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State of the Art Review

Unlocking potential through investment in rural innovation

Authors: Professor Nigel Culkin, Professor of Enterprise & Entrepreneurial Development, University of Hertfordshire; and Dr Panagiotis Kyriakopoulos, NICRE Research Fellow, Enterprise Research Centre

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Contact: n.culkin@herts.ac.uk

Non-technical abstract

Investment in rural innovation is essential to stimulate economic growth, enhance the quality of life, and address rural-specific challenges in response to the institutional changes and economic and technological upheavals to which the industry is subject. This involves diversifying beyond traditional agriculture to include digital technology, healthcare, and renewable energies, among others.

However, infrastructural deficits, skilled labour shortages, and limited access to capital often pose barriers in regions with low population density and large distances from urban areas. Strategic efforts from governmental policies, public-private partnerships, and educational initiatives are crucial for overcoming these challenges. This review provides a snapshot for stakeholders such as policymakers, enterprise agencies, and the research community, summarising key evidence and highlighting gaps.

Summary

Rural innovation investment is a lever for economic development, sustainability, and resilience. In key rural sectors such as agriculture, innovative practices like precision farming demonstrate how technology can optimise resource use and yield. Renewable energy projects provide clean power, creating jobs and reducing fossil fuel dependence. Yet, rural areas grapple with inadequate infrastructure, skill gaps, and financial limitations.

Such regional disparities are acknowledged in the UK Government's Levelling Up White Paper, which lays a framework for tackling them. It highlights the importance of understanding the spatial distribution of six key types of capital: physical, human, intangible, financial, social, and institutional. According to the White Paper, variations in these capital endowments across different regions contribute significantly to differences in business dynamism (encompassing innovation, growth, and international trade). It also recognises the importance of extending the benefits of 'levelling up' to every community across the country, setting out the aspiration that all regions should possess a rich endowment of the six capitals, ensuring that individuals don't need to leave their communities to lead fulfilling lives (Tiwasing et al., 2023).

Therefore, strategic policy support, infrastructure development, and education are vital for fostering rural innovation. Community involvement in rural and urban areas will ensure solutions are locally relevant and sustainable, so that everyone benefits from initiatives to foster prosperity and opportunity across the UK. This summary distils the essence of rural innovation's landscape, emphasising evidence-based benefits and acknowledging persisting gaps.

Background

Dr Panagiotis Kyriakopoulos

Rural innovation is a key concept whose popularity is increasingly recognised as a critical driver, not only for sustainable development, but also for economic growth in rural areas.

The term 'rural innovation' is frequently used by policymakers who advocate for relevant rural policies and practices.

Rural areas can serve as catalysts for innovation. Increasing attention has been given to rural innovation because it is seen as crucial for enhancing the competitiveness of rural small and medium-sized enterprises (SMEs), which, in turn, may lead to the development of the rural economy. Although rural SMEs often innovate, they face additional location-based constraints on top of the usual resource limitations (physical, human, and financial), making innovation more challenging (Johnston & Prokop, 2021).

Key enablers of rural innovation include institutions such as business support agencies, universities, and external finance (Johnston & Prokop, 2021). These entities play a crucial role in fostering innovation by providing essential resources, expertise, and funding. However, it is important to note that these enablers are often more limited in rural areas compared to their urban counterparts (Kalcheva et al., 2018). This disparity may hinder the ability of rural businesses to innovate and grow, emphasising the need for targeted policies and initiatives to support rural innovation. By increasing the availability and accessibility of these key enablers, rural areas can better leverage their unique strengths, fostering innovation.

Recent discussions on rural development highlight the important role of innovations for sustainable rural development, and for addressing global challenges such as climate change, food security, and the transition to a post-carbon society (Kratzer & Ammering, 2019). Innovations in rural areas typically focus on digitalisation, renewable energy, small-scale manufacturing, and agriculture (including agritourism), offering viable alternatives to urban migration by generating local jobs and boosting economic activity. Rural innovation also often involves new technologies, such as for irrigation, pollution control, and waste treatment, or innovative processes and projects that highlight stakeholder cooperation.

Moreover, rural innovation fosters social inclusion by integrating marginalised groups into the economic mainstream, promoting equity, and enhancing the resilience of rural economies. This is unsurprising, as rural areas have the potential to provide fertile ground for innovation to flourish. One of the key elements of rural innovation is the adaptation of existing technologies to meet the unique needs and constraints of rural environments. There are many examples of rural innovation including the development of low-cost, efficient farming techniques, the implementation of renewable energy solutions (i.e., solar and wind power), and the creation of digital platforms to connect rural producers with broader markets.

Evidence

Prof. Nigel Culkin

The literature underscores the transformative impact of investing in rural innovation on both the micro and macro-economic scales. Rural regions possess unique assets that, when innovatively harnessed, can catalyse transformative economic and social outcomes. Traditionally reliant on agriculture, these areas are now at the frontier of diverse sectors, integrating cutting-edge technologies and sustainable practices. For example,

digital agriculture employs Internet of Things and big data approaches to revolutionise farming practices, enabling more targeted and variable rate application of fertilisers and pesticides.

In a rural farming context, a typical agricultural innovation system (Fig. 1) is a network of actors (individuals, organisations, and enterprises). These work together, with supporting institutions and policies in the agricultural and related sectors, to bring existing or new products, processes, and forms of organisation into social and economic use. Policies and institutions (formal and informal) shape how these actors interact and learn together, and how they generate, share, and use knowledge (IFPRI, 2020).

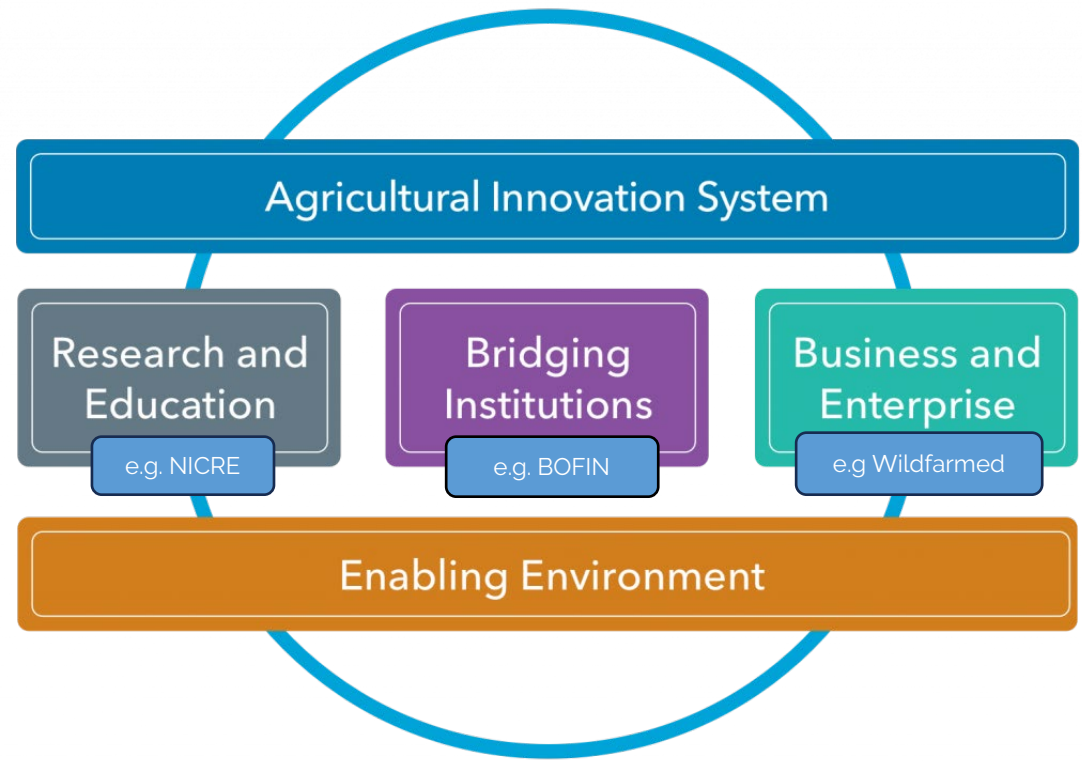

Figure 1: Adapted from IFPRI, 2020.

Where access to capital is available, there is evidence of numerous, well-functioning innovation systems which exemplify good practice across the main components of innovation in the UK and further afield. These systems are enabled by investment, networking and the exchange of skills and knowledge. For example, in 2021, £270million was announced under a new Farming Innovation Programme to be released in funding rounds. This meant that, for the first time, funding became available for farmer-led projects, facilitating innovation by farmers for farmers. Similarly motivated by supporting a transition to a more sustainable food system, US-based Mad Capital provides venture capital to businesses to help them reduce the risk associated with changing their farming practices.

As an example of a 'bridging institution', the British On-Farm Innovation Network (BOFIN) is a rural business start-up that has successfully been awarded six projects (£9.6million) in funding rounds to date, facilitating linking researchers and businesses with farmers to trial technologies on their farms for develop products and improve practice through knowledge exchange.

On the business side, backed by £2.8million of venture capital, Wildfarmed provides an end-to-end supply chain that offers a route to market for crops grown in regenerative farming systems that prioritise soil health. Wildfarmed has developed new markets for its flour, which is a major ingredient in a growing number of retail brands, including M&S own-branded Wildfarmed range. Farmers commit to a set of standards on any land they are using to grow wheat for the company and are rewarded with a premium.

As well as changes in practices, such as moving to regenerative or pasture-fed livestock farming systems, there is a wider need to invest in and adopt innovative greener technologies across the sector. Studies show that investment in precision agriculture can increase yields by up to 20%, while government-sponsored renewable energy projects have the potential to cut emissions and generate regional economic booms. Other opportunities include specialist biostimulants and zero or low-carbon fertilisers to help rural economies achieve net zero status, both through carbon in-setting and generating carbon and biodiversity credits to offset the activities of other businesses.

Policy initiatives, such as the European Union's Rural Development Programme, have been pivotal in driving such innovation, providing a blueprint for success. However, in the UK, with a changing support landscape and progressive decarbonisation by 2050, agriculture in particular is faced with becoming more efficient, and getting more from less. As the UK deviates from the EU Common Agricultural Policy, government support is transitioning from direct support payments to rewarding farmers for implementing more environmentally-sustainable agricultural practices, using 'public money for public goods'.

The literature also demonstrates the lack of a holistic approach when it comes to rural innovation investment and support. Rural innovation more broadly is impeded by an intricate web of formal and informal obstacles that are encountered by rural enterprises. Formal obstacles include subsidies, grants, and bureaucratic red tape, while informal challenges can result from familial ties, traditional norms, and cultural practices.

Evidence points to a clear divide in digital access between rural and non-rural areas (Philip and Williams, 2018, p306) despite generally higher needs for modern communication in these areas due to the higher numbers of remote small and home businesses, effectively impeding technological adoption. The UK Government recognises that good digital connectivity plays an important role in levelling up our rural communities; it increases productivity and helps expand opportunities for flexible working, online education, and leisure activities. In June 2023, alongside the publication of the 'Unleashing Rural Opportunity' policy paper (DEFRA, 2023), it announced a new £7million trial fund to support the deployment of a small number of hybrid network trials combining satellite and fixed wireless services. The expected focus of these deployments will be to communications supporting agri-tech productivity, hill-farming safety, and remote rural tourism applications (DSIT, 2023, p47).

Financial access remains another critical gap for rural innovation, with rural start-ups receiving a fraction of venture capital compared with urban counterparts. This funding gap was recently highlighted by Catherine Lewis La Torre, CEO of British Business Bank, who said:

> "A greater proportion of rural businesses than urban businesses used external finance in 2020, for example, and a greater share of rural business owners also injected personal funds into their business because they felt they had no other choice (La Torre, 2021, p5)."

Additionally, the route to market for many rural products, particularly agricultural, can be relatively slow. Testing in the field is restricted by cropping cycles, with arable crops providing just one opportunity per annum and possible regulatory or certification (e.g., organic) hurdles.

Final overview

Investing in rural innovation is a multilayered strategy pivotal for levelling up rural economies and transitioning to net zero. The evidence reveals significant gains in agricultural efficiency, energy sustainability, and socio-economic development from investment. Yet, the full potential is hindered by infrastructural, financial, and educational gaps. For instance, broadband access is a prerequisite for modern enterprises, yet it is insufficient in many rural locales.

Rural areas often face subpar infrastructure like limited broadband access, a scarcity of specialised skills, and a dearth of investment capital. Understanding these impediments is crucial for stakeholders aiming to facilitate and capitalise on rural innovation as it illuminates the strategic manoeuvres required by constrained rural entrepreneurs as they contend with challenges to secure vital resources, negotiate dependencies, and assert agency in their operations.

Capital flows favour urban-centred innovation, leaving rural entrepreneurs at a disadvantage. Targeted policies, investment in infrastructure, and fostering educational programmes tailored to rural needs are necessary to support the dynamic agricultural innovation system required to help address these gaps.

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