapid growth of certain technologies in agriculture does have the potential to accelerate an agroecological transition. However, it also poses many risks to agroecology, not the least of which is reducing a whole system approach to an *à la carte* menu of technology choices.

The agroecological movements and associated sectors can and need to do a good deal for themselves. The hoped-for agricultural transition is not possible unless the agroecological movement visibly and collectively works to challenge and influence political, regulatory and commercial institutions' control over the trajectory of agritech development and deployment.

We suggest it is critical for the agroecological movement and sector to work together in an agreed formal structure to address these issues and create a transparent framework and protocols for identifying agroecologically appropriate technology.

This involves identifying red lines and trade-offs, as well as resolving disconnects and conflicts between the different strands. It might well require standards or agreed codes of practice to achieve this, which may be problematic for some strands. The practical, philosophical and political questions gleaned from the workshops and our decision-making guide for individual farmers and growers could serve as a starting point for this.

WHAT GOVERNMENT SHOULD DO

Ultimately, though, the context in which these exist and operate is largely set by outside forces. Thus we also suggest a range of actions that government needs to take, such as:

Coherent farming policy Produce a coherent plan and joined up policies for food, farming and land use that places agroecological systems on an equitable footing relative to conventional and high-tech farming.

Whole systems thinking Technological innovation in agriculture should be based on a "whole system" approach, building on – not destroying or bypassing – farm ecosystem management.

Funding with a purpose Funding for technology in agriculture should be primarily aimed at delivering public benefit. It should have a "farm to fork"

perspective with the aim of increasing domestic supply of healthy, ecologically produced food using short supply chains.

Better infrastructure and analysis Establish structures, protocols and a culture of transparency and review for technology development and implementation for all technologies – including agricultural technology.

A Centre of Excellence Establish an agroecologically appropriate technology knowledge hub similar to the transdisciplinary "centre without walls" model of the Danish International Centre for Research in Organic Food Systems (ICROFS), with an ongoing mandate for understanding and providing Information about technology within robust, ethical and sustainable agroecological systems and best practice protocols.

WHAT DEVELOPERS SHOULD DO
Through our workshop and analysis it became clear that very little agritech has been developed with agroecological principles or applications in mind. Thus, through our workshops we arrived at five key areas developers need to focus on.

Co-creation Farmers are not just 'end users' who can provide 'customer feedback'. Involving farmers at the earliest possible point in development is a 'bottom-up' process, essential for creating solutions that are responsive, relevant and impactful.

Think progress, not innovation The "fail fast, fail often" credo of innovation is risky for agriculture Focussing on progress can foster continuous learning and improvement, ensuring that advancements are practical, accessible and scalable for farmers across diverse contexts.

Embrace complexity Developers should consider the broader ethical and sustainability implications of their innovations – food security, environmental conservation, social equity, and economic development – to design more effective and sustainable solutions that address the nuanced challenges and opportunities inherent in agricultural production.

Who shoulders the risk? Some farmers are willing to offer access to their land, facilities or sites to test out new innovations in a "real world" setting. Doing so can yield valuable insights and foster collaboration, but it also poses certain risks for the farmer and raises tricky 'co-creation' questions such as: Post-development are farmers simply expected to switch roles into paying customers – and at what price level?

Follow through and follow up While it is true that all the farmers and growers we spoke to used mobile phones – for example, to support existing tech and communication – when technology goes wrong, an app or a chatbot is not a substitute for in-person, boots on the ground customer support.

MOVING FORWARD
In the context of agricultural transition and the scaling of agroecology, how we innovate, how we develop, invest in and regulate agricultural technologies clearly needs to change.

Much is said and written by policy-makers, politicians, academics and business about the need to make radical change in the way we interact with natural resources and how we use and abuse them, as well as how we have to change our patterns of behaviour and consumption

Land management, food production and food systems – agriculture – is also recognised as pivotal. Yet it is questionable how much is changing, or even whether we have identified a pathway to real change.

Joined up policies that take a whole systems approach to food, farming and land are essential. But these cannot be developed by a privileged few. As the environmental, food system and economic challenges we face become more layered, more diverse and potentially more divisive, it requires more voices at the table taking an active role in developing policy, in planning, in implementation and in oversight.