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Land use innovation

How the UK can unlock solutions to the pressures on land

Royal Agricultural University

NICRE

AFN Network+

LAND USE for NET ZERO HUB

Summary

- There is mounting pressure on land. It has been estimated that the UK would need more than twice the area of Wales to meet its current policy targets. Yet there is no more land. To meet these targets, we need to use land differently.

- To date, most investment in innovation relating to land management has been sector specific. However, more strategic *land use innovation* is essential and gaining traction, focused on *integrating, optimising* and *coordinating* diverse land uses. Examples are included throughout this report.

- The UK has an established research community with substantial capacity to support land use innovation. This work is interdisciplinary, often international, and backed by substantial public and private investment.

- However, the UK has limited infrastructure for knowledge exchange, commercialisation and scale-up in land use innovation. The main land-based sectors have specialist scale-up infrastructure, such as incubators, but there is little dedicated support for strategic innovation that bridges land use sectors.

- To understand the demand and requirements for knowledge exchange, scale-up and commercialisation infrastructure dedicated to land use innovation, we interviewed 40 professionals in this emerging sector:

- Most interviewees agreed that this was a need worth addressing. They were most interested in training and staff development, knowledge exchange, thought leadership and research support. They had mixed views on whether these needs would best be met through virtual support or co-location at a physical incubator or hub.

- The Royal Agricultural University led this research to inform a new land use innovation incubator and cluster on its campus at Cirencester. This will launch in 2025 using existing on-site facilities and offering virtual support, with planning permission sought to expand this into a dedicated 'innovation village' to meet global demand.

- Government should invest in dedicated infrastructure for land use innovation, to help accelerate the development of tools to implement its strategic vision for land, align with its industrial strategy and consolidate the UK's global leadership in providing solutions in this field.

- If you are interested in finding out more or getting involved, please contact Innovation.Village@rau.ac.uk.

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Introduction

We depend as deeply as ever on the land. Agriculture, forestry, mining and nature, seemingly distant from our increasingly urban and virtual lives, still underpin them. As we respond to environmental, economic and geopolitical instability, managing these relationships with land is crucial. Traditional land uses must now combine with our need to protect land for nature recovery, carbon sequestration and renewable energy production. The strategic importance of land-use decisions has never been greater. The need to make them sensitively, to communities, places and landscapes, remains as important as ever.

These mounting pressures call for transformative changes in land use. In practice, this will take new tools for making and implementing more complex decisions about land. We need such tools urgently.

This brief report outlines why transforming land use is necessary, what tools can enable this, and the innovation infrastructure that would help develop these tools. We draw on interviews with professionals across the emerging sector that is rising to this challenge. Led by the Royal Agricultural University (RAU) in partnership with three national research initiatives – the National Innovation Centre for Rural Enterprise (NICRE), Land Use for Net Zero, People & Nature Hub (LUNZ) and Agri-Food for Net Zero Network+ (AFN+) – our report concludes with actions to strengthen support for land use innovation.

The land crunch

The UK's approach to land use planning was built for a different era, still resting on policies created in the immediate aftermath of World War 2.[1] The conflict and post-war reconstruction period brought about dramatic changes in land use. After decades of rural decline and economic policies that favoured cheaper imports, there was an urgent shift towards new technologies and increasing agricultural productivity.[2] This transformation was guided by a tripartite governance framework established in the 1940s, which consisted of farming policy, nationalized planning, and landscape protections. Shaped by priorities such as social mobility and food security, this framework has remained central to national land use planning ever since.

Yet times have changed. There are now urgent, unavoidable and interrelated global factors that are driving us to reconsider how land is used to underpin economic prosperity.[3]

Credit:George Clerk

Food security

The UK's food security relies heavily on stable climate and environmental conditions in our country and the world regions we import from. This is increasingly vulnerable to climate change, biodiversity loss and the degradation of natural capital.[4] The outlook is particularly stark for lowland peat soils, the most productive in the UK.[5] Many irrigation-dependent food growers are in water-depleted areas.[6] With a predicted five billion additional litres of water a day needed by 2050 to meet growing demand for water from industry and homes, the UK faces mounting pressure to manage water resources sustainably.[7]

Environmental security

Climate adaptation strategies will be needed to develop resilient infrastructure, which will increasingly rely on nature-based solutions to cope with climate impacts.[8] Coastal regions in England are particularly vulnerable to sea-level rise and erosion; Environment Agency projections indicate that one in four properties in England could be at risk of flooding by mid-century due to climate change.[9] Nature recovery is integral to environmental security. Government has committed to ambitious tree planting and peatland restoration goals, to halting the long-term decline of species abundance, and to protecting 30% of land and sea by 2030.[10]

Energy security

The dual pressures of climate change and geopolitical conflict are driving investment in energy security and a structural shift toward renewable energy, including biomass.[11] The UK government has set an ambitious target to achieve at least 95% low-carbon electricity generation by 2030, aiming for a fully decarbonized power system by 2035,[12] requiring substantial investment in grid infrastructure.[13] Infrastructure investment is needed to keep pace with changing power sources and projected population growth, which drives housing demand and requires energy-efficient homes to mitigate emissions.[14]

This pile-up of pressures creates a "land crunch" (Figure 1, see page 6).[15] It has been estimated that the UK would need an extra 4.4 Mha of land by 2050 – more than twice the area of Wales – to meet current policy targets for net zero and biodiversity (Figure 2, page 7).[16]

This is not just a challenge in the UK. According to Chatham House, by 2050 the world could face a shortfall in farmland – the gap between what is available and what is needed – equivalent to twice the land area of India.[17] Yet there is no more land. To meet these needs, we need to use land differently. While this overall measure of the challenge makes it seem abstract, these pressures on land are experienced daily, in tensions over specific decisions in places around the country.

ALL NATIONS

Net-zero greenhouse gas emissions by 2050[18]

Climate Change Act 2008 (Amended 2019)

50,000

ENGLAND

Plant 50,000 hectares of trees per year by 2035[19]

Environmental Improvement Plan 2023

ENGLAND

Restore 35,000 hectares of degraded peatland by 2025[20]

SCOTLAND

Restore 250,000 hectares of degraded peatland by 2030[21]

Environmental Improvement Plan 2023

10%

ENGLAND

All new developments in England deliver a 10% net gain in biodiversity[22]

Environment Act 2021

House-building

ENGLAND

Build 1.5 million homes by 2030[23]

SCOTLAND

Deliver 100,000 new affordable homes by 2032[24]

ALL NATIONS

Protect 30% of land and seas by 2030[25]

30 by 30

ALL NATIONS

Phase out petrol and diesel vehicles by 2030. Ensure only zero emission vehicles sold by 2035[26]

Zero emissions transport

WALES

Create or restore wildlife habitats on at least 10% of farmed land by 2025[27]

Sustainable Farming Scheme

75%

ENGLAND

Restore 75% of England's water bodies to good ecological status[28]

Plan for Water (2023)

ALL NATIONS

70% of UK electricity from renewable sources by 2030[29]

Increase solar capacity from 14GW to 70GW by 2035[29]

Energy White Paper 2020

ENGLAND

Broadly maintain current levels of domestic food production[30]

SCOTLAND

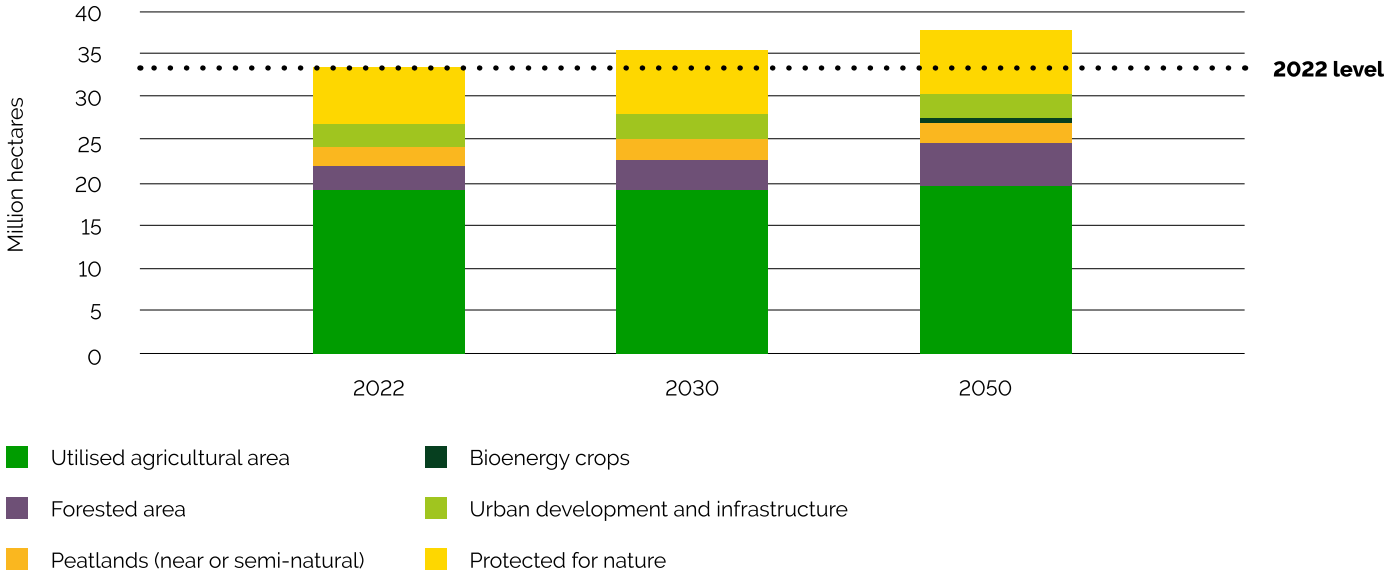
Grow the food and drink sector to £30 billion in turnover by 2030[31]

Government Food Strategy, England (2022) Industry Strategy, Scotland (2023)

Figure 1: *Land-dependent national policy commitments.*

Figure 2: *Potential increase in UK land area needed by 2030 and 2050 to meet net zero and biodiversity commitments if current agricultural productivity, diets and food waste remain static.*[32]

Policy commitments are: increase woodland cover to 16% of UK land area by 2030 and 18% by 2050, restore 300,000 ha peatland by 2050, scale up bioenergy crop production to 23,000 ha per year by mid -2020s; protect 30% of land for nature by 2030. Agricultural output is calculated as a function of population projections.



Land use innovation

Investment in innovation relating to land has, until now, been mostly sector-specific, through initiatives to improve technologies and practices within each land-based industry, such as agri-tech or renewable energy. Such innovations in land management moderate the pressures on land to the extent they increase the efficiency of each type of land use, for example through sustainable intensification in agriculture.[33] Yet the diagnosis that we face a land crunch already assumes ongoing incremental improvements in land management.

With 'innovation as usual' unable to resolve the competing demands on land, more holistic innovation strategies have been gaining traction, focused not only on the scale of demand or supply from land, but also on the scope and allocation of land uses, the relationships between them, and the specificities of place (Figure 3). This is land use innovation. This approach shifts the focus of innovation from improving management within specific land use sectors and supply chains, such as agriculture or urban development, to novel ways of integrating, optimising and coordinating diverse land uses in context (Figure 4). It develops ways to harness the synergies and manage the trade-offs between the multiple demands on land.

Coordinate

Seeking to align decisions about different land uses and reach consensus on trade-offs, especially through joined up policy-making and localised decision-making.

Optimise

Seeking to ensure uses are allocated to the most suitable land.

Integrate

Developing multifunctional land management that combines or stacks more than one land use.

Figure 3: *Land use innovation. The case studies on the following pages illustrate these three approaches.*

Finance	Green finance for natural capital and nature-based carbon emissions reduction and sequestration, such as Exchange Market by Soil Association Exchange.[34]
Digital	Decision-support tools based on maps and geospatial data such as Land App.[35]
Management	Technical and administrative ways of integrating land uses, for example through nature-based solutions, agroforestry or agrivoltaics.[36]
Commerce	Establishing new markets, such as for biodiversity net gain and environmental resilience through networks such as 'Landscape Enterprise Networks' (LENs).[37]
Policy	Developing land use frameworks to coordinate decisions across planning, agriculture and other policy domains.[38]
Legal	Novel contracts for tenants and land managers, such as The Crown Estate's new Environmental Farm Business Tenancy.[39]
Education	Developing new skills associated with all the above, such as Scotland's new Nature-based Jobs and Skills Implementation Plan 2024-2025.[40]
Community	Communities taking ownership of land to manage it for local needs and priorities, for example through Community Land Trusts.[41]

Figure 4: *Examples of land use innovation.*

Why we need joined up action

This is a field where technical and social innovation, commercial and community innovation, and private and public sector innovation are interwoven and deeply interdependent. The commercial value and viability of different land uses and management strategies rely on planning policies, fiscal measures and public payments. Novel tools, rules and approaches can affect all these directly, or cascade across them.

The case studies in this report are examples of land use innovation that illustrate this important emerging sector. An example of policy innovation is the long-awaited Land Use Framework for England, proposed in Government's current consultation.[42] Underpinned by improving geospatial data, it is intended to enable joined-up action across agriculture, forestry, infrastructure and housebuilding, and will drive demand and possibilities for tools for joined-up land use decision-making.

Profile: Agile Homes

In a nutshell: Agile Homes design and deliver affordable, safe, and low-carbon homes using biobased materials and modern construction methods.

The challenge: The Government estimates the UK needs to build 300,000 new homes each year. At the same time, only one in eight renters can afford to buy in the area they live in. Agile Homes are not the only ones saying the housing market is broken, but they may be the only ones calling 'affordable housing' the oxymoron of our time. Rather than tweaking the existing market, they set out to build a whole new model. One where properly affordable and properly sustainable homes are a return on investment.

The solution: Agile homes are super-insulated, triple-glazed, airtight and naturally low-carbon. They use the latest in modern methods of construction that are socially impactful and lower cost. As well as more traditional build styles, Agile have developed 'Tam', a unique, prefabricated, rapid-response housing solution. The 'Tam' homes are made of super-insulated straw and timber panels, made off-site then transported and assembled on-site to make a home. The walls, floors and roof can take as little as a day to erect and can be ready to occupy in just 6 weeks.

The future: In 2024, Agile built 26 affordable homes, a school, a robotics laboratory, three holiday homes, and a cancer care centre. In the coming years, from 2025 to 2026, they will construct over 130 homes. Ninety percent of these homes will be rented at Social or LHA rates, and many of them will be specially designed for individuals requiring supported living. Their homes are exceptionally well-insulated, leading to a 90% reduction in energy consumption compared to the 1990 baseline. This not only makes heating the homes more affordable but also eliminates the risk of condensation and mould formation.

The existing UK development model will not deliver on the target of 1.5 million new homes, let alone affordable ones. We need to think differently. At Agile we work with both public and private land owners to reduce land cost. We need to think differently about land-use to develop resilient and low carbon communities that are connected to the land they live, work and learn from. At Agile, we do this by unlocking land no one thought could be developed; reducing material costs by trading the carbon storage we bank in our buildings, and with the social value we generate in everything we do.

Craig White, CEO Agile Homes

UK research and innovation investment

The UK has substantial and growing public research capacity to support strategic innovation in land use and land management. Relevant research is intrinsically interdisciplinary, spread across a wide range of institutes and university departments, such as geography, planning, environmental sciences, economics, agriculture, forestry and computer science.

Research related to innovation or transitions in land use or management has surged over the past decade, in the UK and globally (Figure 5). Over 100 UK universities and research institutes have published research in this field.[43]

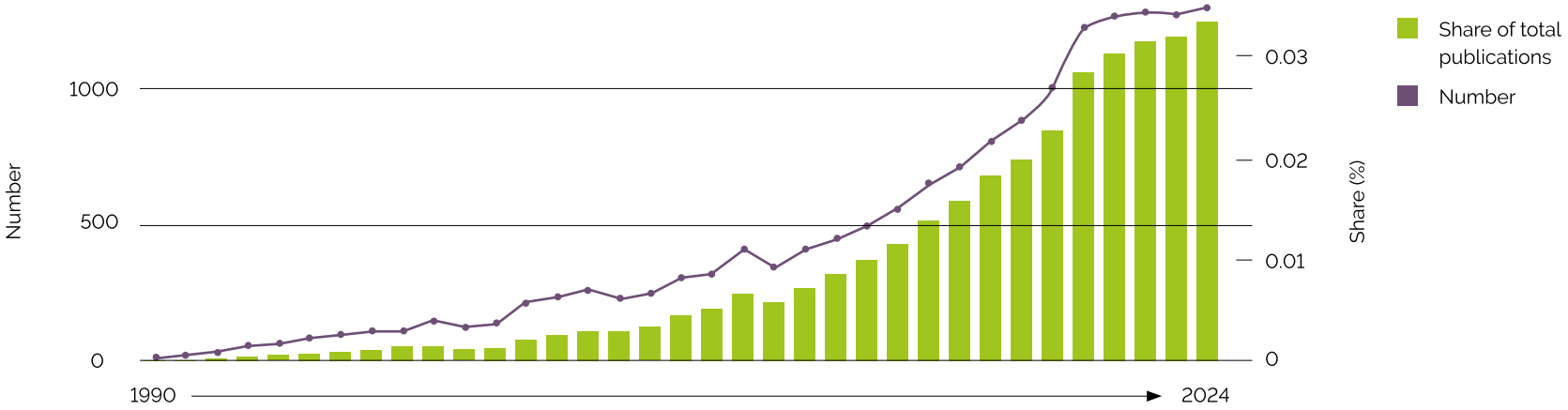


Figure 5: *Relevant research publications on Web of Science by year.*[44]

Research collaboration

This is an increasingly established research community, with extensive collaboration among universities and research institutes (Figure 7). Many of these are currently involved in the Land Use for Net Zero, People & Nature (LUNZ) programme, a cross-government funded initiative to strengthen research capacity and support policy development in this field.

Much of this work has been international in scope. The most cited research involving UK contributors offers global perspectives on key dynamics in land use and management, such as urbanisation, deforestation and the intensification of agriculture. International collaborations have most commonly been with partners in the US, France, Germany and Switzerland (Figure 8).

Much funding for this research has been international too, with UK scientists partnered in projects backed by funding agencies and philanthropists from dozens of other countries. Within the UK, LUNZ is the latest in a succession of strategic research programmes focused on land use and land management, including the Landscape Decisions Programme and the Rural Economy and Land Use programme (Figure 9). These have been interdisciplinary, policy-oriented programmes, combining funds across research councils and government departments.

Credit:Chunyip Wong

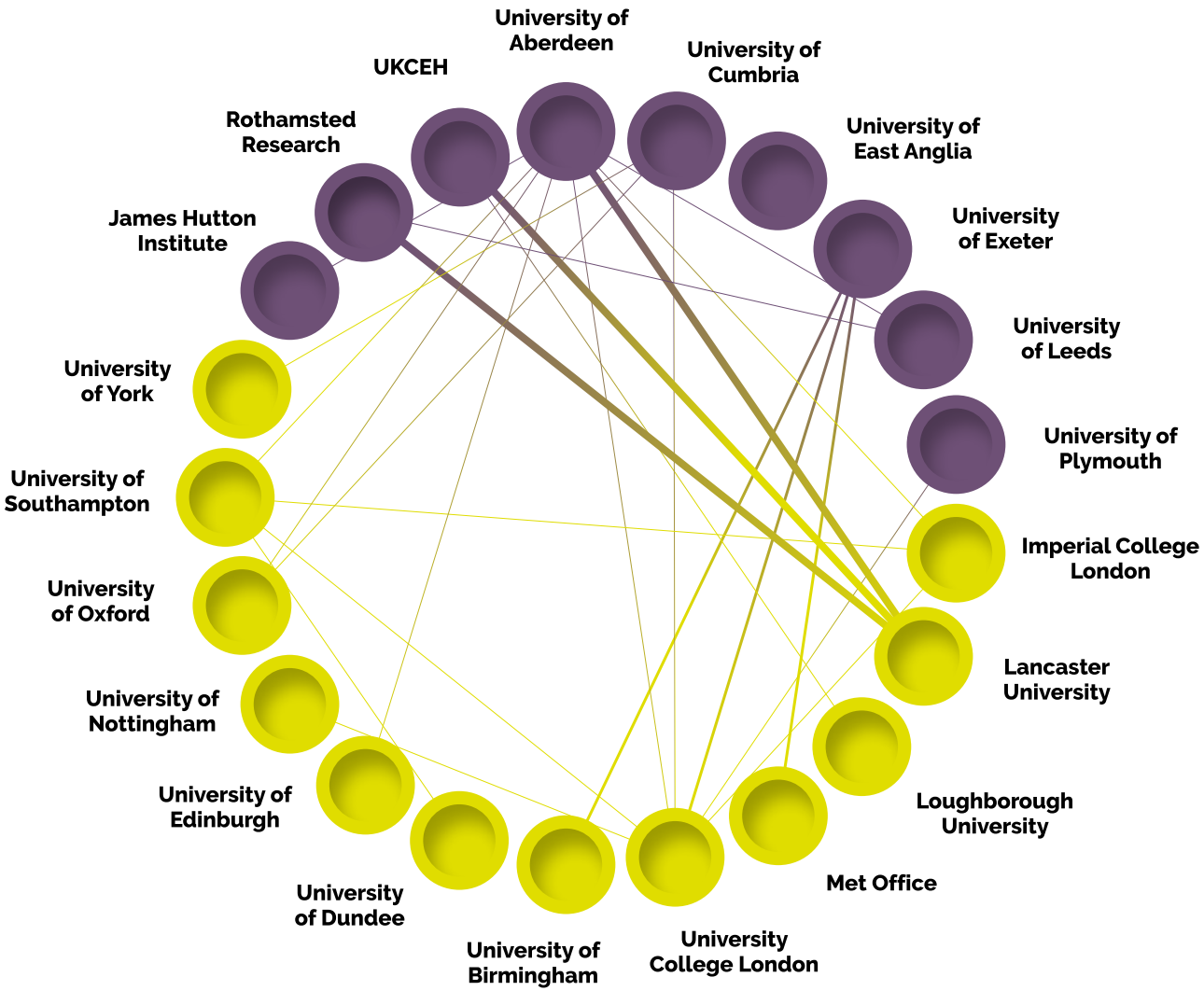


Figure 7: *Most frequent UK co-author affiliations for publications on land use innovation or transitions. Organisations with purple dots are part of the LUNZ network (Hub and projects). Heavier lines reflect more interaction between organisations.*[45]

LUNZ Hub partners

The James Hutton Institute
University of Leicester
Cranfield University
UWE Bristol
University of Reading
Agricultural Valuers
Ulster University
University of Greenwich
Rothamsted Research
Royal Agricultural University
University of Aberdeen
Innovation for Agriculture
Queen's University Belfast
afbi Agri-Food & Biosciences Institute
National Trust
Food, Farming & Countryside Commission
UK Centre for Ecology & Hydrology
Place Collective
vizzuality.
Prifysgol Bangor University
University of Oxford
University of Leeds
University of Cambridge
Sustainable Soils Alliance
Mentera
University of Gloucestershire
Natural England
Forest Research
University of Exeter
SRUC
eunomia
Prifysgol Aberystwyth University
ADAS

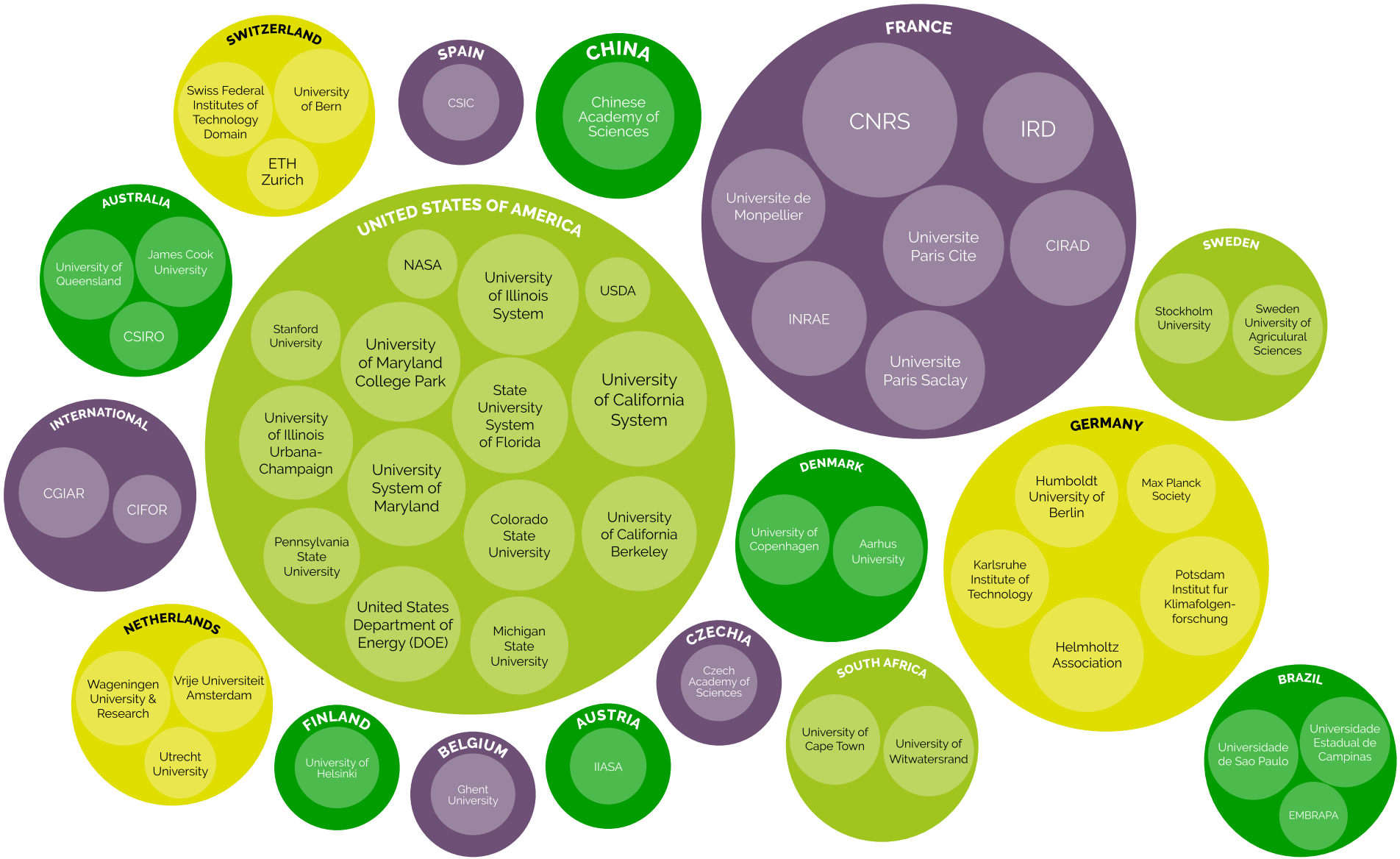


Figure 8: *Top affiliations of international researchers co-publishing with UK partners on land use innovation or transitions.*[46]

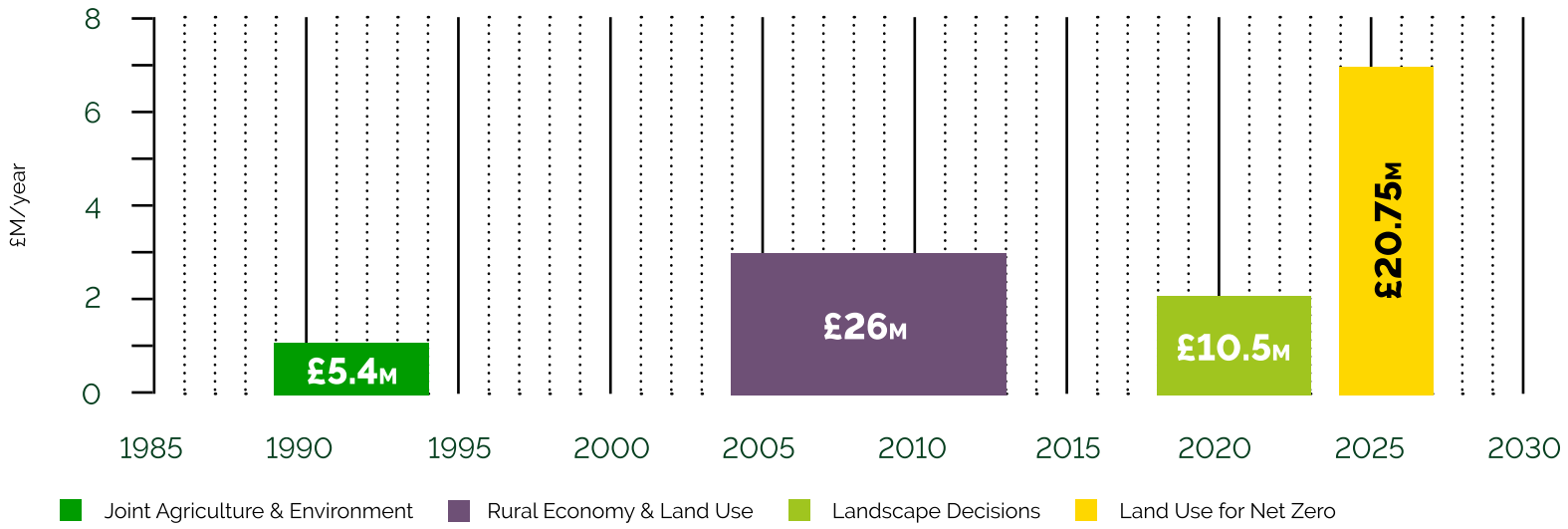


Figure 9: *UK strategic research funding programmes focused on land use transformation.*

FUNDERS

Joint Agriculture & Environment[47]
(1989-1994)

Agriculture and Food Research Council, the Economic and Social Research Council (ESRC), and the Natural Environment Research Council (NERC)

Rural Economy & Land Use[48]
(2004-2013)

ESRC, NERC, the Biotechnology and Biological Sciences Research Council (BBSRC), the Department for Environment, Food and Rural Affairs (Defra) and Scottish Government

Land Use Decisions[49]
(2018-2023)

NERC, with the Engineering and Physical Sciences Research Council, ESRC, BBSRC and the Arts and Humanities Research Council (AHRC), with policy support from Defra

Land Use for Net Zero[50]
(2024-2027)

BBSRC, UK Research and Innovation, NERC, ESRC, AHRC, Engineering and Physical Sciences Research Council (EPSRC), Medical Research Council (MRC), and the Science and Technology Facilities Council (STFC)

Private investment in land use innovation

Private investment in innovative UK companies within this sector has also been growing. Capital invested in innovative land management businesses in the UK has increased more than 30-fold in a decade, from £8M in 2013 to £262M in 2022.[51] This emerging land management sector is currently smaller in scale than agri-tech, and the higher share of venture capital corresponds with more of the companies being early-stage (Figure 10).

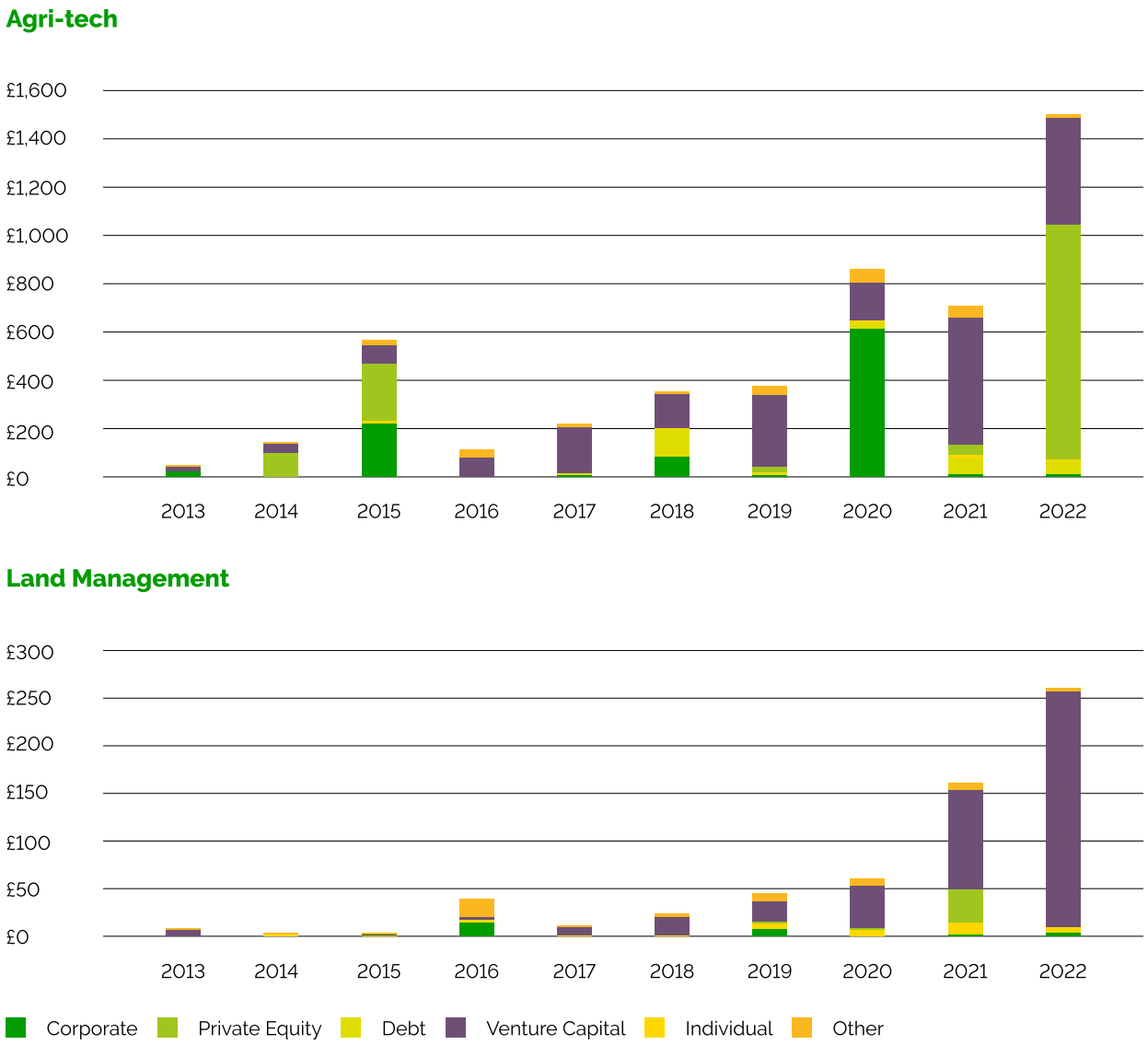


Figure 10: *Capital invested in innovative land management and agri-tech businesses by deal type (millions).* [52]

OPTIMISE

Profile: Land App

In a nutshell: Land App is intuitive mapping software that allows land managers to work with their advisors to create a baseline of their land, measure natural capital, plan land-use change, and collaborate with stakeholders across landscapes or through the value chain.

The challenge: There is increasing pressure on our land. We need it to grow our food, purify and regulate our water, nurture our biodiversity, build our homes and develop our infrastructure. The priorities are endless; the land for them isn't. At the same time, land managers are increasingly being called upon to understand, maximise, and report on their land's natural capital, but doing so can be time-consuming or inaccurate.

The solution: Land App is a user-friendly platform that can help land managers map land from the scale of a single field which when replicated scales up to a whole landscape and nation. Land managers can map out and assess the natural capital of their land. They can then explore different land-use strategies. For example, where would planting trees provide the best balance of biodiversity and profitability? Where is the best plot for flower-rich margins? Or what's the best way to manage land that's susceptible to flooding? More than just managing their own holding, farmers and land managers can then link up with their neighbours to make changes that enrich the whole landscape.

The future: To build national resilience, land managers need market incentives to invest in targeted measures. Land App is collaborating with the UK Government on the Land Use Framework and with the Commonwealth to replicate this approach globally, ensuring resilience measures are implemented where they're most needed, efficiently and effectively.

Credit Will Sibly

A resilient planet is achievable through wise, connected, data-driven decisions and by empowering land managers to deliver meaningful resilience outcomes. Scaled globally, these efforts will secure a sustainable future for generations to come.

Tim Hopkin, Land App

Land App

Innovation infrastructure

Research and investment are vital but insufficient components of a thriving innovation system. Also essential is infrastructure to support those developing novel solutions, and reduce the risks and costs doing so, particularly for emerging and early-stage enterprises.[53] Key functions include connecting entrepreneurs, researchers and funders, providing shared facilities, and supporting commercialisation and market development.

The UK is often characterised as world-leading in research but lagging other countries in innovation and productivity. This is attributed to the structure of its innovation system as a "hub without spokes".[54] While the UK has extensive research and innovation infrastructure, including hundreds of internationally significant facilities, its soft infrastructure for knowledge exchange or translation, commercialisation and scale-up, is relatively weak and fragmented (Figure 11).[55] This is a challenge across many sectors, including land-based industries such as agriculture.[56]

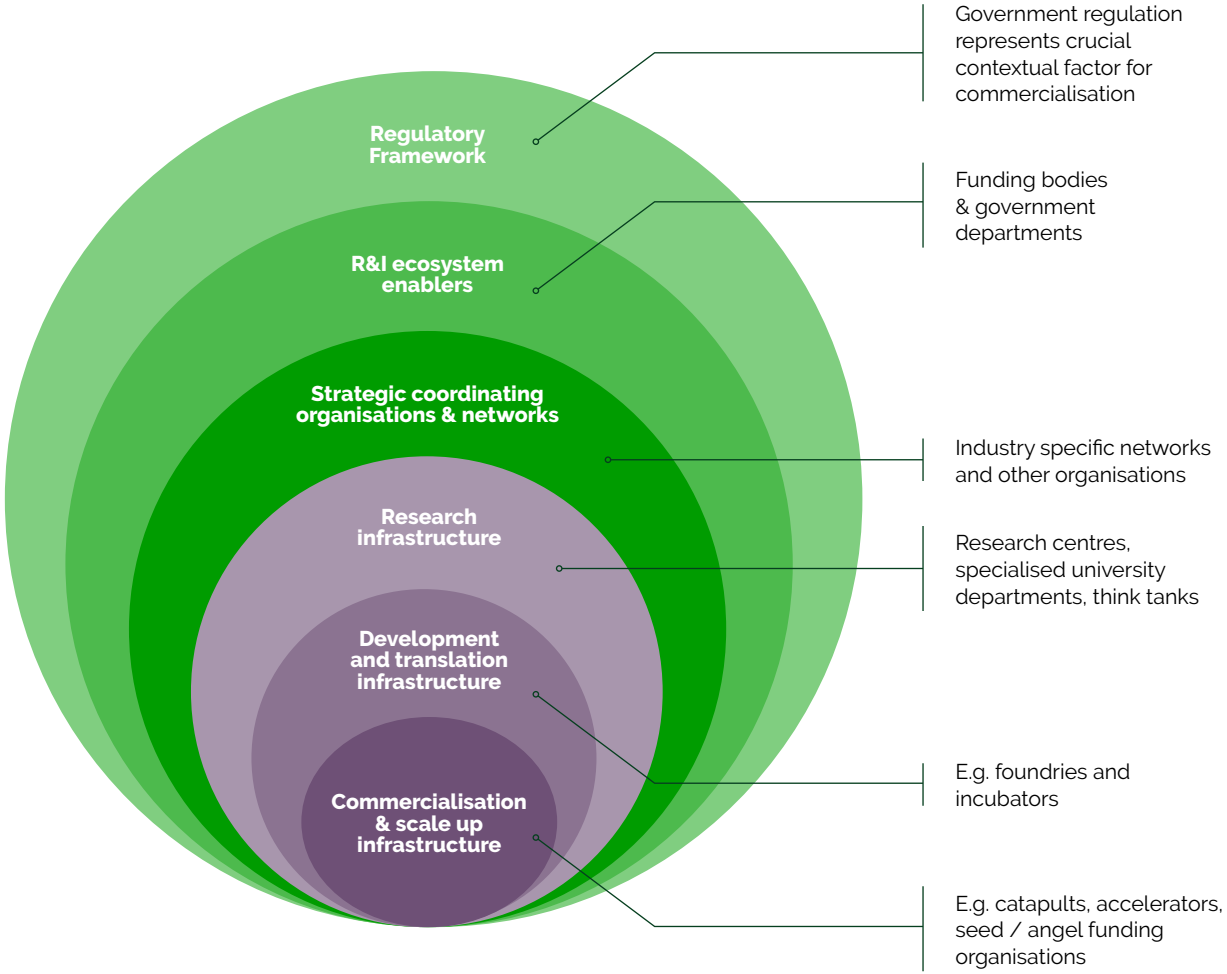


Figure 11: *Categories of soft and physical infrastructure for emerging technologies.*[57]

Commercialisation and scale-up

Commercialisation and scale-up infrastructure in the UK has grown over the past decade, driven by a combination of venture capital and publicly-funded efforts to enable innovation. It ranges from the catapults to incubators and accelerators set up to support start-ups (Figure 12), often focused on particular sectors or regions. There are now hundreds of incubators and accelerator programmes in the UK, supporting thousands of businesses.[58]

Overall, such initiatives are effective. Research by NESTA found start-ups benefitted from participating in incubators or accelerators through greater survival rates, employment growth and investment.[59] Many of the different forms of support provided by such programmes yield benefits, with access to peers, funding and exposure having the greatest impact on employment (Figure 13). Start-ups particularly welcomed access to partners and customers, help with forming a team, and help testing and refining their business model.

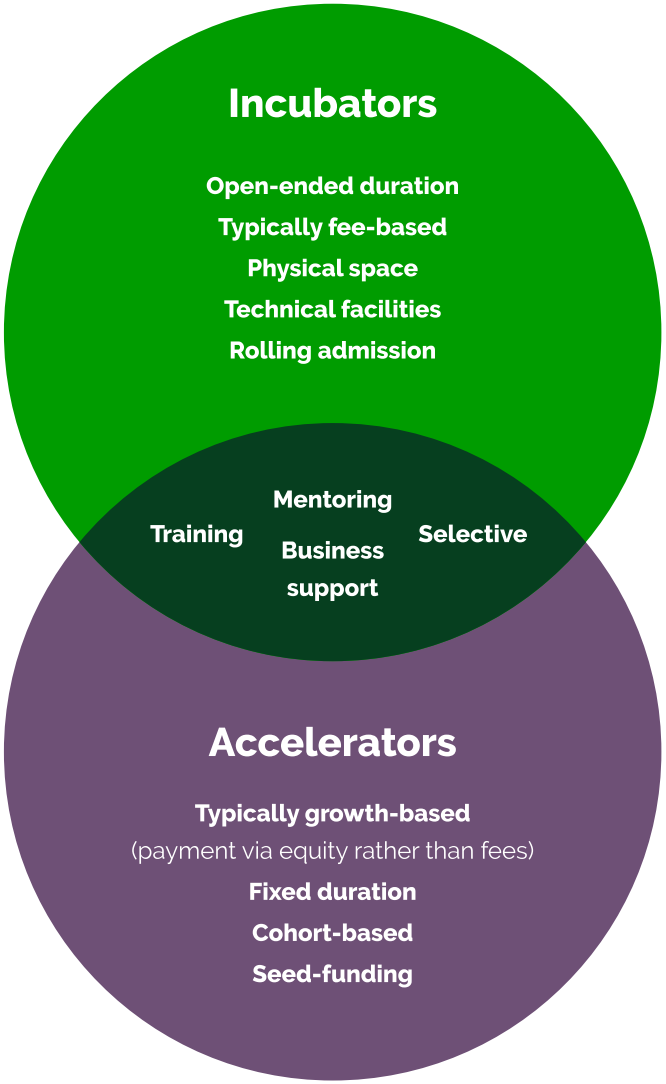


Figure 12: *Defining characteristics of incubators and accelerators.*[60]

	Perceived impact	Employment growth	Employees with a degree	Development stage	Innovation	Patenting	R&D (Log)	Investment raised
Access to partners & customers	+++							
Access to investors							+++	+++
Access to peers		+++	++					
Testing & refining business model	+++	−−−	−					−−
Help with team formation	+++	++		+++	+			
Direct funding from the programme	++	+++			+++		+++	+++
Business skills development								
Press or media exposure		+++				+++		
Lab space or equipment								
Legal, financial, marketing or HR support	+					−−	−	−−
Help measuring social impact			++					++
Office space								
Coaching / personal development				−−				
Mentoring support								
Industry expert	+				++			
Entrepreneur (exited a venture)								
Entrepreneur (not exited)								
VC / angel		++	+++					
Consultant, business developer		−−−	−−		−	+		
Mentoring intensity		+				++		

Figure 13: *Impact of incubator and accelerator activities on start-ups. Summary of impact results where + represents a positive and − represents a negative coefficient.*[61]

COORDINATE

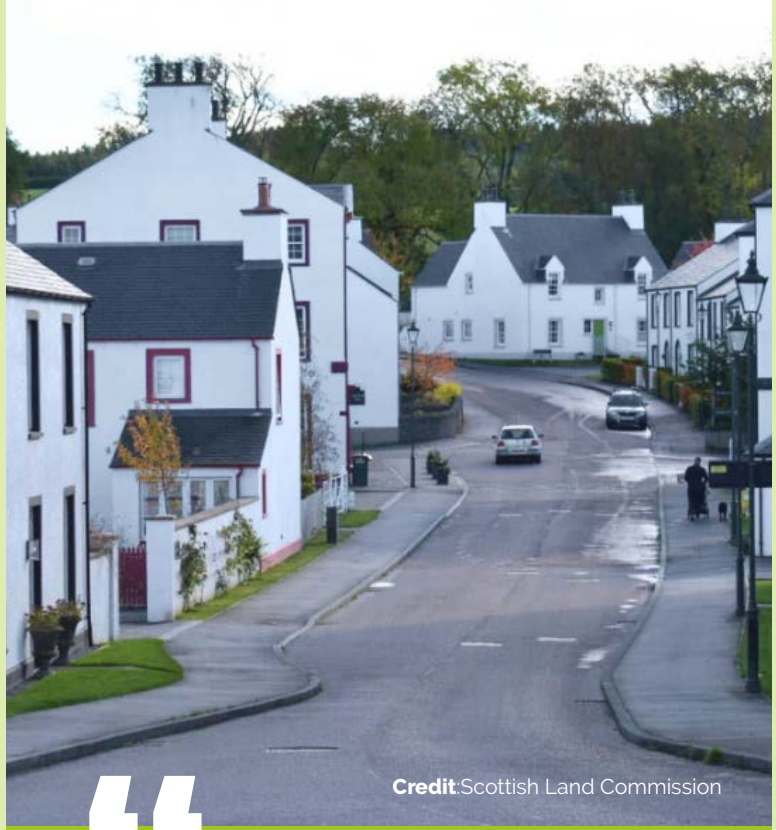
Profile: Scottish Land Commission

In a nutshell: The Scottish Land Commission is a non-departmental public body who provide leadership and advice in reforming the ownership and use of land in Scotland.

The challenge: Scotland has a particularly concentrated pattern of land ownership, with implications for communities, farmers, local economies and wider inequalities. Addressing this has been a theme of the Scottish Parliament since devolution but remains complex. Solutions span several government divisions including rural economy, environment, housing, planning and economy. Effective policy must navigate land and property rights, human rights, social justice and economic interests. However, doing so is critical. Scotland sees land as central to its ambitions to achieve net zero, economic prosperity and tackling inequality.

The solution: The Scottish Land Commission was set up in 2017 to provide an ongoing capacity for advice, evidence and analysis. The Commission advises the Scottish Government and Parliament on law and policy and works directly with land owners, managers and communities to support good practice on the ground. Amongst other work they have made recommendations on taking a public interest led approach to the housing market, convened a taskforce to tackle vacant and derelict land and published codes of practice for tenant farming. However, the work that could have the most impact is informing the Land Reform Bill which at the time of writing is being considered by Scottish Parliament. This introduces significant regulation of large land holdings in the public interest including an obligation to publish and engage on a management plan, give prior notice of sale and potentially to lot land when selling.

The future: In the next 18 months the Commission will be advising on the role of tax reforms in supporting land reform and land use change for net zero. It will also be engaging on what a 'land reformed' Scotland would look like.



Credit:Scottish Land Commission

Our work spans policy and practice across both rural and urban Scotland. One of the big cultural shifts in recent years is the increase in community engagement in land decisions, something that is now both expected and accepted as responsible practice. With the challenge of a just transition to net zero, the questions of who is involved, who benefits and how from Scotland's land are going to remain central to both communities and to the national economy.

Hamish Trench, Scottish Land Commission

Dedicated support

Innovation in land use and land management is patchily served by commercialisation and scale-up infrastructure. Each main land-based sector has some specialised research translation, incubation or scale-up support (Figure 14). Agriculture now has an especially large number of dedicated support initiatives, fuelled by more than a decade of strategic investment by government since the Agri-tech Strategy.[62]

However, there is very limited support infrastructure in the UK or internationally for strategic innovation across land use sectors, focused on the challenges of integrating, optimising and coordinating the competing pressures on land. A pioneering exception is Geovation, the innovation hub for Ordnance Survey (Figure 15). Focused on start-ups using geospatial and property data, it has provided important backing for land use innovation.

While digital start-ups are well-supported by Geovation, they represent only one segment of this emerging field of innovation. Innovation focused on other tools and approaches than location data currently have no dedicated support infrastructure.

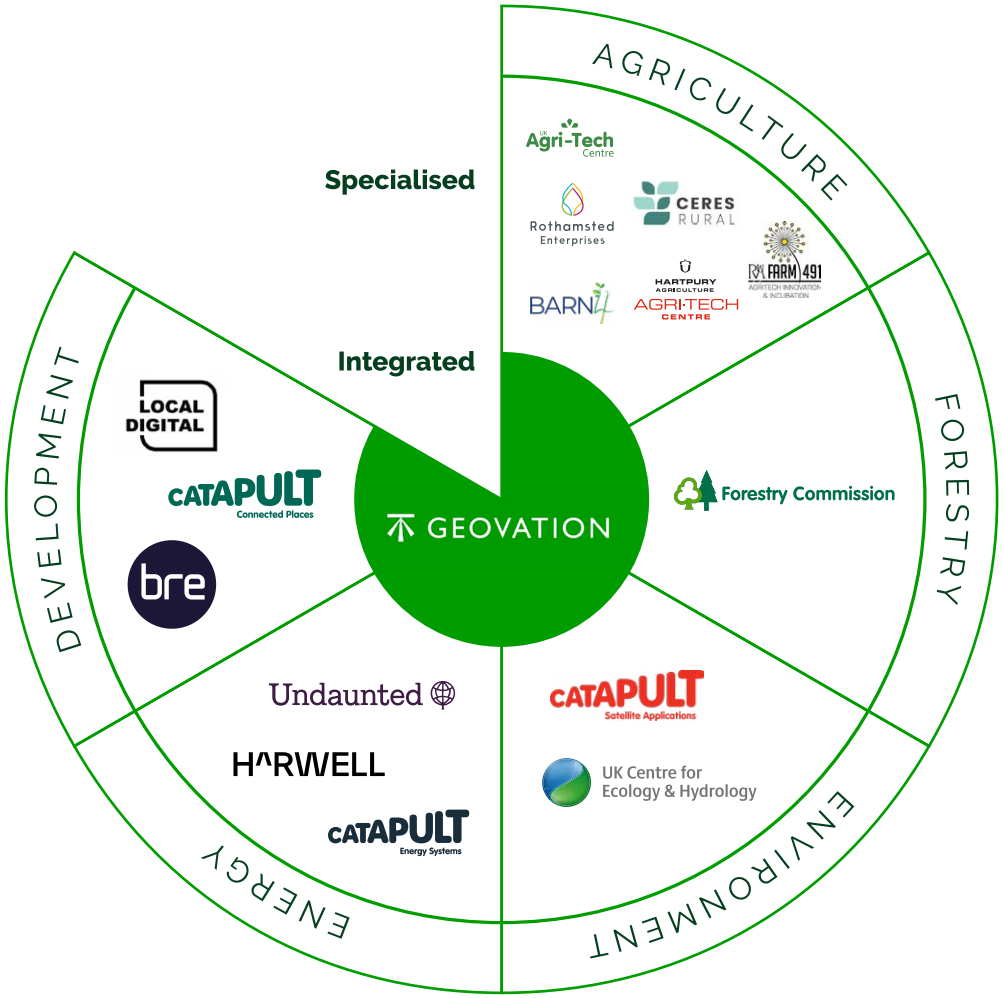


Figure 14: *Examples of commercialisation and scale-up infrastructure initiatives relevant to innovation in land use and land management.*

Geovation

Geovation is an incubator and accelerator that supports the innovative use of location data to address global challenges. Founded by the mapping agency for Great Britain, Ordnance Survey, it offers central London office space, business development support, investor introductions and fully funded accelerator programmes. It has over 2000 members and has supported more than 250 geospatial or property start-ups through its accelerator, which have gone on to raise £250M and create 2,500 UK jobs.

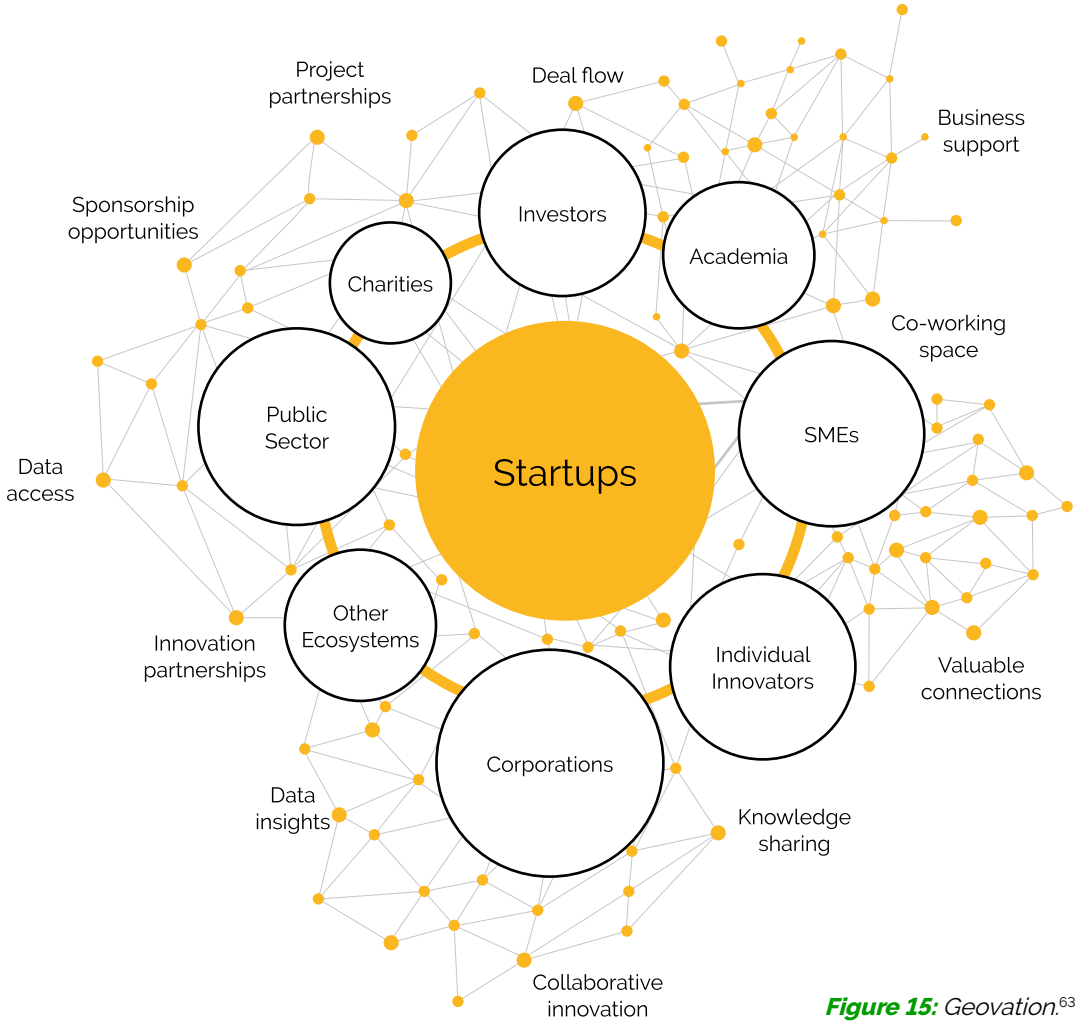


Figure 15: *Geovation.*[63]

Profile: Food, Farming and Countryside Commission (FFCC) & Vizzuality

In a nutshell: In a Cambridgeshire pilot, FFCC explored how a Land Use Framework could help local leaders manage competing pressures on land and designed a software prototype that could underpin it.

The challenge: England currently has no coordinated, spatially defined approach to making decisions about land use. We need land to produce food, to build on (whether houses, jobs, shops and public services, or for transport, energy and water infrastructure), to provide space for nature, trees and water, and to combat climate change and achieve net zero. While some of these uses clash, many could be entirely compatible, but they will not happen in the right way and the right place by chance. A Land Use Framework could address all these problems, informing and facilitating decision-making, helping the right things to happen in the right place, and building confidence in and support for decision-making about land.

The solution: In Cambridgeshire, FFCC carried out a listening exercise, focused on reaching those who felt left behind either socially, economically or geographically, to explore their ambitions for land and its use. They also developed, with the help of local spatial data design company Vizzuality, a prototype of a spatial data visualisation tool they believe would provide a crucial evidence base in support of a land use framework. The tool simply but effectively layers data about key land uses in the area, bringing together issues that are never normally seen together on a single map, illustrating both where the conflicts lie and where the potential for synergies can be found.

Credit:Chunyip Wong

It was clear that there is plenty of data and evidence available – the problem was presenting that data in a way that was accessible to decision-makers across different policy sectors, to maximise synergies and highlight possible tensions. With Vizzuality we were able to layer different data sets over a map, so that flood risk zones, agricultural land, housing developments and others were clearly visualised together. Instead of pressing for abstract targets and needs for different sectors, this tool allowed the group (with diverse experience and backgrounds) to understand the spatial challenges of land use and therefore make more effective decisions.

Georgie Barber, FFCC

Innovator needs

To understand whether there is potential demand and benefit from addressing the gap in innovation infrastructure by providing dedicated support for strategic land use innovation, we interviewed 40 UK-based professionals across this sector.[64] Their organisations ranged from start-ups to established SMEs and large corporates. They included businesses, government agencies, charities and academics. They worked in a wide range of relevant specialisms, including finance, rural property, renewable energy and agriculture (Figure 16).

	Large (L)	**Medium (M)** <250 employees & <£50m turnover	**Small (S)** <50 employees & <£10m turnover	**Micro (Mi)** <10 employees & <£2m turnover	**Total**
Academic (A)	-	1	-	-	1
Finance (F)	2	-	2	3	7
Management (M)	3	2	2	-	7
Policy (P)	-	1	2	2	5
Technical (Tl)	2	1	6	3	12
Technology (Te)	-	1	2	5	8
Total	7	6	14	13	40

Figure 16: *Interview participants by organisation size and specialism, with quote attribution key.*

Overall support

The interviews tested the proposition that there was a substantial gap to be addressed in infrastructure to enable strategic land use innovation. It also explored participants' appetites for engaging with a range of potential support mechanisms, of the types outlined in Figure 13 (p.20).

We scored participants' overall comments on the proposition on a five-point scale. Most (22) supported or strongly supported the proposition, five were sceptical and the remainder were neutral.

Reasons for support

Those who supported the proposition highlighted the strategic importance of transitions in land use and management, in the UK and globally, and the value of cross-sector collaboration in developing effective solutions. They saw this sector extending beyond any specific land use, such as agriculture, and warranting dedicated support. It was broader than agri-tech, which was seen as relatively crowded with innovation support initiatives. By contrast, there was seen to be very limited support dedicated to land use innovation.

"We recently renamed our 'agriculture' team to be our 'land' team, reflecting the issues and challenges you describe." (LTI)

"There's nothing quite like it." (SF)

Reasons for scepticism

The main reasons for scepticism were the breadth and complexity of relevant issues, the diversity of subsectors involved presenting an overwhelming range of needs, and the risk that commercial pressures would override social and environmental considerations, steering innovation in directions that were of limited public benefit.

Support priorities

The people we spoke with said they were most likely to use the following services:

Training and staff development

"We would like to upskill staff… definitely CPD - really important." (MeM)

"There's a lack of quality training and skills around environmental sector and biodiversity net gain and nutrient neutrality." (STl)

'"More training [is needed] on the data available to support decision making at every scale." (MeM)

"It needs to be specific and focused, not one-size-fits-all." (MiTl)

Knowledge exchange

"The end stage is regenerative landscapes. That's the north star. There is a massive need for a space or community share and learn on this." (LF)

"[It is] about the curation. What would be really great would be focused time really in depth on the underlying assumptions." (MiF)

Thought leadership

"[There is] a big gap in coherent multifaceted thought leadership related to land management." (SM)

"If you're looking at the tech end that's quite narrow. The intellectual capital is the more interesting bit." (LTl)

Research support

"We are getting asked questions that are bigger than we can answer so would be interested in accessing research support. It needs to be quality." (LM)

"Would like to be able to pick up the phone and ask on research questions." (MeM)

Online or in person

Participants had mixed feelings about whether these needs could be addressed through virtual support, or would best be supported through physical co-location at an incubator or hub. There was seen to be value in face-to-face interaction. However, as this sector comprises businesses and organisations spread around the UK, many with remote teams, attracting a critical mass to one location was seen as challenging.

"The key is the cluster or community. People want to learn from their peers." (SF)

"Physical proximity is a really important part of enabling the serendipitous interaction." (STe)

"The idea of co-locating is challenging. Is co-location the cake or the icing?" (SP)

"Will some of this stuff happen more virtually post covid - 80% online. Then where do you come together?" (MeP)

For those envisaging a physical hub, the mix of businesses and other organisations would be crucial to its value. Key factors were that it should include:

- Policy-makers, as policy is a major driver of land use innovation.
- Established businesses such as rural property companies and land agents, yet not be dominated by one.
- Start-ups, yet not exclusively, as they are by no means the only innovators in this field.
- Researchers, to help spark, co-develop and test innovations.

As many of the innovations in land use are knowledge-based services, labs were not a priority. However, relevant facilities, for example to test innovations on the ground, were suggested by some as potentially attractive.

"Something like that that gives real-world opportunities for trialling and testing would be incredible." (MiTl)

INTEGRATE

Profile: RegenFarmCo

In a nutshell: RegenFarmCo design circular and regenerative farm systems that build carbon, biodiversity, and other essential ecosystem services whilst producing food.

The challenge: While regenerative agriculture is gaining traction, there's still a long way to go before most UK land is farmed in a way that is genuinely restorative. However, a significant number of farmers, food companies, water companies, and land owners are eager to adopt land management practices that enrich soils, enhance biodiversity, and improve resilience. Transitioning to regenerative approaches is crucial for these stakeholders to achieve their emissions reductions and meet net-zero targets.

The solution: RegenFarmCo scales circular and regenerative landscapes through intelligent design, developing multifunctional environments that integrate hydrology, productive woodland, wildflower meadows, and upcycled infrastructure. Their food production methods, realised through agroforestry and mixed farming systems, maximise carbon storage via ecological diversity and density.

Recognising the importance of collaboration, they work closely with various stakeholders. Jonathan Davies, Managing Director of Levy, emphasises this approach, *"As part of Levy's decarbonisation plan, it is essential that we drive innovation throughout the supply chain, empowering growers and farmers to produce sustainable, ecologically rich food."*
This collaborative spirit is echoed by Fresh Direct's Marketing Director, James Armitage, who shares, *"We are excited to begin new collaborations with three of our growers to drive innovation at the start of our supply chain. We recognise the need for action to understand the real challenges and opportunities in advancing regenerative agriculture."*

The future: RegenFarmCo is expanding, leveraging recent funding to enhance staff capacity and its pivotal role in facilitating knowledge exchange. To drive meaningful change and scale their impact they are actively developing new partnerships focused on regenerative landscapes and collaborating with a range of organisations.

Thanks to the recent funding, we're now able to bring more diverse perspectives and skills into our workshops. It's exciting to see how increased capacity helps us provide hands-on training in regenerative practices, empowering farmers and communities to adopt eco-friendly techniques. Our goal is to create lasting change for healthier ecosystems and more resilient farms.

Dr Vincent Walsh, RegenFarmCo Founder

UK leadership

As global pressures on land continue to build, so too will demand for tools that can help governments and communities to manage and prioritise land uses. By supporting its growing community of researchers, start-ups and land management specialists addressing this need, the UK is well-placed to become a world leader in the sector.

Government is currently consulting on a proposed Land Use Framework for England. The main benefits of developing and implementing an effective framework would come through enhanced food and energy security, nature recovery, and better decisions about land in places and communities around the country.

Rising to this challenge will also yield economic dividends, reducing costs to taxpayers by targeting incentives and improving the coherence and efficiency of policies relating to land, reducing externalities, and enabling private investment in nature recovery.

Yet, in addition, there are direct economic opportunities in developing the tools to deliver these material benefits. By investing to address the current gap in dedicated commercialisation and scale-up infrastructure for land use innovation, the UK government can harness such opportunities across the four nations. This way, Government's development of a strategic vision for land use will directly complement its economic plans and industrial strategy.

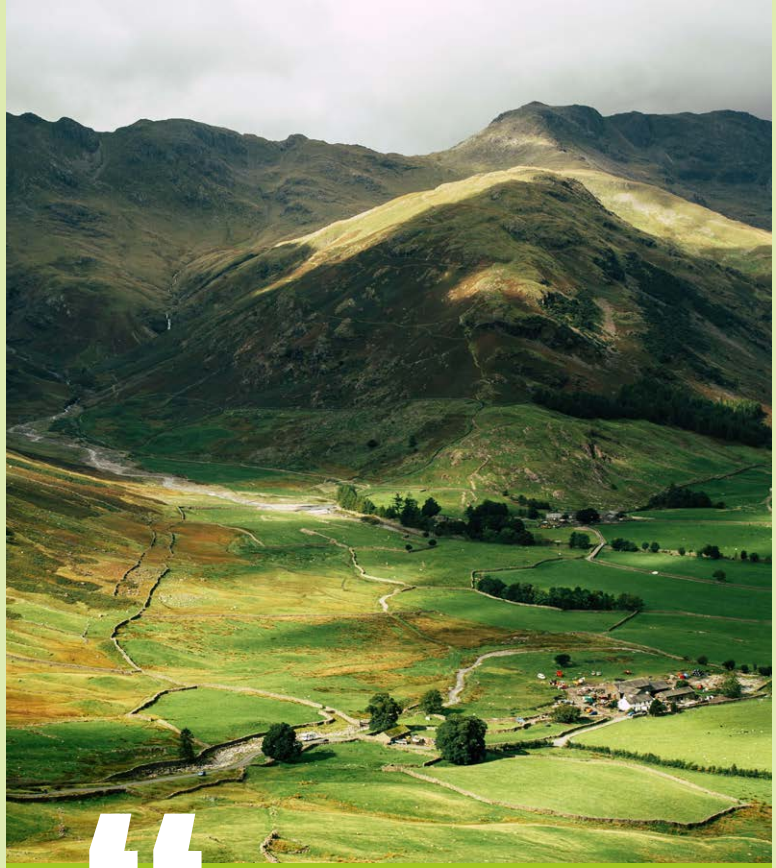
COORDINATE

Profile: Landscape Enterprise Networks (LENs)

In a nutshell: LENs helps businesses with a shared interest in a landscape to club together and fund land management practices that deliver practical resilience.

The challenge: More and more, the agri-food sector is recognising the risks that shifting climate, geopolitics and trade place on their supply chains. Whether building resilience to input costs, drought, flooding, or pests and diseases, investing in sustainable landscapes isn't just good for the environment, it is good for business. However, the notion of businesses paying for 'ecosystem services' can seem complicated or abstract. It is also difficult to collaborate with other investors who are interested in supporting nature-based solutions. Without a practical way to work together, it is difficult to engage industry, including and beyond the agri-food sector, in ways that could drive change on a greater scale.

The solution: Developed over the past five years by 3Keel, with strategic support from Nestlé, Diageo and PepsiCo, LENs is now operating across five European regions. By the end of 2025, LENs will have directed €45million of private sector funds to farmers, to pay for on-farm habitat work, and the adoption of regenerative and nature-friendly farming practices. For the businesses providing funding this delivers supply chain resilience, water catchment management, plus reportable carbon and biodiversity outcomes. For the farmers it's a source of income that goes directly into securing the future of their business. The promise of the LENs approach is that it uses these convergent commercial imperatives to drive transformative change in landscape outcomes – benefiting nature and society.



Business shapes landscapes, and businesses depend on landscapes. So it's self-evident that to transform the resilience of land, for business and society, we need to combine vision and innovation with practical entrepreneurship, i.e. with business. For us, building shared-interest contracts to fund landscape resilience is both an opportunity for transformative impact, and a commercial opportunity for us and our network of partners.

Tom Curtis, Landscape Enterprise Networks

Dedicated innovation support

The research reported here is informing the development of a new innovation incubator and cluster on the Royal Agricultural University's (RAU) campus at Cirencester, Gloucestershire. Addressing the need for dedicated infrastructure to enable land use innovation aligns with the RAU's purpose, "to care for the land and all that depends on it". The university has made a strategic commitment to meet the demand for such innovation support.

The vision is a thriving cluster of businesses, researchers and changemakers dedicated to strategic innovation in land management. While directly addressing this need in the UK, the aim is to build a global community. This would be a national capability, providing a platform for researchers from universities and institutes nationally and internationally to engage with innovators and entrepreneurs in the private, public and third sectors.

The RAU will initially host this using existing facilities. Anticipating the global need for such support, the university has submitted an outline planning application for a dedicated innovation village. Fittingly, this proposes a pioneering, landscape-led development, setting new standards for sustainable building and regenerative design.[65] The RAU is one of many UK institutions doing relevant research, including the LUNZ partners, Agri-food for Net Zero Network+ and National Innovation Centre for Rural Enterprise. Its strengths in providing this platform are down to its specialist training provision, industry networks and location. It is a leading trainer of land agents and rural chartered surveyors, the key professional sector responsible for advising on strategic land use decisions. Its rural campus and local partnerships will offer a testbed for innovation at the landscape scale.

The RAU will launch this initiative during 2025. If you are interested in finding out more or getting involved, please contact Innovation.Village@rau.ac.uk.

Image: Architype

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AFN Network+

The UKRI Agri-food for Net Zero Network+ brings together more than 2,000 people from across UK agri-food to identify the key research gaps which need to be addressed if we are to reduce emissions in the sector and achieve the UK's transition towards net zero by 2050.

LUNZ (Hub)

The Land Use for Net Zero, Nature and People (LUNZ) Hub is an innovative research initiative that will help drive the transformation of UK land use needed to achieve net zero by 2050. www.lunzhub.com

NICRE

The National Innovation Centre for Rural Enterprise is a unique hub of innovation and research excellence working with a network of national and local partners. We collaborate, research and co-design ideas and solutions to foster rural enterprise and unlock the potential in the UK's rural economies. www.nicre.co.uk

RAU

The Royal Agricultural University, the first agricultural college in the English-speaking world, has been at the forefront of agricultural education, research, and innovation since 1845. Today, we have around 1,100 undergraduate and postgraduate students from more than 46 countries studying at our Cirencester campus. www.rau.ac.uk

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