



Beyond GM Briefing | July 2026

Defra's Farming Roadmap 2050: Which Future is Being Built?

At face value, Defra's Farming Roadmap 2050 presents itself as a long-term vision for a profitable, productive, sustainable and resilient farming sector.

It adopts much of the language that farmers, environmental organisations and agroecological practitioners have spent decades advocating: healthier soils, lower-input farming, biodiversity, water stewardship, resilience and nature-friendly farming. It also recognises the need for farming to deliver food security while restoring nature, reducing emissions and supporting viable farm businesses.

These are welcome and important sentiments reflecting a growing consensus about the direction agriculture must take.

But the [Farming Roadmap](#) has many layers.

Despite the scale of the rhetoric, it reads less like a transformation plan than a consolidation of existing policy streams. It may borrow the comforting language of regeneration and resilience but the underlying narrative about agricultural change – and the clearest strategic role, funding and institutional momentum – is given over to technological innovation.

For the purposes of the report, “nature-friendly” includes lower-input systems, regenerative and organic farming, integrated pest management, soil-health measures, water stewardship and some “agroecological practices”; but notably it does not engage

with agroecology – or indeed, organic – as whole-system approaches to farming, ecology, knowledge, markets and power.

In this broad context, nature-friendly farming is recognised for the public goods it can deliver.

In reality, the concept of farming that is “nature-friendly” is used as a loosely defined political bridge allowing Defra to maintain that the drive for higher productivity and efficiency is not incompatible with environmental recovery.

Advanced genetics, digital technologies, automation and precision systems are presented as the machinery of transformation.

This ambition matters because it shapes where public money goes, which forms of expertise are valued, which businesses are built, and which farmers are treated as innovators rather than recipients of innovation designed elsewhere.

The Roadmap, therefore, risks reproducing the very problem it claims to solve: a farming system in which ecological transition is praised in principle, but the dominant investment pathway continues to favour technological fixes, commercialisation and externalised expertise.

The central question is this: what model of agricultural innovation is government really building?

Nature-friendly farming and technology are not playing the same role

Defra's Farming Roadmap incorporates both technological innovation and nature-friendly farming into its vision for the future of agriculture. However, they occupy fundamentally different positions within that vision.

Nature-friendly farming is primarily associated with environmental benefits: healthier soils, biodiversity recovery, cleaner water and lower-input systems. Technological innovation, by contrast, is presented as a principal driver of agricultural change.

Future productivity and resilience are linked to investment in technology, research and innovation and, the report argues, advances in artificial intelligence, automation, robotics, precision technologies and advanced genetics are *“set to reshape how farms operate, decisions are made and risks are managed”*.

This difference in emphasis is subtle but significant. Farming in a nature-friendly way is framed largely as a destination, while technology is framed as both the route and the vehicle that will get us there.

Investment reveals priorities

This distinction becomes clearer when the Roadmap's investment commitments are examined.

Technology is supported through a series of named programmes, dedicated funding streams and innovation initiatives.

These are presented as long-term investments in research capability, technology development, commercialisation and adoption. It repeatedly identifies specific funds, institutions and financial commitments. For example, it commits to:

“investing up to £15 million until 2029 through the Genetic Improvement Networks (GINs), improving the productivity, resilience, sustainability and nutritional quality of key UK crops, including harnessing innovation enabled by precision breeding.”

Similar commitments to technology adoption, digital infrastructure, automation and innovation funding are made throughout.

By contrast, regenerative, agroecological and organic approaches are generally discussed within the context of Environmental Land Management schemes, land management practices and, increasingly, private finance. These approaches are not accompanied by dedicated research programmes or specific budgets of the kind associated with emerging technologies. For example, the Roadmap refers to:

“targeting funding and research towards innovative projects that reduce emissions from livestock, including selective breeding, methane-suppressing feed products and novel grazing regimes, enabling productivity through improved nutrient management and support for integrated pest management and agroecological approaches.”

The Roadmap identifies at least £225 million in named technology and innovation commitments, including £200 million for the Farming Innovation Programme, up to £15 million for Genetic Improvement Networks including precision breeding, and up to £10 million for AI-based environmental monitoring. This sits within a wider agri-tech and biosecurity infrastructure that includes private investment, automation, robotics, data systems and major national capability-building.

In contrast, while it does contain substantial funding for environmental land management and some research that may support nature-friendly practices, it does not make equivalent, specific or detailed funding commitments to the development of organic, agroecological or nature-friendly farming systems as innovation pathways in their own right.

The distinction is evident not only in levels of investment, but in the language of the Roadmap itself. Technology is discussed in terms of research, innovation, capability and growth. Agroecological approaches are discussed in terms of management practices, environmental delivery and support.

If nature-friendly approaches are genuinely expected to play a central role in the future of farming, they require the same strategic commitment to research, development, demonstration, knowledge exchange – and crucially investment – that is currently directed towards technological innovation.

Technology adoption without technology governance

Defra’s Roadmap should also be read as part of the wider agenda to develop what is being called the “[engineering biology](#)” sector. Although understated in the report, genetic engineering/precision breeding is no longer treated as a discrete policy question, but as one component of a broader innovation ecosystem built around advanced genetics, data systems, automation, artificial intelligence and commercialisation.

As part of the [UK’s Modern Industrial Strategy](#), with broad applications to boost productivity, support net zero and drive growth, the government has [committed £644m](#) to the development and deployment of engineering biology across several sectors. In agriculture, the Genetic Technology (Precision Breeding) Act 2023 is widely viewed as the ‘[door-opener](#)’ for the future scaling of gene-edited crops, engineered biological pesticides, alternative proteins and the [infrastructure](#) needed to scale them, although [public acceptance remains contested](#).

This is a significant shift that changes the nature of the debate. The question is no longer simply whether gene editing or precision breeding should be permitted. The Roadmap largely assumes that question has been settled. The focus instead becomes

how rapidly biological innovation can be developed, deployed and commercialised.

Most strikingly, the Roadmap treats the question of technological adoption as largely settled while leaving the governance questions unresolved. Traceability, labelling, coexistence, contamination, organic protection, patents, liability, consumer choice and democratic oversight are largely absent.

In effect, the Roadmap accelerates the technology conversation while sidestepping the accountability conversation.

Organic is the test case

Organic farming is the clearest test of whether Defra’s Roadmap is serious about systems change.

Organic is not simply another nature-friendly practice. It is the UK’s most mature, legally defined model of standards-based environmental agriculture, with inspection, certification, market recognition and clear restrictions on the use of genetically engineered organisms. No equivalent legal framework exists for regenerative agriculture, climate-smart agriculture or other nature-friendly farming approaches.

Yet while the Roadmap promises an Organic Action Plan, it attaches no dedicated budget, no major research programme, no organic breeding strategy and no comparable innovation infrastructure.

If government is serious about organic as part of the farming future, the Roadmap must commit to more than encouraging words. It needs a budget, targets, research support, public procurement commitments, market development, supply-chain protection and clear safeguards against contamination from precision-bred and other genetically engineered organisms. Without these, the Organic Action Plan risks becoming an

perpetually future prospect rather than an active strategy.

Planning reform: the hidden growth agenda

The roadmap's planning reform section – ignored by many – also deserves closer scrutiny.

It presents planning reform as a way to help farmers invest, diversify and develop infrastructure that supports domestic food production, animal welfare and the environment. The examples given – reservoirs, greenhouses, polytunnels and farm shops – sound broadly compatible with resilience and nature-friendly production.

However, the wider policy context suggests a more troubling possibility. Earlier this year [Freedom of Information documents](#) obtained by the *Guardian* showed that proposed changes to the National Planning Policy Framework (NPPF) may also make it easier to approve new or expanded intensive livestock units by giving greater weight to domestic food production, reducing the scope for local objection and making environmental refusal more difficult.

The proposed infrastructure changes – the result of intensive industry lobbying – sit uneasily with the roadmap's repeated emphasis on lower-input, nature-friendly and resilient farming systems.

The infrastructure question is not limited to livestock. In principle, horticulture, supported by greenhouses and polytunnels can support domestic production and climate resilience.

But large-scale greenhouse production can also represent a highly capitalised, energy- and water-intensive model of farming, dependent on automation, proprietary varieties, controlled environments and concentrated supply chains.

A farming roadmap cannot credibly present itself as nature-friendly while also making it easier to expand the infrastructure for industrial practices – whether large-scale protected cropping for year-round tomatoes and strawberries or expanded intensive poultry units – without robust scrutiny of pollution, animal welfare, energy and water use, local environmental impacts, feed dependency, disease risk and cumulative regional impacts.

This is another example of the roadmap's central ambiguity: environmental language is foregrounded, while the underlying growth agenda remains insufficiently examined.

This ambiguity raises the same basic questions: what kind of growth is being enabled, and who benefits from it?

How should innovation be evaluated?

Defra's Farming Roadmap promotes a diversity of approaches to agricultural innovation, from precision technologies and advanced genetics to lower-input systems, integrated pest management and environmental practices. What is less developed is a framework for evaluating these different pathways.

Should public investment prioritise technologies that promise productivity gains, or farming systems that seek to reduce dependence on external inputs? How should competing claims about resilience, sustainability and long-term value be assessed? What criteria should be used to compare different approaches?

These questions become increasingly urgent as public investment in agricultural innovation grows. Yet the Roadmap says relatively little about how different innovation pathways are weighed against one another, how investment decisions are made, or what constitutes success beyond broad ambitions for productivity, resilience and sustainability.

Innovation in agriculture is not confined to new technologies. It also emerges through new ways of understanding ecological processes, managing farming systems, generating knowledge and organising relationships between farmers, researchers and the wider food system.

A broader understanding of innovation also broadens the question of who innovates. Farmers are not simply passive adopters of technologies developed elsewhere, but [active innovators](#) whose knowledge, experimentation and adaptation contribute to agricultural progress.

The real choice embedded in the Roadmap

The problem is not that nature-friendly, organic or agroecological approaches are absent from the Roadmap. They are present throughout.

The problem is the secondary role they are given.

Technology is funded as innovation. Nature-friendly farming is funded as environmental delivery. Advanced genetics, automation, digital systems and engineering biology are treated as engines of future growth, while agroecological and organic systems are treated as beneficial practices to be supported around the edges. In the government vision, the nature-friendly language risks becoming the reputational cover for a technology-led growth agenda.

That is not a neutral balance of approaches. It is a political and investment choice about what kind of farming future is being built.

There is still value in engagement with Defra. But engagement should not require pretending that this Roadmap is more balanced – or committed to ‘nature-friendly’ farming – than it is.

If the trajectory is towards a farming future organised around engineering biology, automation, data systems, proprietary genetics and technology adoption, then this is no longer simply a negotiation over policy detail. It is a contest over the future of farming itself.

That contest should be named clearly. The question is whether English agriculture will be shaped around ecological resilience, farmer autonomy, public accountability and legally protected standards, or whether those values will be accommodated only at the margins of a technology-led growth agenda.

A genuine Farming Roadmap would not simply add nature-friendly language to an innovation strategy built elsewhere. It would ask which futures reduce dependency, restore ecological function, protect farmer autonomy, strengthen local and regional food systems, and serve the public interest.

On that test, Defra’s Roadmap is not yet a transition plan. It is a holding pattern with better language.

Beyond GM, July 2026