A roadmap for UK pulses: Releasing pulses' potential for nutrition, nature and net-zero

Jing Zhang, Monika Zurek, Jennifer Lucey

UNIVERSITY OF OXFORD
eci
NATURE-BASED SOLUTIONS INITIATIVE
Department of BIOLOGY
SMITH SCHOOL OF ENTERPRISE & ENVIRONMENT
OXFORD MARTIN SCHOOL

Why this roadmap?

Over the past couple of years, a growing number of initiatives have explored the role of pulses in supporting healthier diets, more resilient farming systems and wider environmental goals in the UK. Through the UKRI-funded BeanMeals project and subsequent stakeholder workshops, a common challenge has been repeatedly highlighted: while there is broad agreement on the potential value of pulses, there is less clarity on the practical and coordinated actions needed to support their expansion across the food system.

This roadmap builds on previous research, stakeholder interviews and multi-stakeholder workshops to identify shared priorities and pathways for action. Its aim is not to prescribe a single solution, but to explore how different parts of the pulse system may need to evolve together over time.

The UK pulse system: ambitions, realities and coordination challenges

> **Terminology: Throughout this report, we use the term pulses to refer to the dried edible seeds of legume crops, including peas, beans, lentils and chickpeas. The report therefore focuses on the wider UK pulse system, while recognising that some challenges and opportunities may differ between individual pulse crops.**

There is growing global interest in the potential role of pulses as nitrogen-fixing crops and sources of plant protein and fibre in supporting more sustainable diets, more diverse and agroecologically aligned farming systems, and wider goals around nutrition, nature and net-zero. In the UK, this momentum is increasingly reflected across policy, civil society and industry initiatives. Recent developments include growing attention to pulses within the food system and net-zero discussions, campaigns led by organisations such as The Food Foundation and Beans is How to double beans consumption by 2028,[1] and wider interest from researchers, procurement actors and retailers in the role pulses could play within the UK food system. Together, these initiatives point towards an ambition in which UK-grown pulses play a greater role on UK people's plates.

Yet despite growing attention, both production and consumption of pulses in the UK remain relatively limited.

- Around 800,000 tonnes of peas and field beans are produced annually in the UK. Animal feed remains the dominant outlet for domestically grown pulses (e.g. 92% of UK dry pea production in 2023 and 60% in 2024).[2]

1 The Food Foundation. Bang in some beans. n.d.

2 Defra, Department of Agriculture, Environment and Rural Affairs (Northern Ireland), Welsh Government, Knowledge and Analytical Services, The Scottish Government, Rural and Environment Science and Analytical Services, 2025. Agriculture in the United Kingdom 2024 Table 7.7a and 7.7b Protein crops - field peas and field beans, 2022 to 2024. Crown Copyright

- Pulses occupy only a modest share of UK arable land, estimated at around 5–6%,[3] despite wider ambitions around crop diversification and more resilient rotations.
- Approximately 80% of dry beans consumed in the UK are imported from North America.[4]
- Average consumption remains below 15g cooked pulses per person per day across age groups,[5] less than one-fifth of the 80g portion that counts towards the UK's 5 A Day recommendation in Eat well guide.[6]

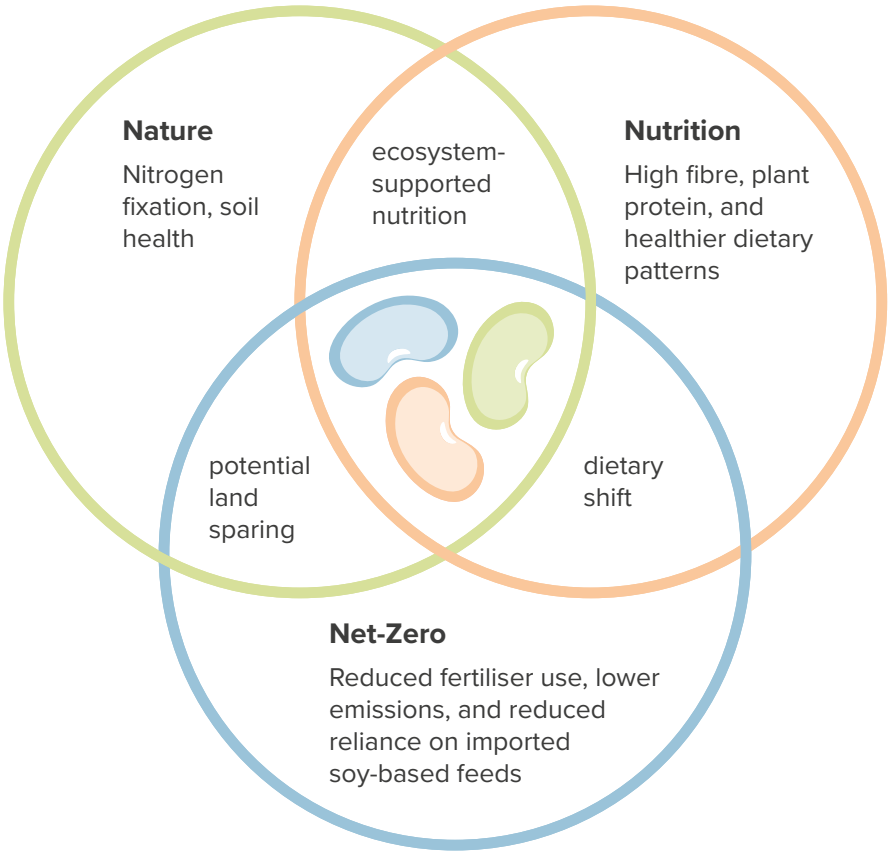


Figure 1: Triple win for pulses

While pulses are often associated with benefits for soil health, biodiversity, lower-emission diets and reduced agricultural inputs, these outcomes don't come automatically. The contribution of pulse expansion across nutrition, nature and net-zero goals depends heavily on how pulses are produced, processed, distributed and consumed within wider food and farming systems.

For example, nature-related benefits may be shaped by factors such as pesticide use, crop rotations and integration into more diverse agroecological systems. Likewise, net-zero and nutritional benefits depend not only on increasing pulse production, but also on how pulses are incorporated into diets, what products and pathways are prioritised, and whether pulse expansion contributes to wider shifts across food systems and land use.

3 Calculated with data from UKCEH Land Cover® plus: Crops

4 Calculated with data from UK trade flow under product code 071333-Kidney beans, including white pea beans (*Phaseolus vulgaris*), World Integrated Trade Solution, World Bank.

5 Calculated with data from the National Diet and Nutrition Survey (NDNS).

6 NHS, n.d. UK eat well guide.

System challenges across the UK pulse value chain

Bridging the gap between ambitions for pulses and current system realities is not simply a question of producing more pulses domestically. It also requires system alignment in which production, processing infrastructure, supply chains, procurement and everyday consumption evolve together over time. For this reason, we adopt a food-systems perspective across the evidence synthesis and stakeholder discussions. A recurring pattern emerges: different parts of the system face different forms of uncertainty, risk and constraint, and many of the conditions needed to support this alignment remain unevenly developed.

Production

Pulses are widely recognised for their agronomic and environmental benefits within farming systems, particularly through nitrogen fixation, reduced fertiliser requirements, improved soil health and more diverse crop rotations.[7] **However, growers continue to face low or uncertain returns, yield variability, pest and disease pressures, and competition from established export markets**. While interest in expanding pulse production is growing in the UK, decisions at farm level remain strongly shaped by risk, crop rotation fit and the availability of reliable market outlets.

Processing

Limited UK processing and infrastructure capacity remains one of the clearest bottlenecks across the pulse system. **Cleaning, splitting, milling, storage and manufacturing capacity for pulse-based food products remain uneven and fragmented, particularly for domestically grown crops**. Stakeholders repeatedly identified a "missing middle"[8] between production and downstream markets, where uncertainty around investment, viable business models and scale continues to constrain system development. Existing international supply chains often benefit from greater standardisation and established infrastructure, making it difficult for UK-grown pulses to compete in mainstream markets.

Procurement

Public procurement is widely recognised as a potentially important lever for scaling pulse consumption, particularly in schools, hospitals and other institutional settings. **However, procurement systems currently rely heavily on standardised, low-risk formats such as canned beans and established supply chains. Fragmented purchasing practices, limited coordination and tight budget constraints often weaken the visibility of demand signals upstream**.[9] As a result, procurement ambitions do not always translate into the confidence needed for growers, processors or manufacturers to invest in expanding UK pulse production and supply chains.

7 Horril, M., Maguire, R. & Ingram, J. 2024 The contribution of pulses to net zero in the UK. *Environmental Research*, 1, 022001. doi: 10.1088/2976-601X/ad4be9

8 Ingram, John, et al. Fork to farm: reverse engineering a food system. *Philosophical Transactions of the Royal Society B: Biological Sciences,* 380.1935 (2025). doi: 10.1098/rstb.2024.0158

9 Michaels, L. & Barling, D. 2025. School meal nutrition and procurement policies in England: governance variability and innovation in implementation settings. *Frontiers in Sustainable Food Systems,* 9: 1643778. doi: 10.3389/fsufs.2025.1643778

Retail & food services

Retailers are increasingly engaging with plant-rich diets, sustainability commitments and pulse-based product innovation. However, retail decisions remain heavily shaped by commercial risk, consumer familiarity, price competition and shelf-space pressures. **Much of the current retail market is dominated either by canned beans with imported ingredients or highly processed products, such as meat alternatives made with pea protein, in which pulses appear as ingredients rather than visible whole foods**. While UK-grown pulses may align with retailer ambitions around sustainability and provenance, these attributes do not consistently translate into stable market demand or price premiums.

Consumption

Pulses are used within the UK diet, but primarily through a relatively narrow range of products and uses. Beyond established formats such as peas or baked beans, pulses are not yet widely embedded within everyday meal routines. **The need for convenience foods, limited confidence about preparing pulses, narrow product repertoires and uneven familiarity with different pulse types continue to shape consumption patterns**.[10] Although health and sustainability narratives around pulses are increasingly visible, these do not automatically translate into broader or more sustained dietary change.

Taken together, the challenge facing UK-grown pulses is not a lack of interest, evidence or isolated initiatives. Rather, it is the difficulty of coordinating change across production, infrastructure, markets and consumption over time.

Some parts of the pulses system are already densely populated with activity, innovation and policy attention, particularly around production, breeding and consumer-facing initiatives, while others – **most notably processing and infrastructure – remain weakly connected or underdeveloped**. In particular, the relationship between upstream production decisions and downstream demand remains uncertain, creating the need to think systemic forms of innovation that span production, processing, markets and consumption. **Stakeholders repeatedly highlighted questions around sequencing, investment risk and responsibility: who moves first, under what conditions, and with what degree of confidence that other parts of the system will follow**.

Key questions shaping the future of UK pulses

- What conditions make pulse production a viable option for growers and supply-chain actors?
- How can investment in UK pulse processing and infrastructure become commercially viable?
- What kinds of procurement and retail demand are capable of supporting domestic pulse supply chains?
- How do different pulse pathways and product formats shape opportunities for scaling?
- What would enable pulses to become part of everyday diets beyond a narrow range of familiar products?

10 Michaels, L. and Dickinson, A. 2025. Beanmeals: Increasing bean consumption in UK households by supporting their transition from bean novice to expert. Preprint.

Scaling up UK pulses by 2035: A Roadmap

To explore what a more developed UK pulse system might look like in practice, stakeholders from across farming, processing, procurement, retail, civil society and research were invited to develop a shared vision for 2035. The vision below reflects areas of broad convergence that emerged through this process and provided the starting point for the roadmap.

Vision: A more aligned UK pulse system by 2035, characterised by stronger connections between production, infrastructure, markets and consumption, enabling pulses to play a greater role across farming systems, food pathways and everyday diets.

Farm	Value chain & enabling conditions	Fork
• Pulses integrated within more diverse and agroecologically aligned farming systems • More viable market opportunities and reliable outlets for growers • Stronger breeding, agronomic knowledge and advisory support • Greater UK-grown pulse capacity across food, feed and ingredient pathways	• Better coordination across production, processing, procurement and retail • Expanded domestic processing, aggregation and infrastructure capacity • Stronger visibility of demand, standards and supply-chain information • Improved physical and financial access to pulses across the food system	• Pulses embedded more widely within everyday diets • Greater diversity of pulse products and formats • More convenient and culturally relevant pulse-based foods • Wider familiarity, accessibility and culinary confidence

From vision to roadmap

Building on the vision, the roadmap co-developed with stakeholders focuses on the practical and systemic conditions needed to support the UK pulse system over time with particular attention to the challenges of implementation across different parts of the UK pulse system.

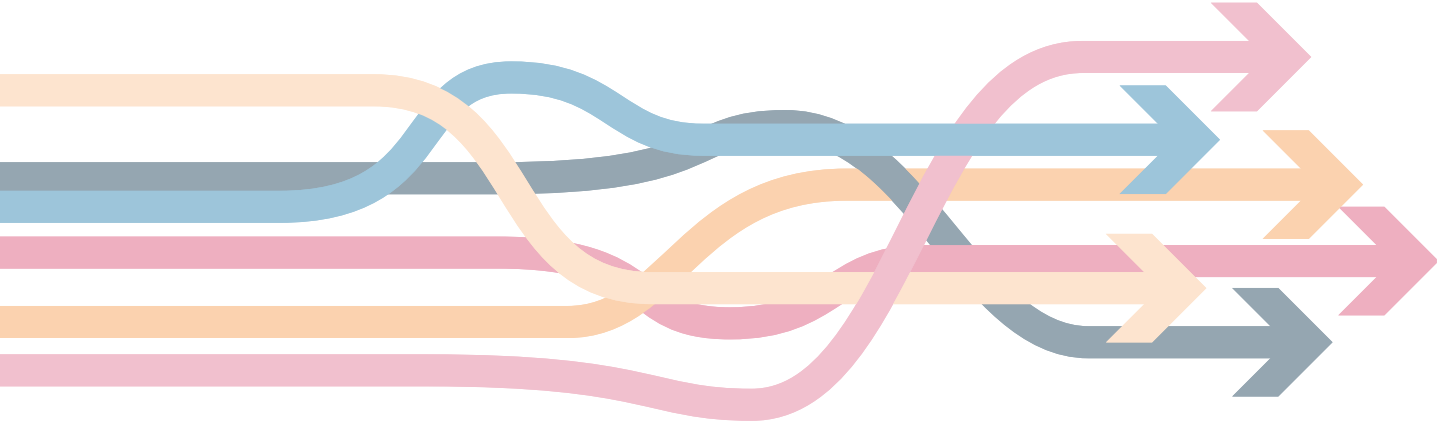
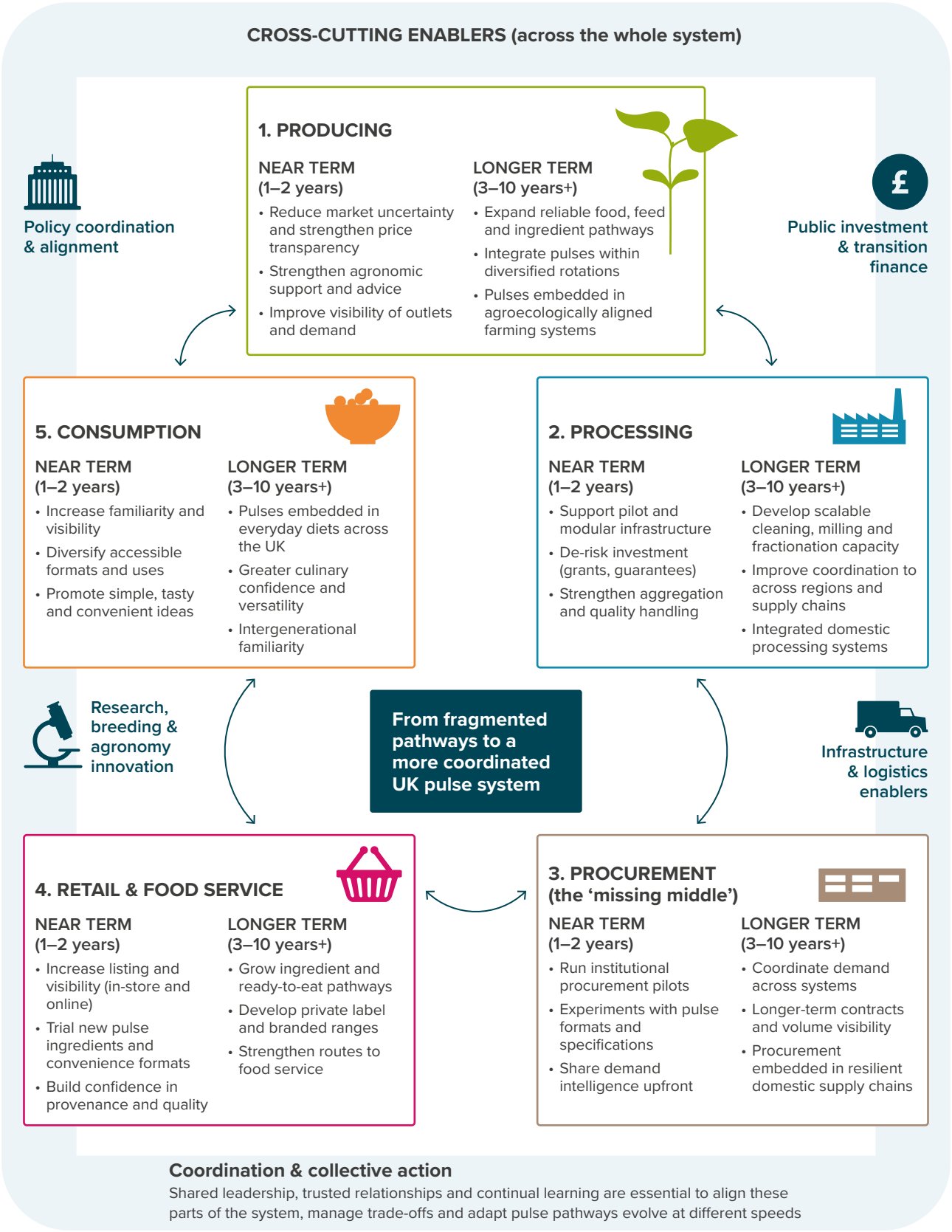


Figure 2: A roadmap for UK pulses

Different parts of the pulse system must strengthen together over time to unlock pulses' potential for nutrition, nature and net-zero.



Discussions throughout this roadmap highlighted that pulses are unlikely to scale through a single route. Rather, different pathways, including feed, ingredient and food uses, may create different opportunities, face different constraints, and contribute differently across nutrition, nature and net-zero goals.

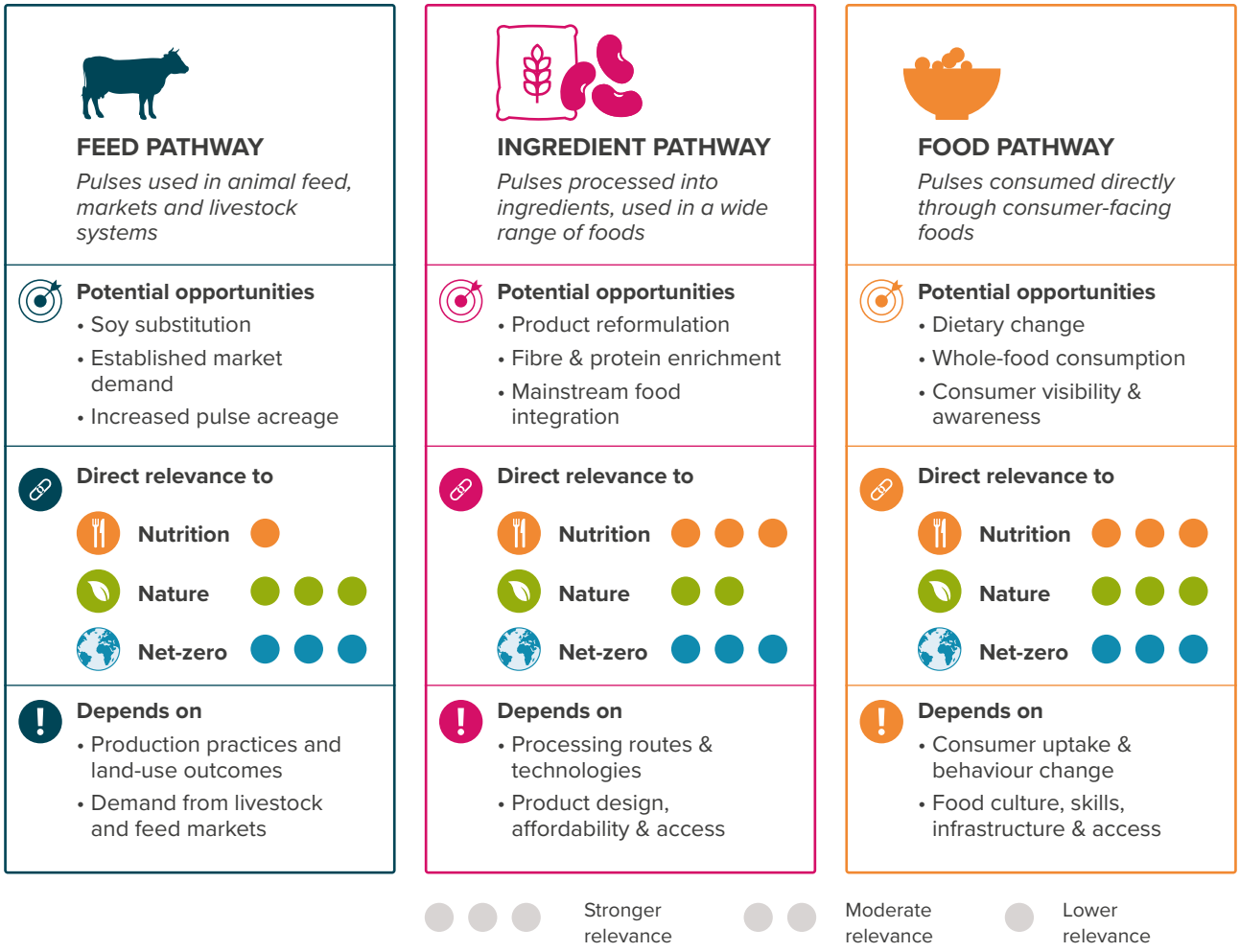


Figure 3: Different pathways, different opportunities

Different pulse pathways may contribute to nutrition, nature and net-zero goals through different routes, but outcomes depend on wider system conditions.

The relevance of different pathways to Nutrition, Nature and Net-zero goals is indicative rather than deterministic and depend on production practices, processing routes, sourcing decisions and wider food system change.

Different pathways connect to nutrition, nature and net-zero goals through different mechanisms. Rather than choosing one pathway over another, stakeholders emphasised the importance of understanding how different pathways can coexist and evolve within a more coordinated pulse system. This has important implications for the design of policies, investments and interventions intended to support pulse expansion in the UK.

Priorities for enabling a more coordinated UK pulse system

Building on the roadmap, stakeholders identified several areas where targeted action could help accelerate progress across multiple pulse pathways and strengthen coordination across the wider system.

1. Create stronger and more visible demand signals for UK pulses

Stronger and more coordinated demand signals are needed to support investment across the wider pulse system, particularly for domestic food and ingredient pathways.

Relevant actors

Public procurement bodies • Local authorities • Schools and universities • Retailers • Manufacturers • Food-service providers

Near-term opportunities

- Expand institutional procurement pilots using pulse-based foods
- Improve visibility of longer-term purchasing commitments
- Increase flexibility in product specifications and formats
- Support product development using UK-grown pulses

> “The issue wasn’t production – pulses were already being grown. The issue was market failure. Consumers didn’t know these foods existed… If a major retailer decided to launch UK-grown pulse-based products, that could be transformative. The ingredients already exist.” *Josiah Meldrum, Pulse processor and business entrepreneur*

> “As a farmer, I’m not going to grow a new crop unless I think someone will buy it. The processor won’t buy unless they’re confident in supply and quality. Retailers and manufacturers won’t commit unless they think consumers are interested and supply is reliable.” *Andrew Moxey, Agricultural economist*

2. Build the “missing middle”

Greater investment in processing, aggregation and regional infrastructure is needed to strengthen domestic pulse pathways and reduce dependence on fragmented supply chains.

Relevant actors

Processors • Manufacturers • Investors • Regional development actors • Farmer cooperatives • Public funders

Near-term opportunities

- Support shared and regional processing infrastructure
- De-risk investment in cleaning, milling and storage capacity
- Strengthen coordination across supply chains
- Support scalable business models for UK-grown pulses

> “In Scotland, there are currently no primary processors for pulses. So pulses grown in Scotland are sent to England for processing and then returned... At small scale, processing equipment might cost around £100,000. At large scale, it could be millions... There are farmers considering cooperative investment at small scale... One idea is to spread risk by processing multiple crops, such as pulses, cereals, hemp.”
> *Andrew Moxey, Agricultural economist*

> “There is definitely synergy in processing infrastructure between feed and food systems.” *John McArthur, UK-grown feed protein entrepreneur*

3. Improve viability for growers and supply-chain actors

Pulses are unlikely to scale unless they become a more viable option within farming systems and supply chains. Reducing market uncertainty, strengthening agronomic support and recognising the wider environmental value of pulses across rotations and farming systems are important conditions for improving pulse viability.

Relevant actors

Growers • Agronomists • Breeders • Advisory networks • Supply-chain actors • Policymakers

Near-term opportunities

- Strengthen agronomic advisory support and demonstration networks
- Support breeding and varietal development suited to UK conditions
- Improve visibility of reliable market outlets and demand pathways
- Recognise rotational and environmental benefits within policy frameworks

> “Legumes have lower input costs, so in some cases they’re a better crop financially, but they are more variable… Weather explains more variation in legumes, while inputs explain more variation in cereals. So farmers have more control over cereal yields.”
> *Jake Bishop, Crop scientist and agronomist*

> “Farmers don’t grow for human consumption because it costs more and the crops are risky. Returns are uncertain.” *Josiah Meldrum, Pulse processor and business entrepreneur*

> “The gross margin must compete with alternative crops in the rotation.”
> *John McArthur, UK-grown feed protein entrepreneur*

4. Support experimentation across multiple pulse pathways

Discussions repeatedly emphasised that UK pulses are likely to scale through multiple pathways, including food, ingredient, blended-product and feed routes. Different pathways may contribute differently across nutrition, nature and net-zero goals, and may require different forms of support, infrastructure and market development over time.

Relevant actors

Retailers • Manufacturers • Food-service providers • Researchers • Innovators • Investors

Near-term opportunities

- Support innovation across multiple pulse uses and product formats
- Enable experimentation within retail and food-service settings
- Improve understanding of pathway-specific impacts and trade-offs
- Avoid overly narrow assumptions about how pulses should scale

> “The immediate opportunity for pulses in the short term is in the feed industry. The medium to long term is about the emergence of human consumption.” *John McArthur, UK-grown feed protein entrepreneur*

> “There are different pathways here: functional ingredients at large scale, or more niche products like split peas. It depends on the ambition – local or global.” *Andrew Moxey, Agricultural economist*

Outstanding questions for research and experimentation

While the priorities outlined above highlight areas for near-term action, several important questions emerged through the roadmap process where further research and experimentation could help reduce uncertainty and support implementation.

- **Sequencing and coordination**: Understanding how change can be initiated across interconnected parts of the system, and which interventions are most likely to unlock wider system development.
- **Incentives and risk**: Identifying policy, market and financial mechanisms that can reduce the risks associated with growing, processing and using UK pulses, particularly where actors are reluctant to move first.
- **Demand thresholds and market signals**: Understanding the scale and form of demand needed to stimulate investment in processing infrastructure, supply chains and domestic production, and how this may differ across pulse pathways.
- **Land use and system-wide impacts**: Understanding how increased pulse production interacts with wider land-use decisions, dietary change and crop substitution. This includes questions around whether pulses displace other crops, reduce reliance on imported feed and food crops, or contribute to wider land-use change within and beyond the UK.

Closing reflections

Pulses are often presented as a simple solution to challenges spanning nutrition, nature and net-zero. The findings in this report suggest a more nuanced picture. Different UK pulse pathways may contribute differently across public goals, and no single intervention is likely to unlock change on its own.

The challenge is therefore not simply to produce or consume more pulses, but to create the conditions under which production, infrastructure, markets and consumption can evolve in more coordinated ways over time. While many uncertainties remain, stakeholders consistently highlighted opportunities for action. The roadmap presented here is intended as a starting point for that wider conversation.

Organisations represented in the UK pulse roadmap workshop

This roadmap was informed by workshop discussions involving stakeholders from across farming, food manufacturing, retail, civil society, policy and academia. Organisations represented at the workshop are listed alphabetically below: Backcasting to Achieve Food Resilience; Birmingham City Council; Bucksum; Farm Adaptation Network; Food Facets of Urban World; The Food Foundation; The Good Food Institute Europe; Good Food Oxfordshire; Green Alliance; IGD; John Innes Centre; Lidl GB; Pareto Consulting; Rimini Centre for Economic Analysis; Riverford Organic Farmers; Sustain; Sustainable Restaurant Association; UKRI NERC; University of Hertfordshire; University of Leeds; University of Liverpool; University of Oxford; University of Reading; Vivienne Schadinsky Environmental Art; Waitrose.

The workshop also featured case study contributions from Farm Adaptation Network, Lidl GB, Sustain, The Food Foundation and University of Reading, helping to ground discussions in practical experience and current initiatives.

*Organisations are listed for transparency and do not imply endorsement of the findings or recommendations presented in this report.

Stakeholder conversation contributors

The following individuals contributed to stakeholder conversations that informed the development of this roadmap.

- **Josiah Meldrum** | Co-Founder, Hodmedod Ltd
- **Jake Bishop** | Lecturer in Crop Science, University of Reading
- **Andrew Moxey** | Agricultural economist, Pareto Consulting
- **John McArthur** | CEO, BritPulse Feed Ingredients Ltd

Project team

- **Project lead: Dr Jing Zhang** | Researcher/Project and Knowledge Exchange lead, University of Oxford
- **Dr Monika Zurek** | Food Systems Transformation Group Leader, University of Oxford
- **Dr Jennifer Lucey** | Senior Researcher and Deputy Director for Nature based Solutions Initiative, University of Oxford
- **Roger Sykes** | Food Systems Programme Manager, University of Oxford
- **Sophie Robins** | Principal Change Designer, Forum for the Future

Acknowledgements

Authors

- **Jing Zhang** | Food Systems Transformation Group, Environmental Change Institute; Agricultural Resilience Impact and Innovation Hub, Nature-based Solutions Initiative; Department of Biology, University of Oxford
- **Monika Zurek** | Food Systems Transformation Group, Environmental Change Institute, University of Oxford
- **Jennifer Lucey** | Agricultural Resilience Impact and Innovation Hub, Nature-based Solutions Initiative; Smith School for Enterprise and the Environment, University of Oxford

This work, 'A roadmap for UK pulses: Releasing pulses' potential for nutrition, nature and net-zero', was supported by the Natural Environment Research Council (NERC) [grant number NE/W004976/1] as part of the Agile Initiative at the Oxford Martin School.

We would particularly like to acknowledge Roger Sykes for his invaluable support with stakeholder engagement, project coordination, and facilitating connections across the UK pulse community throughout the project. We are also grateful to our project partner, Sophie Robins, for her thoughtful contributions to the design, preparation and facilitation of the stakeholder workshop.

We are especially grateful to all stakeholders who participated in interviews, workshops and discussions throughout the project, sharing their expertise, experiences and perspectives. We also thank the wider community of practitioners, policymakers, researchers and industry representatives who contributed their time and insights.

This project builds on the foundations established through the BeanMeals project and the Legumes Initiative. We would like to acknowledge all colleagues and collaborators who contributed to those efforts. The evidence, insights and networks developed through this earlier work were instrumental in shaping this roadmap.

We are additionally grateful to Dr John Ingram for his support during the proposal development stage. We also thank the Agile Initiative team and the Oxford Martin School for their support in hosting and facilitating the workshop.

Finally, we acknowledge the broader support provided by colleagues and teams across the Environmental Change Institute, the School of Geography and the Environment, and the Department of Biology at the University of Oxford.

Suggested citation

Zhang, J., Zurek,, M & Lucey, J. 2026. A roadmap for UK pulses: Releasing pulses' potential for nutrition, nature and net-zero. Oxford: Environmental Change Institute, University of Oxford.

Environmental *Change* Institute

Food Systems Transformation Group

A trusted leader in food systems research and learning

www.eci.ox.ac.uk/research/food-systems

Agricultural Resilience Impact & Innovation Hub

Agricultural Resilience Impact & Innovation Hub

A strategic initiative at the University of Oxford, partnering across disciplines and stakeholders to co-create research and innovation for agricultural resilience.

www.naturebasedsolutionsinitiative.org/projects/agricultural-resilience-impact-and-innovation-hub/

www.eci.ox.ac.uk/research/roadmap-uk-beans