LAND USE for NET ZERO HUB

UNIVERSITY OF LEEDS

THE POTENTIAL DESIGN, STRUCTURE, AND DELIVERY OF A NATIONAL NETWORK OF LIVING LABS TO ACHIEVE 'FOOD-FARMING-ENVIRONMENT' BALANCE

Report for Land Use for Net Zero Hub, December 2025

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Disclaimer

This report presents a summary of views, insights, and recommendations gathered from participants through surveys and workshops conducted as part of the Living Labs engagement process. The content reflects the independent perspectives of those participants and does not represent the official position or policy of Defra, the UK Government, or any of the devolved administrations. Any references to potential future actions or recommendations should be interpreted as suggestions made by participants, not as commitments or endorsements by government bodies.

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Executive summary

The Land Use for Net Zero Hub commissioned a project to the University of Leeds, aimed at mapping (i) existing capabilities and (ii) various stakeholder perspectives regarding on-farm applied research and demonstration (referred to as Living Labs (LLs)) to answer the question: “What could a UK network of LLs look like and how it might function?".

The following approaches were adopted:

1. an online survey to provide a ‘snapshot’ of what type of on-farm applied research and demonstration were in place across UK, and
2. an in-person workshop that brought together farmers, researchers, policy makers and stakeholders in the agri-food supply chain to discuss the potential design and delivery framework of a national network of LLs.

The key findings from the online survey as collected from 55 respondents (81% from England) were:

Characteristics of LLs: The majority of responses (78%) were from LLs with less than 50 farmers, 67% of LLs have been in operation for less than 5 years, arable, mixed and livestock farms are the most common type of farms involved in LLs, and the membership of LLs comprised mainly farmers, NGOs / charities and researchers.

Aims of LLs: Key aims reported by over 80% of respondents were: (i) improving environmental conditions, sustainability, (ii) knowledge exchange / sharing best practice among participants, and (iii) improving resilience of farm business to climate change. The key aim reported by over 70% of respondents was testing new farming practices or combinations of farming practices.

Data collection at LLs: Data collection most frequently focussed on soil health and biodiversity indicators. Only 9% of LLs reported no data collection whereas 51% of the respondents mentioned that collecting and analysing data to assess economic and environmental benefits was one of the major challenges of running a successful LL. Only 53% and 40% of LLs were collecting data on yield and farm economics, respectively, meaning that many LLs could not show the impact of adopting new practices and/or technology on farm profit. Only 27% of LLs were collecting data on Greenhouse Gas (GHG) emissions despite 58% stating ‘reducing GHGs’ as one of their main aims. While 75% of LLs included costs for taking measurements/collecting data, only 56% included costs for data collation, analysis and reporting. This highlights that the full potential of the collected data was not realised.

Funding of LLs: Forty seven % of the LLs in our survey were funded by government. Twenty two % of LLs were also predominantly self-funded by farmers. However, securing long-term funding and financial viability of LLs was the number one challenge highlighted by 87% respondents in the survey.

The outputs of the workshop and consultation with regard to ‘what could a national network of LLs for sustainable farming look like and how it might function’ are outlined in the table below.

Topic	Recommendations based on survey and interviews
1. Aim, goals and name of a LLs network need to (i) appeal to a range of different stakeholders, and (ii) support the transition to sustainable farming systems.	**1A**: Set aims/goals at national level (by funder, advisory board and / or LLs network coordination lead), but let individual LLs decide the approach to achieve them. **1B**: Articulate aims/goals before planning for governance. **1C**: Ensure the network has a name that attracts large-scale participation, particularly from farmers.
2. Governance, structure and operation: There is need for a well-structured governance framework for the LLs network to ensure stakeholders work together effectively to achieve the aim/goals of the network.	**2A**: Set up a well-structured governance framework for both the network and individual LLs. **2B**: Map out existing initiatives, conduct a stakeholder analysis, identify organisations already delivering similar outcomes (e.g. Farming Connect in Wales), and integrate, where possible, these efforts into a national LLs network. **2C**: Make a national LLs database that catalogues (existing and new) individual LLs, including details on location, size, main aim and focus. **2D**: Fund a number of new 'hub and spoke' LLs that comprise of a research intensive farm hub with a satellite of working farms carrying out trials. This could consist of, for example, six LLs (one in each of the devolved nations and three in England that represent regional / sector hubs) phased in over a period of years, taking into account existing facilities. **2E:** Fund a team / organisation to facilitate and coordinate the LLs network to maximise its value. **2F**: Fund and set up an advisory board / steering committee to provide guidance and expertise to the coordination team / organisation.
3. Context: A LLs network should include representatives from all farm systems, as they operate differently and will be impacted by adopting new agricultural practices and technologies in different ways.	**3A*:*** Ensure a LLs network encompasses different farming systems, farm sizes, research scales, and locations (varying climates, soil types), possibly being organised around sectoral and geographical foci. **3B**: Ensure multiple spatial scales are encouraged in LLs (from field to catchment) and that long-term funding is available to capture the temporal variability in response of different outcomes.
4. Participants: For the LLs network to function effectively, fostering diverse stakeholder collaborations is essential.	**4A**: Ensure multiple stakeholders are participants of the LLs network and involved in the operation of the LLs network (including farmers, researchers, NGOs, trusts, charities, governmental institutions, industry representatives, farm advisors, and the public). **4B**: Ensure researchers from different disciplines are involved in the LLs network - including social scientists, to measure whether the LL leads to behavioural change, data analysts, economists
5. Data collection, analysis, storage and use: The types of data collected should align with the aims and goals of the LLs network	**5A**: Establish a framework of minimum indicators, which include environmental, agronomic, economic and social science data, and standard operating procedures that all LLs could follow to establish relevant baseline data. **5B**: Data should be collected by a range of stakeholders that includes farmers, scientists and potentially the public (via citizen

	science), who are given adequate training and financial support to ensure data is collected according to standard protocols. **5C**: An Enterprise Data Platform (EDP) should be used to manage and integrate data across the LLs network, offering tools for data acquisition, storage, preparation, delivery, governance, and security, enabling data-driven decision-making. **5D**: A data manager should oversee the EDP and there should be a data management plan with clear protocols around data sharing.
6. Funding: Funding should cover all operational costs of the LLs, including consumables, facilitator time, mentoring and networking, and farmers' time and expenses	**6A**: A LL network should be adequately funded over the long-term (at least 5 years). **6B**: Design a 'LL funding call' for stakeholder groups to collaboratively apply for and receive funding for an individual LL. **6C**: Ensure a key funding criterion for individual LLs is that they engage with the LLs network and all collected data and information must be shared within the national LLs network database to ensure broader impact. **6D**: Options to secure private sector investment should be explored as long as data ownership, data accessibility, and power dynamics were carefully managed.
7. Knowledge production and exchange: A well-structured approach to knowledge exchange will help ensure a diverse range of stakeholders stay informed and engaged over the long-term.	***7A***: Ensure that the LLs network has a knowledge exchange manager who oversees the knowledge exchange and communication strategies. **7B**: At the network level, a dedicated knowledge exchange and communications strategy should be developed to include press releases, social media engagement, an annual LLs conference and communications for specialised magazines. **7C**: Integrate the LLs network into further and higher education curricula to equip future farmers, advisors, and agronomists with the skills needed for sustainable agriculture. **7D**: Outreach strategies should be tailored to reach a broader audience, particularly those who are less engaged and use existing farmer networks to encourage participation and peer-to-peer learning. **7E**: Engage with (i) multiple organisations/stakeholders from the beginning, (ii) existing databases/platforms, (iii) other LLs networks in other countries to ensure scaling up and impact are achieved.
8. Evaluation and impact: Evaluating the rate of adoption of new practices and technologies over time is crucial. Evaluations should ensure transparency and demonstrate the tangible impacts of investments.	**8A**: Key performance indicators should be developed (by the funder and/ or steering committee) at the beginning, which cover a range of social, economic and environmental metrics. **8B**: A structured evaluation framework should be embedded into the LLs network from the outset to determine if the money has been well spent and to ensure effective assessment of the LLs network's impact. **8C**: Share economic business cases from different farming systems to reduce risk to farmer associated with adoption of new practices when transitioning to a more sustainable farming system.

1. Introduction

Over the past 80 years, agricultural intensification has been a dominant global policy for producing affordable food and improving food security (Watson et al., 2021). This has relied on mechanisation, breeding programmes, and increased fertiliser and pesticide use to boost productivity (Watson et al., 2021). While effective in feeding a growing population, agriculture is now a major driver of soil degradation, biodiversity loss, GHG emissions, and pollution (Springmann et al., 2018) and remains highly vulnerable to climate change (Harvey et al., 2020).

To meet the future food demands while achieving the environmental goals such as net-zero and biodiversity restoration, transformative action to make farming more sustainable is critical. While such transformation requires collaborative action across value chain sectors, the public and government departments, changes at the farm level will be crucial. Agroecological and regenerative farming practices are increasingly seen as key to addressing environmental, economic, and social challenges (Rhodes et al., 2017; Buckton et al., 2024). However, farmers, agribusinesses and policy makers must have access to the latest science and technology to adapt and support the transition to more sustainable farming. While existing on-farm demonstrations/research and advisory services are well established in the devolved nations (e.g. in Wales there are Farming Connect and Henfaes Research Station amongst others), in England, the flow of agricultural science from research to farms is fragmented, with poor links between researchers and farmers (and farm advisors) and no single institution or group of institutions overseeing farm advisory services (Lowenberg-DeBoer et al., 2022). This hinders adoption of improved farming practices and new technology to advance food production as well as achieve multiple sustainability targets, such as biodiversity and net-zero goals. In addition, research needs to be addressing farmers' questions and evidence requirements regarding transitioning to more sustainable practices; much of the current advice available to farmers is based on a high input, highly mechanised farming system.

In the EU, creating and supporting 'living labs' (LLs) is increasingly seen as a valuable route to transfer research into practice and drive change (Malmberg et al., 2017). The European Network of Living Labs (ENoLL) defines a LL as a user-centred, open innovation ecosystem that integrates research and innovation processes in real-life communities and settings, focusing on co-creation and real-world experimentation to address the local and global challenges (Malmberg et al., 2017). ENoLL also lists five elements that must be present in LLs:
(1) active user involvement, (2) real-life setting, (3) multi-stakeholder participation, (4) multi-method approach, and (5) co-creation. In an agricultural context, LLs bring together farmers, scientists, and other stakeholders to co-develop and test innovative technologies and on-farm practices that aim to sustain productivity and rural livelihoods whilst simultaneously improving the environment. Furthermore, LLs promotes synergy between researchers from different disciplines, encouraging a multidisciplinary approach (Ciaccia et al., 2021). By developing site-specific knowledge and offering space to exchange this knowledge, LLs support farmers' skills and capacities. They give an opportunity to experiment and to learn about solutions that work within their systems (Okumah et al., 2021) and biophysical conditions.

In Canada, a national network of agroecosystem LLs has been set up that is coordinated and funded by Agriculture and Agri-Food Canada (AAFC), which is the Government department of Canada responsible for supporting agriculture and agri-food sector (McPhee et al., 2021). The AAFC developed the LLs Initiative in response to the urgent need for sustainable and resilient solutions to mitigate and adapt to the effects of climate change. The approach also served as a model for greater collaboration with stakeholders toward system-wide innovation (McPhee et al., 2021). A network of LLs has been developed over time to strengthen the impact achieved (e.g. through scale, and shared learning) and accelerate the development, adoption, and mainstreaming of sustainable farming.

In a recent report commissioned by Defra, Burgess et al. (2023) reviewed the feasibility of setting up a national network of LLs in the UK. The report highlighted that while a range of farmer networks, demonstration farms, and farm clusters/groups existed across the UK, they all have different aims and structures, and LLs mean different things to different stakeholders. The report also highlighted that more support would be needed to build an effective network of LLs out of what already exists. In particular, the report mentioned the need for long term financial support, development of standard data collection procedures, improved communications and collaborations between farmers and researchers, and increased support for knowledge exchange and infrastructure.

Defra and the devolved administrations are now interested in exploring how a national network of LLs might be designed to fulfil the following functions:

- enable user-centred applied research and farmer-led knowledge exchange;
- strategically coordinate funding, trials, and test technologies and practices on real farms;
- fill evidence gaps around practices, including impacts on GHG and ammonia emissions, biodiversity, soil health, productivity, economics, social indicators, and farmer confidence; and
- develop standards for data collection (including experimental protocols, trial design, and statistical analysis), sharing (via knowledge exchange and communication etc.) and a framework for monitoring and evaluation (with a view to impacts and outcomes and benefits realisation).

To inform such explorations, the Land Use for Net Zero (LUNZ) Hub commissioned a project through the Agile Policy Centre aimed at mapping (i) existing capabilities and (ii) various stakeholder perspectives regarding on-farm applied research and demonstration (referred to as LLs) to answer the question: "**What could a network of LLs look like and how it might function?**".

Two methods were adopted:

1. an online survey to provide a picture of existing LLs in UK, and
2. an in-person workshop with selected stakeholders to discuss potential design and delivery framework of a national network of LLs followed by a consultation.

2. Characterising existing agricultural living labs in the UK

2.1. Approach

A survey was addressed to anyone involved in a demonstration farm or farmer-research network/cluster or equivalent structure that undertakes knowledge exchange of best practice and/or testing and experimentation on real farms within UK. For consistency, the term 'living labs' was referred throughout the approach. We acknowledged that not everyone is familiar with this term, and that it may be subject to different interpretations.

The aim of survey was to provide a 'snapshot' of what types of initiatives already exist across UK, to help inform the design of a national network of LLs. The questionnaire comprised 21 questions (see Appendix 1) that covered the characteristics of LLs (location, size, age), aim and focus of LLs, data collection (types and applications), knowledge exchange events (types and reach-out) and funding (source and amount).

A snowballing procedure was used to recruit the survey participants, starting with existing contacts from the research team, followed by a request to participants to share the survey among their networks. Researchers used their professional social media (e.g. LinkedIn, X/Twitter) or specialised network newsletters (e.g. Farmers Network and Yorkshire Agricultural Society) to further advertise it. A screening question was used to filter out UK based respondents. The survey was launched in English and Welsh languages on 23 Sep 2024 and kept opened until 31 Jan 2025.

A total of 55 responses were received from 45 LLs in England (81%), 7 in Scotland (13%), 2 in Wales (4%) and 1 (2%) in Northern Ireland (Fig 1.). Thirty three % of the respondents were farmers, 27% researchers, 25% from a non-government organisation (NGO), trust or charity, 13% farming advisors, and the remaining 2% of the respondents were from businesses (Fig 1). Regarding the main role of the respondents in their LL, 67% are facilitators or leaders of the LL, 31% are farmers, and 22% are researchers (Fig 1).

Due to the relatively small sample size, we have only run descriptive analysis on the survey data.

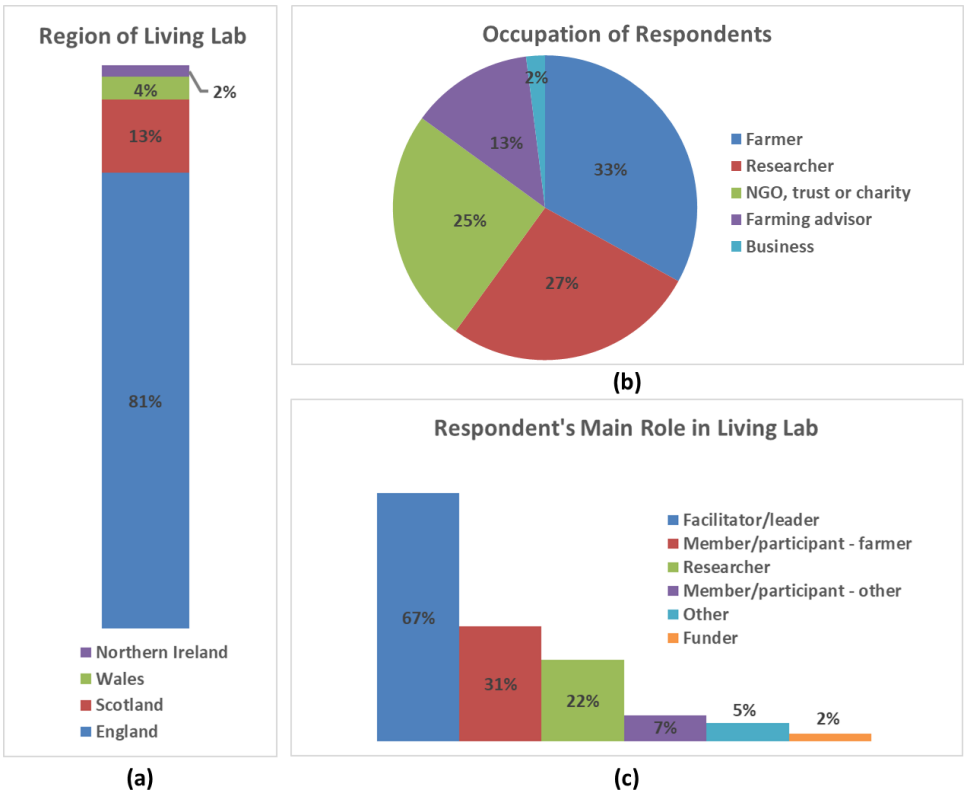

Figure 1. Characteristics of survey respondents with regard (a) location of living lab, (b) occupation and (c) main role in the living lab.

2.2 Survey results

2.2.1 Motivations for participating in a living lab

For the 25 farmers/farming advisors, their top three motivations for participating in a LL was to 'reduce impact on the environment', 'improve financial viability of farm business', and 'access to training to gain new knowledge and skills' (Table 1). Sixty four % also wanted 'to have a voice on relevant issues'. For the other 30 respondents who were not farmers or farming advisors, the top three motivations (Table 1) were 'demonstrating and quantifying the impacts of sustainable farming practices on environmental, economic and social factors', 'supporting the transition to sustainable agriculture', and 'reducing impact of farming on the environment' (together with 'exchanging information and knowledge').

Table 1. Motivation for participating in a living lab (multiple options could be chosen)

Motivation (Farmers/Farming Advisors, N=25)	Count	Percentage
Reduce impact on the environment	19	76%
Improve financial viability of farm business	18	72%
Access to training to gain new knowledge and skills	18	72%
To have a voice on relevant issues	16	64%
Explore new business opportunities	11	44%
Access to new technology/equipment	10	40%
Better connection with social support network	7	28%
Help with access to financial support	6	24%
Requirement of the supply chain	4	16%
Other (source of income)	1	4%
Motivation (Other participants, N=30)	**Count**	**Percentage**
Demonstrating and quantifying the impacts of sustainable farming practices on environmental, economic and social factors.	26	87%
Supporting the transition to sustainable agriculture	25	83%
Reducing impact of farming on the environment	23	77%
Exchanging information and knowledge	23	77%
Engage with a wider range of stakeholders	18	60%
Improving resilience of the supply chain	11	37%
Increase visibility of your organisation within the agri-food community	8	27%
Exploring new business opportunities	7	23%
Other (highlighting the agricultural and environmental challenges and opportunities facing upland farmer; assessing the potential of new crops and varieties; integration between farming and species / habitat conservation)	3	10%

Key messages:

- For farmers or farming advisors, the most common motivations for participating in a LL was to reduce impact on the environment, improve financial viability of farm business and access to training to gain new knowledge and skills.
- For participants from other occupations, the most common motivation to participate in a LL was to demonstrate and quantify the impacts of sustainable farming practices, supporting the transition to sustainable agriculture, and reducing impact of farming on the environment.

2.2.2 Characteristics of the living labs

With regards to numbers of participants within the LLs, 36% of the LLs involved fewer than 10 farmers, 42% involved 10-50 farmers, while 17% involved more than 50 farmers (Fig 2a). With regards to number of years in operation, 13% of the LLs were newly established and have been running for less than a year, while 55% have operated for 1-5 years, and 29% have been

in operation for more than 5 years (of which 20% have existed for more than 10 years) (Figure 2b).

Most of the LLs involved arable farms (75%), mixed farms (71%) and livestock farms (64%), and 45% of the LLs involved dairy farms. Thus, most LLs involved multiple farm types. In contrast, only 11% of LLs involve horticultural farms (Figure 2c). In terms of the spatial scale that the LLs were operating at, 44% are at the landscape scale, while 60% are at the whole-farm level, with nearly 40% at the field scale (Figure 2d). Split field, tramline and plot trials were also being carried out in 27%, 20% and 15 % of the LLs, respectively.

Regarding the source of funding, government was the largest funder (47%), followed by NGO, trust or charity (25%) and research institute (24%, e.g., Universities) (Figure 2e). Notably, 22% of LLs were mainly self-funded by farmers. Only 13% and 11% of LLs were mainly funded by agri-businesses or the agri-food supply chain, respectively (Figure 2e). In addition to farmers, a wide range of organisations were involved in the LLs, with NGOs, trusts or charities involved in 64% of the LLs, farmer association/group in 45%, government agencies in 42% and water industry in 22%. Interestingly, researchers were only involved in 53% of LLs, and the local community was only involved in 20% of the LLs (Figure 2f).

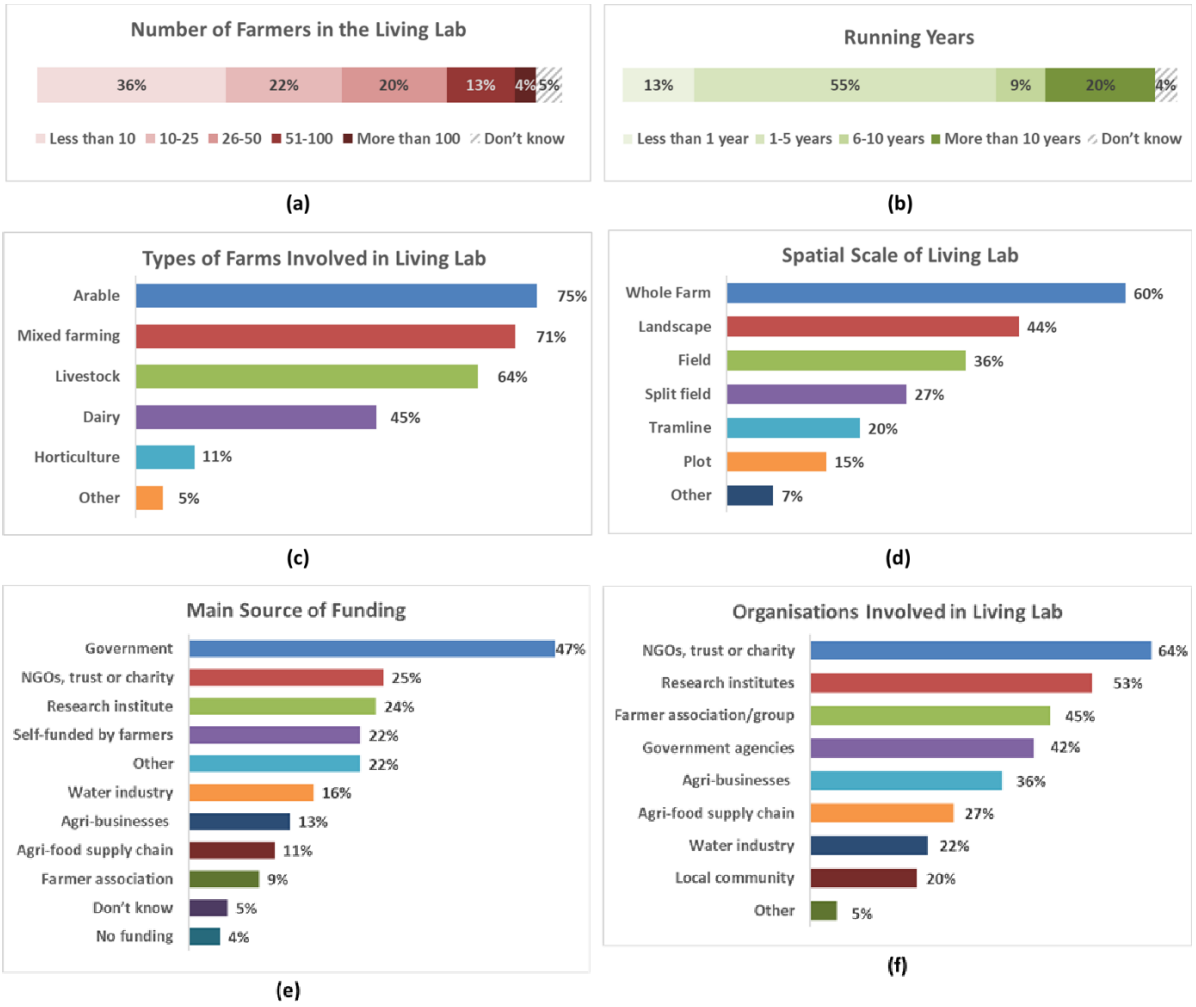

Figure 2. Characteristics of living labs, (a) size, (b) years in operation, (c) farm type, (d) scale, (e) funding, and (f) type of participants.

Key messages:

- 78% of the LLs involved 50 or fewer farmers.
- 68% of the LLs have been running for 5 years or less.
- Arable, mixed and livestock farms are the most common type of farm involved in the LLs, and the most common spatial scale is the whole farm level (60%).
- Government is the most common funding source of LLs (47%), followed by NGOs, trusts or charities (25%), research institutes (24%) and self-funded by farmers (22%).
- NGOs, trusts or charities are the most common organisations (64%) involved in LLs.
- Research institutes are only involved in 53% of the LLs and the local community in 20%.

2.2.3 Costs included in running a living lab

The most common cost associated with running LLs were 'general running costs' (meeting rooms, travel and subsistence) (Table 2). Additionally, 75% of the LLs included the 'costs of measurements' (e.g. sampling, lab analysis), 64% of them included 'payment to facilitators/advisors', and 56% of them included the costs of 'data collation, statistical analysis and reporting', and 'dissemination or education events', while 51% included 'payments to researchers'. It is interesting to note that only 27% of the LLs made payments to participating farmers and only 45% cover the cost of implementing new agricultural practices (Table 2), suggesting that farmers were covering these costs.

Table 2. Costs included in running a living lab

Type of Cost (multiple options could be selected)	**Count**	**Percentage**
General running costs (e.g. meeting rooms, travel and subsistence)	45	82%
Costs of measurements (e.g. sampling, lab analysis)	41	75%
Payment to facilitators/advisors	35	64%
Data collation, statistical analysis and reporting	31	56%
Dissemination/education events	31	56%
Payment to researchers	28	51%
Cost of implementing new practices (e.g. seeds, inputs, equipment)	25	45%
Payment to participating farmers	15	27%
Don't know	5	9%
Other	2	4%

As for the approximate total annual cost of running a LL (Figure 3), 18% had an annual running cost of less than £10,000, 27% of the LLs cost £10,000 - £50,000, whilst 26% of them cost more than £50,000. Twenty nine % of respondents did not share information on the approximate total annual cost.

We ran a cross-sectional analysis of the annual running cost of different size (in terms of number of farmers) LLs. Because of missing data (35% of LLs involving less than 10 farmers and 30% of LLs involving 10-25 farmers did not have cost information) it is difficult to make a rigorous comparison of the running costs of LLs of different sizes. Nevertheless, the number

of participating farmers does not appear to be a determinant of the cost of running a LL, because the LLs with less than 10 farmers have the largest proportion of LLs with the highest annual costs (more than £50,000 per year) (Figure 3). The cost of running a LL is more likely related to the types and amount of things included (Table 2), such as data collection and collation and payment to farmers, rather than the number of farmers in the LL.

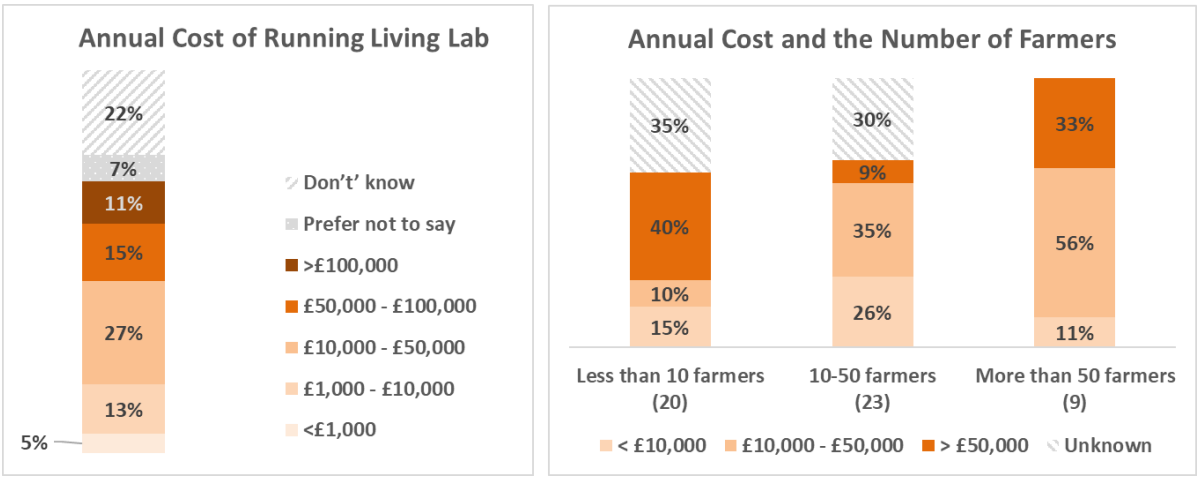

Figure 3. Annual costs of running a living lab

Key messages:

- The most common types of costs included in running a LL were general running costs, costs of taking measurements, and payment to facilitators/advisors.
- 27% of the LLs made payments to participating farmers and only 45% cover the cost of implementing new agricultural practices.
- The most common range of annual cost of running LLs was £10,000 - £50,000 per year. 11% of LLs cost more than £100,000 per year. The number of involved farmers did not appear to be a strong determinant of the cost of running LLs.

2.2.4 Aims and objectives of living labs

With regards to the main aim of the LLs (Table 3), the top three aims selected by over 80% of respondents were 'improving environmental conditions, sustainability', 'knowledge exchange / sharing best practice among participants', and 'improving resilience of farm business to climate change'. Additionally, 'testing new farming practices or combinations of farming practices' was one of the main aims of 71% of the LLs. Whilst 58% of the LLs had 'reducing GHG emissions' as one of their main aims, only 38% of the LLs had 'public engagement / education' as one of their main aims. In contrast, testing new technology and products were only being carried out in 36% and 27% of LLs, respectively.

Table 3. Main aim of living labs

Main aims of Living Labs (multiple options could be selected)	Count	Percentage
Improving environmental conditions, sustainability	49	89%
Knowledge exchange / sharing best practice among participants	48	87%
Improving resilience of farm business to climate change	45	82%
Testing new farming practices or combinations of farming practices	39	71%
Reducing GHG emissions	32	58%
Improving farm economics	30	55%
Improving farm productivity	24	44%
Public engagement/education	21	38%
Testing new technology	20	36%
Testing new products	15	27%
Other	4	7%

Regarding the specific objectives of the LLs (Table 4), almost all (93%) had 'improving soil health' as one of their objectives. 'Improving conservation of biodiversity' and 'promoting regenerative agriculture / agroecology practices' were both ranked in second place (75%) and were closely followed by 'improving water quality' (73%). The objectives of 'reducing use of synthetic fertilisers', 'increasing crop health, yield, and quality', or 'reducing greenhouse gas emissions' were the main objective of 69%, 67% and 64% of LLs, respectively. Additionally, 'reducing inputs of pesticide' and 'promoting natural flood management' were an objective of 55% and 51% of LLs, respectively. On the other hand, only 25% of LLs have the objective of 'promoting animal welfare', and 16% of them had the objective of 'promoting organic farming methods'.

Table 4. Main objective of living labs

Objectives of Living Lab (multiple options could be selected)	Count	Percentage
Improving soil health	51	93%
Improving conservation of biodiversity	41	75%
Promoting regenerative agriculture/agroecology practices	41	75%
Improving water quality	40	73%
Reducing use of synthetic fertilisers	38	69%
Increasing crop health, yield, and quality	37	67%
Reducing GHG emissions	35	64%
Reducing inputs of pesticide	30	55%
Promoting natural flood management	28	51%
Promoting changes to grazing management practices	25	45%
Reducing ammonia emissions	23	42%
Promoting animal welfare	14	25%
Promoting organic farming methods	9	16%
Other	1	2%

Key messages:

- The top three aims of the LLs were improving environmental conditions and sustainability, knowledge exchange / sharing, and improving resilience of farm business to climate change.
- The top three objectives of the LLs were improving soil health, improving conservation of biodiversity, and promoting regenerative agriculture or agroecology practices (followed closely by improving water quality).

2.2.5 Data and information collection and sharing

Soil health indicators (e.g., structure, chemistry, biology, soil organic matter) were the most common type of data collected at 67% of LLs (Table 5). Data on 'biodiversity indictors' (e.g. pollinators, birds, mammals, and plants), 'crop yield' (e.g. quality, quantity) and 'practical experience of implementing new practices or using new technology/products' (e.g. problems encountered, time to carry out, changes required to machinery) were collected at 56, 53 and 51% of LLs, respectively. However, data on GHG emissions were only collected by 27% of LLs (Table 5), despite 58% of LLs stating 'reducing GHGs' as one of their main aims (Table 2). Interestingly, 9% of the LLs did not collect any data (Table 5) and yield and farm economic data were only recorded at 53% and 40% of LLs, respectively.

Table 5. Types of data collected by living labs

Data Collected in Living Labs (multiple options could be selected)	**Count**	**Percentage**
Soil health (e.g., structure, chemistry, biology, soil organic matter)	37	67%
Biodiversity indicators (e.g. pollinators, birds, mammals, plants)	31	56%
Crop yield (e.g. quality, quantity)	29	53%
Practical experience of implementing new practices or using new technology/products (e.g. problems encountered, time to carry out, changes required to machinery)	28	51%
Water quality	22	40%
Economics (e.g. farm profits, costs)	22	40%
Changes in application rates of fertiliser/pesticides by members of the living lab	21	38%
Crop health (e.g. disease, pests, weeds)	20	36%
Changes in uptake of different farming practices/products/technology by members of the living lab.	19	35%
GHG emissions (e.g. carbon dioxide, nitrous oxide, methane)	15	27%
Other	7	13%
No, we do not collect any data	5	9%
Don't know	1	2%

In terms of who the LLs shared data with (Table 6), 89% of them shared data with their own members, 64% shared data with farmers outside of their LL, 55% shared data with researchers, and 47% shared data with NGOs, trusts, charities, or governmental agencies. Only 35% and 33% of LLs shared their data with agri-business or partners in the agri-food supply chain, respectively.

Table 6. Who living labs share data with (multiple options could be selected)

Who does the living lab share data with?	**Count**	**Percentage**
Members of the living lab	49	89%
Farmers outside of the living lab	35	64%
Researchers	30	55%
NGOs, trusts, charities	26	47%
Government agencies	25	45%
Agri-businesses	19	35%
Agri-food supply chain	18	33%
Other	4	7%
Don't know	3	5%

Most of the LLs communicated data / information verbally during farm walks or at meetings (85%), or through reports or project briefs (71%, Table 7). Fifty three % used social media to disseminate information, while 42% used websites, and 33% used newsletters. It is not clear how much of the information reached farmers outside the LLs as only 20% of the LLs disseminate information via farmer magazines, although farmers from outside LLs could view findings communicated on social media platforms and websites.

Table 7. Communication channels used by living labs

Communication Form/Channel (multiple options could be selected)	**Count**	**Percentage**
Verbally on farm walks or at meetings	47	85%
Reports or project briefs	39	71%
Social media (e.g. YouTube, twitter/X, etc.).	29	53%
Via websites	23	42%
Newsletter	18	33%
Farmer magazines	11	20%
Other	7	13%
They are not communicated/shared	3	5%

Key messages:

- The most common types of data collected are soil health and biodiversity indicators.
- Economic data was only collected at 40% of LLs
- The least common types of data collected (36% or less of LLs) are information on crop health, changes in practices/uptake of new technology and data on GHG emissions.
- The collected data/information are normally shared among members of the LLs, farmers outside of the LLs, and researchers, but less widely shared with agri-business and the agri-food supply chain.
- The collected data/information are normally disseminated verbally on farm walks or at meetings, via reports or project briefs, and via social media.

2.2.6 Actions and outcomes of involvement in a living lab

Seventy five % of participants believed that involvement in a LL 'increased farmer environmental awareness', while 64% of participants reported 'wider adoption of best/sustainable management practices' after involvement in a LL. Additionally, 62% of participants reported 'increased farmer confidence' and 58% 'increased evidence-based decision making on farm'. On the other hand, only 24% of participants reported increased farmer welfare, 36% reported adoption of new technology/products and 44% increased application to agri-environment schemes (Table 8).

Table 8. Actions/Outcome of Involvement in a living lab (multiple options could be chosen)

Actions/Outcome of Involvement in Living Lab	**Count**	**Percentage**
Increased farmer environmental awareness	41	75%
Wider adoption of best/sustainable management practices	35	64%
Increased farmer confidence	34	62%
Increased evidence-based decision making on farm	32	58%
Increased application to agri-environment schemes	24	44%
Wider adoption of new products/technologies	20	36%
Increased farmer welfare	13	24%
Other	9	16%
Don't know	2	4%
None of the above	1	2%

Key messages:

- The top three outcomes of involvement in a LL were increased farmer environmental awareness (75%), wider adoption of best/sustainable management practices (64%), and increased farmer confidence (62%).
- The least reported outcomes of involvement in a LL were increased farmer welfare (24%), adoption of new technology/products (36%) and increased application to agri-environment schemes (44%).

2.2.7 Major challenges in running a successful living lab

'Securing long-term funding and ensuring financial viability of a LL' was chosen by far more survey respondents (87%) than any of the other challenges listed (Table 9). Additionally, 51% of respondents regarded "collecting and analysing data to assess economic and environmental benefits" as one of the major challenges. 'Continued engagement and commitment of participants of the living lab', 'collecting evidence of changes in practices and uptake of technology by farmers', and 'difficulties in scaling up the impacts of the changes in practices beyond the farm scale' were chosen by 38, 35 and 35% of respondents, respectively. Finding farmers and researchers to engage in the LL was identified as a challenge by 16 and 18% of respondents, respectively.

Table 9. Major challenges in running a living lab (multiple options could be chosen)

Major Challenges in Running a Successful Living Lab	Count	Percentage
Securing long-term funding and financial viability of the living lab	48	87%
Collecting and analysing data to assess economic and environmental benefits	28	51%
Continued engagement and commitment of participants of the living lab	21	38%
Collecting evidence of changes in practices and uptake of technology by farmers	19	35%
Difficulties in scaling up the impacts of the changes in practices beyond the farm scale	19	35%
Lack of support from the agri-food supply chain and consumers	10	18%
Finding/engaging with researchers with relevant expertise.	10	18%
Finding farmers willing to participate in research trials	9	16%
Other	5	9%

Key messages:

- Securing long-term funding and financial viability of a LL was identified as the most common challenge in running a successful LL, followed by collecting and analysing data to assess economic and environmental benefits.

2.3 Summary of key findings

The online survey results give an indication of the characteristics, aims and operations of current farming initiatives across the UK (noting that 81% were from England) that could form the basis of a national network of LLs. There is currently no single database for registering LLs in the UK, and therefore it is not possible to establish the coverage of our survey or its representation. However, the findings are very similar to those reported by Staley et al. (2023), who found that 76% of LLs, in their survey of 22 LLs, contained less than 50 farms (we reported 78% involved 50 or fewer farmers), that approximately 50% had been running for 5 years or less (we reported 68%), and that arable and livestock farms are the most common type of farms involved in LLs. As found in our survey, Staley et al. (2023) also reported that biodiversity and soil health were the most frequent target outcomes, and data collection most frequently focused on these indicators.

While only 9% of LLs in our survey reported no data collection was taking place, 51% of respondents regarded 'collecting and analysing data to assess economic and environmental benefits' as one of the major challenges of running a successful LL. In addition, only 53% and 40% of LLs were collecting data on yield and farm economics, respectively, meaning that many LLs could not show the impact of adopting new practices and/or technology on farm profit. Interestingly, while 75% of LLs included costs for taking measurements/collecting data, only 56% included costs for data collation, analysis and reporting. This highlights that the full potential of the data being collected is not being realised. Staley et al. (2023) reported that just under 40% of respondents in their survey were not currently collecting data, but of these

75% would like to collect data if given more funding, knowledge or support. Overall, findings from both surveys indicate that there is potential for more effective data collection and analysis if funds allowed. However, securing long-term funding and financial viability of LLs was the number one challenge highlighted by 87% of respondents in our survey.

As reported by Staley et al. (2023), sharing of data, information, and best practice was predominately carried out at meetings / farm walks (85%). Seventy five %s of participants believed that involvement in a LL increased the environmental awareness of farmers and 64% of participants reported wider adoption of best/sustainable management practices. On the other hand, only 24% of participants reported increased farmer welfare, 36% adoption of new technology/products and 44% increased application to agri-environment schemes. Given that one of the main aims of LLs is to encourage uptake of new technology and engagement with agri-environment schemes, these values seem relatively low. This calls for in-depth exploration on whether engagement with LLs does actually lead to substantial behavioural change (as it would be expected, Okumah et al. 2021) or whether there is not sufficient capacity within the LLs to measure behavioural change (which requires the involvement of social sciences, which are likely to be much less represented amongst the skill sets of LLs leads and facilitators).

Forty seven % of the LLs in our survey were funded by government, while many receive from other sources such as NGOs and charities, and agri-supply chain and water companies. Many LLs are also predominantly self-funded by farmers, as reported by Staley et al. (2023). However, as discussed above, the level of funding has a big impact of the type and amount of data collected and analysed.

Overall, the survey results show that there are lots of small and very small LLs (78% have 50 farmers or fewer, 58% have 25 farmers or fewer), most of which have only been in operation for less than 5 years, consisting of mainly livestock and arable farmers, along with researchers and NGOs/charities. The main focus of LLs was improving soil health and biodiversity. However, data collection is identified as a major challenge, along with securing long-term funding. In addition, data collation, analysis and reporting are only occurring at about half of the LLs. Information and data are predominately shared between participants of LLs at meetings and farm walks.

3. Stakeholder consultation on the design of a national network of living labs

3.1. Approach

The consultation comprised two stages. First, an in-person stakeholder workshop was held on 28 Nov 2024, from which a first draft of the workshop outputs was produced. This draft was shared with workshop participants and a wider set of stakeholders, including those who had been invited to the workshop but could not attend. The workshop included experts from industry, academia, and policy. See Appendix 2 for a full list of the organisations represented and Table 10 for the types of stakeholders consulted.

Table 10. Types of stakeholders consulted

Stakeholder Type	Attended Workshop	Additional stakeholder who did not attend workshop	Total
Farmer	4	0	4
Academic	4	1	5
Consultancy – Business	4	0	4
Charity – giving advice to farming community	7	0	7
Non-departmental public body	1	0	1
Government Department	2	2	4
Total	**22**	**3**	**25**

The workshop took place at the University of Leeds farm in West Yorkshire, with the participation of 20 stakeholders and two representatives from Defra. The aim of the workshop was to explore what form a network of LLs could take and how it should function. The workshop covered the following topic areas and involved a range of facilitation techniques (break-out table, carrousel discussions, interview-style and plenary discussions):

1. Structure, operation, management and scale of a LLs network
2. Data collection, analysis, storage and use
3. Funding structure and costs
4. Knowledge sharing and communication strategies
5. Impact and evaluation

The workshop started with an overview of the concept of a LL – again in acknowledgement that not everyone uses the term and that it is in any case subject to interpretation. They were presented as initiatives and structures aimed at bringing people together to address sustainability challenges, carry out research, innovation and knowledge exchange in real life settings, and to drive change. It was highlighted that LLs have been used in a range of contexts, including agriculture.

During the workshop, a 'taster' of the survey results was presented, to help set the scene and stimulate discussion. The workshop ended with a presentation and discussion on Defra's Viable Systems Model (VSM) for the Governance Structure of a network of LLs.

The detailed workshop outline is available in Appendix 3.

A further three stakeholders provided input to the preliminary workshop report (see details in Table 10). In section 3.2 we provide account of the discussions around each of the four areas that were covered during the workshop, identifying the main themes that emerged during the discussions and distilling the key messages that serve as a basis for recommendations in section 4.

3.2 Results from the stakeholder workshop

3.2.1 Value of a UK network of living labs

There was consensus among consulted stakeholders that establishing a UK network of LLs has the potential to be a high-impact mechanism for generating research, fostering knowledge exchange, and driving innovation in agriculture. It was thought a network of LLs would strengthen connectivity between individual LLs across the UK, facilitating collaboration and data sharing among diverse stakeholders while accelerating the adoption of sustainable practices through sharing experiences, findings, and best practices. The snowball effect, where ideas spread from one group to another, was seen as a major advantage, leading to widespread uptake of sustainable practices and maximising the return on investment.

However, to ensure efficiency and avoid duplication, attendees emphasized the importance of mapping out existing initiatives, conducting a stakeholder analysis (to identify level of involvement, interest, and influence), identifying organisations already delivering similar outcomes, and integrating these efforts into a LLs network to preserve valuable partnerships, i.e. participants cautioned against "reinventing the wheel". By leveraging past lessons learned and building on established structures and expertise, it was felt that a LL network could maximize its impact, accelerate knowledge exchange, and ensure efficient resource allocation, ultimately creating a stronger, more connected, and effective system for supporting the transition to more sustainable agriculture.

3.2.2 Structure, operation and management of a national living labs network

3.2.2.1 Structure of a living labs network

Several participants suggested that a LLs network should be made up of a number of individual 'hub and spoke' LLs. Each of these individual LLs could be structured around a research-intensive farm serving as the demonstration 'hub'. The hub farm may be able to conduct detailed comparative research trials and host knowledge exchange events. Branching out from the demonstration hub could be the 'spokes' or 'satellites'; larger field-scale or split- field trials established on commercial working farms with different contexts, forming a satellite structure. This approach would create a group of LL farms collectively adopting and testing innovations in the same vicinity with similar climates, and guided by the hub farm. It was also suggested that the hub could be responsible for compensating farmers to trial new practices and technologies in the satellite farms. Integrating working farms into the network would allow for direct comparisons, such as a 'standard' farmer following business-as-usual practices versus a nearby field or farm implementing different practices. It was acknowledged that commercial farms need to be at the heart of a LLs network.

There was much discussion about where the hub farm for each individual LL should be located. Some participants suggested that it would be more efficient to base the LL hub farm within already established LLs, while others proposed leveraging and expanding Linking Environment And Farming (LEAF) Innovation Centres, and others suggested using research farms (e.g. university and college farms). However, various advantages and disadvantages of

using research farms versus commercial working farms as the 'hub' were highlighted, which are summarized in Table 11.

Table 11. Advantages and disadvantages associated with hosting living lab hubs on research farms compared with 'standard' working farms.

Location	Advantages	Disadvantage
Research farm	• Greater level of control over trial activities to ensure research integrity • Researchers on site, leading the trial to ensure research integrity • Committed to delivering research long-term • Good access to infrastructure and research facilities	• Potentially less buy-in from farmers as research not conducted on working farm • Results may not be reflective of standard working farm • Standard farming equipment may not be used • Research farm may not be run as a 'real farm' so less information on finances
Working farm	• Potentially greater level of buy-in from local farmers • Greater success of farming practice due to experienced farmer who is knowledgeable about their land • In depth practical advice by experienced farmer • The outcome should be immediately transferable to other real life settings	• Less control over the trial with greater risk to research integrity, due to the greater number of people and contractors working on farm • Possible challenges with long term commitment from farm and farmer • Implementing research trial design might not fit to standard farm practice resulting in extra time, equipment and resources required of the farmer • Possible challenges with infrastructure and access to research facilities and equipment

Participants raised concerns about farmers' willingness to commit to research trials and the extent of financial support available for those conducting long-term research. Challenges associated with trials on working farms were also discussed, including infrastructure limitations (e.g., electricity supply in fields), access to research equipment and facilities, and the availability of personnel. Additionally, reduced control over trial activities due to the involvement of various farm workers, including contractors was highlighted as a potential risk to research integrity. Thus, there is potentially a trade-off between scientific rigour and how attractive participating in a LL will be for farmers. These challenges also highlight why farms that have experience of carrying out trials may be better suited to being the hub of the LL farm. It should be noted that funding from government may help to surmount the challenges encountered when carrying out trials on real farms.

Participants highlighted that various individual LLs already focus on different environmental and agricultural concerns, presenting an opportunity for the LLs network to build on existing

structures. However, they noted that there is currently no national database cataloguing these LLs, what they focus on and how they are managed.

There was a consensus that the LLs network should be overseen by a coordination team/organisation to help maximise its value. Participants debated the pros and cons of different stakeholders or organisations taking on this role. Potential coordinating groups mentioned included national parks, crop- or livestock-focused groups, and The Soil Association, which oversees 'Innovative Farmers'—a program where farmer groups collaborate with researchers on specific topics. It was considered crucial to select a network coordinator or organisation that speaks the right 'language' and has the trust of the wider community. The value of an advisory board to provide guidance, act as a sounding board and offer insights to inform decision-making to a LL network initiative was also mentioned.

Key messages:

- A LLs network could be made up of a number of individual 'hub and spoke' LLs that comprise of a research intensive farm hub with a satellite of working farms carrying out trials.
- A LLs network should be overseen by a team/organisation to coordinate the LLs to maximise its value. Various types of organisations could take this role but it's critical that they are a trusted by the wider community.

3.2.2.2 How should the living labs network operate?

Participants agreed that the overall aim and strategy for a LLs network should be determined at the national level, ideally linked to knowledge gaps and potential impacts of priorities. Who determines the overall aim and strategy was not discussed in the workshop – it could be the funder and/or a LLs network coordination team. However, participants felt that the specific focus and methods for achieving the overall aim of the network should remain flexible, allowing individual LLs to decide on the best approach for their needs and context. There was strong agreement that farmers should play a key role in deciding, alongside other stakeholders, which innovative practices or technologies to trial in response to these needs. These practices and technologies would then be tested in the context and scale at which they are intended to be adopted — on local farms under real agricultural production conditions. Achieving this requires strong collaboration among stakeholders to integrate diverse perspectives, questions, and methods, ensuring that individual LLs effectively defines its priorities and selects the most relevant innovations to trial. It also requires effective leadership of individual LLs as well as the network.

To operate a LLs network effectively participants highlighted the need for fostering diverse stakeholder collaborations, a strong focus on co-creation with farmers and creating a real-world testing environment, which are discussed in this section. Other factors to consider are data collection and collation (see section 3.2.3) and effective knowledge exchange (see section 3.2.5).

Operational integrity affects not only the quality of research data and outcomes but also the level of engagement and buy-in from stakeholders. Therefore, multiple stakeholders should

be involved in the operation of a LLs network, including farmers, researchers, governmental institutions, industry representatives, non-profit organisations, and the public. Participants raised several points regarding the pros and cons of involving different types of stakeholders in LLs operations and how this might influence the selection of new practices and technologies to be tested at individual LLs (see Table 12). Participants agreed that involving 'real' farms and farmers in research is essential to ensure that practices are both financially and practically viable, while remaining relevant to local conditions. Participants also emphasized the need to involve scientists and researchers to help design data collection methods (see Section 3.2.3.2). It was considered that their involvement would enhance policy credibility and ensure the predesign of replicable, statistically robust experiments. It was also acknowledged by some participants that farmers often receive help from advisers, and that their role should not be underestimated in supporting the adoption of new practices and technology. In Scotland and Wales, the government fund third party delivery bodies to provide farm advice. Thus, it is important to include farm advisors in LLs. A particular concern raised by participants was the potential for certain groups (e.g., supply chain actors) to dominate or steer the interests of the individual and network of LLs in their favour, resulting in a power imbalance. It was suggested that this risk could be mitigated through the design of a well-structured governance framework for both the network and individual LLs.

Not-for-profit organisations were suggested as strong candidates for running and coordinating individual LLs, acting as knowledge brokers between the various stakeholders involved (e.g. NFU, CLA, AHDB were mentioned by participants, but there are many other organisations that could fulfil this role). Overall, there was consensus on the need for 'honest brokers' with relevant and specialised expertise to lead/facilitate individual LLs.

Table 12: The advantages and disadvantages of involving different stakeholders in the operation of the living labs network

Stakeholder	Advantages	Disadvantages
Farmers	• Awareness of problems and issues • Practical, time requirements and financial/business knowledge	• May need support with innovations and new practices (from trusted advisers) • Potential for focus on productivity rather than sustainability but this is business driven so need support from supply chain and agri-environment schemes • Lots of different contrasting priorities and opinions
Researchers	• Can support in trial design and ensure trials are scientifically robust.	• Slow to report results and/or communicate effectively with farmers (how can this be improved?)

	• Can support with research projects and person time for data collection and analysis (provided funding is available)	• May over complicate farm research • May prioritise own research interests
Supply chain e.g. supermarkets, processors, seed suppliers, agronomists, etc.	• Could support financially • Increased awareness of the results due to their involvement could help to identify ways in which they could support • Could provide down-stream supply chain insights • Could provide research insights not in the published literature	• May direct LLs network to support commercial interests • Could use data from the LLs to support commercial interests • Other stakeholders may not want to share information in the presence of the supply chain (creating mistrust and possible conflict) • May create power imbalance between stakeholders

Key messages:

- Overall aim and strategy for a LLs network should be determined at the national level, but individual LLs could decide how to achieve this for their context.
- Multiple stakeholders should be involved in the operation of a LLs network, but their involvement comes with pros and cons.
- Need for a well-structured governance framework for both the network and individual LLs to ensure stakeholders work effectively together.

3.2.2.3 Which type of farming systems should a living labs network include and where and at what scale should it operate?

Participants agreed that a LLs network should include representatives from all farm systems, as these systems operate differently and will be impacted by adopting new agricultural practices and technologies in different ways. Therefore, the LLs network should encompass different farming systems (livestock, arable, and mixed), farm sizes (small, medium, and large), research scales (research trials, field scale, and whole farm scale), and locations (varying climates, soil types). Participants were particularly keen for the network to represent UK farming systems, acknowledging that UK farming consists of approximately 60% grassland and 40% arable land. They also recognised that each farm has its own context (climate, soil type, size, system). Others pointed out the legacy impact of historical practices and crop rotations, emphasising the importance of understanding the historical context of farms/LLs to properly interpret the data being collected.

One suggestion to address the diversity of farm types and regions was to have LLs in each of the devolved nations, organised into sectorial and/or regional foci. Another suggestion was that a LLs network should cover landscape archetypes in the UK (e.g., Natural England's National Character Areas, which represent landscapes with distinct and recognizable characteristics at the national scale). However, as there are 159 of them, it is unlikely that each will be represented by an individual LL. Alternative classification schemes could include the SoilScapes classification of soil types into 27 classes or new Defra soil classification that places soil into 12 groups based on erosion and compaction risk.

Because the LLs network needs to be able to answer questions relevant to many types and sizes of farms across the country, it needs to be inclusive and accessible to ensure broad participation. Therefore, the location of the individual LLs is crucial—not only for answering these questions but also to ensure stakeholders can easily access and attend knowledge exchange events. However, where the LLs should be and how decided was beyond the scope of the workshop, and will partially depends on funding availability.

It was emphasized that the LLs network should focus on practices that are future proof, particularly in relation to the changing climate. For example, testing practices that are resilient under drought and heavy rainfall events. Participants agreed that the spatial scale of research, measurements, and trials conducted by the individual LLs should depend on their specific research question. All spatial scales are seen as important and relevant, ranging from plot to field to farm to catchment to landscape to region. In some cases, a nested approach (multiple spatial scales) would be most appropriate. For instance, if the goal is to assess crop yield, the field scale is best (since the plot scale may overestimate yields). However, if the aim is to examine the impact on water quality, the catchment scale would be more suitable (provided that inputs from other sources are accounted for). Additionally, it was noted that comparisons between treatments and control groups are easier to manage at smaller scales. It was acknowledged that the scale of adoption (at the field and farm level) by farmers often differs from the scale at which the benefits of adoption are quantified.

Participants also highlighted the importance of considering the temporal scale (i.e., the time required to observe change), as this can vary depending on the variables being measured. There was extensive discussion about the role regenerative agriculture could play in improving farm resilience, noting that achieving meaningful benefits may take decades. As a result, long-term funding for LLs network would be necessary to fully capture the benefits of transitioning to regenerative agriculture. In this context, the impact of weather on farming was also raised, emphasising the need for long-term monitoring to assess the effects of climate change and extreme events on crop yields, ecosystem services, and other factors. Additionally, participants stressed the importance of documenting and communicating failures such as instances where certain approaches did not work as expected.

- ***Key message:***
- *A LLs network should be representative of the range of farming systems, climates, soil types and farming business across the UK, possibly being organised around sectoral and geographical foci.*
- *Multiple spatial scales have a role to play in LLs (from field to catchment); and longevity is important to account for temporal variability.*

3.2.3 Data collection, storage and use

3.2.3.1 What type of data should be collected?

There was strong consensus that the types of data collected should align with the aims of a LLs network and help provide farmers with actionable insights to help create sustainable and profitable farming systems. However, it was noted that individual LLs are unlikely to all be

collecting the same data, given different priorities and farm contexts. Therefore, participants suggested the collection of a standardised set of common metrics (baseline data) at each individual LL. A generic framework could be established to define this set of common metrics. Individual LLs would have the flexibility to collect additional data beyond this baseline data to address their specific research questions. The importance of long-term data collection was also highlighted.

Participants proposed a wide range of potential indicators and data types (see Table 13). Notably, these indicators extended beyond environmental and agronomic variables to include economic and social factors, which were also considered important.

In terms of farm profit, some participants suggested that production costs could decline due to reduced input costs. However, it was noted that there is limited evidence on how transitioning to sustainable agriculture impacts farm profitability. A LLs network could play a key role in collecting, compiling, and sharing this information. Additionally, some participants proposed that beyond farm-level economics, LLs should also assess broader financial benefits, such as cost savings for county councils and government agencies (e.g., Natural England and Environment Agency). For instance, reduced sediment on roads and decreased downstream flooding could generate economic benefits for society that should be captured.

Table 13. Types of data that would be useful to collect in the living labs network

Environmental	**Economic**	**Agronomic**	**Social**
• Carbon footprint; Farm-gate nitrogen and phosphorus budget • Soil health – e.g. worms, carbon and or organic matter, infiltration rate, structure, water stable aggregates, etc. • Water & air quality • Soil hydrology • Biodiversity – above and below ground species • GHG fluxes • Climate variables – e.g. rainfall, temperature, radiation etc. • Foodborne pathogens • Antimicrobial resistance (AMR)	• Cost of production • Revenue from selling produce • Net profit margins • Input costs – labour, fuel, seed, pesticides, fertiliser, etc. • Beyond the farm-gate impacts – e.g. economic benefits for society	• Crop yield and quality • Tillage methods • Crop health • Animal welfare • Dates of all operations, e.g. Pesticide and fertilisers use – amount and timings • Crop nitrogen use efficiency • Grazing management • Manure/slurry management – including chemical analysis	• Mental health & emotional well-being • Attitudes • Behaviours • Participation in previous agri-environment schemes • Risk perception • Barriers to change • Social norms

Key messages:

- *A framework of minimum indicators that all LLs could collect to establish relevant baselines should be established.*
- *This framework should include environmental, agronomic, and economic data, but also, and this is deemed as important, social factors.*

3.2.3.2 Who should collect the data?

It was acknowledged that different stakeholders could contribute to data collection in various ways. Farmers already collect a significant amount of agronomic and economic data, as well as some environmental data, which could be valuable for the LLs network. For example, farmers are collecting and reporting data as part of specific public and private scheme requirements and this is likely to include some of the data types presented in Table 13. Therefore, it is essential that there is flexibility in data requirements so that, where it makes sense to do so, farmers can be using the same data to report for different purposes. However, who owns the data may determine how it can be used.

Participants noted that farmers might struggle to collect additional data due to time constraints or a lack of familiarity with certain sampling methods, lack of equipment and facilities needed to take the measurement, necessitating additional support. This support could range from financial assistance to training, and equipment provided by researchers or organisations. Some participants suggested that platforms such as 'Gatekeeper' and 'Muddy Boots', which are already used by many farmers, could be used for data collection.

Certain types of data, particularly those requiring specialised expertise (e.g., GHG flux measurements), were considered more suitable for collection by scientists and researchers. In line with the proposed LLs network structure (see Section 3.2.2.1), it was suggested that more intensive data collection could take place at a 'hub farm', while lighter-touch, less intensive monitoring and data collection could occur at satellite farms, primarily carried out by farmers.

The potential role of citizen science in the data collection process was mentioned but not explored in depth. However, training volunteers to assist with data collection was seen as a beneficial way to alleviate pressure on both farmers and researchers. To maintain data quality and consistency, adequate training would be essential to ensure that samples and measurements follow standardised protocols and use appropriate equipment.

- ***Key messages:***
- *Data should be collected by a range of stakeholders that includes farmers, scientists and potentially the public.*
- *Guidance and financial support should be given to ensure data is collected according to standard protocols, including training of participants - and volunteers (if involved).*

3.2.3.3 Data storage, analysis, and access

There was consensus that data storage and analysis should be structured across multiple tiers, including, individual farm, individual LL and the LLs network. For example, some farmers may already be using tools or calculators to capture and store data.

The value of a shared data repository and data analysis across a LL network was highlighted, as it would allow new research to build on past findings, preventing duplication of efforts and past mistakes. Analysing data at the network level would provide additional value beyond what is currently achieved, where individual projects primarily analyse their own data in isolation. However, there could be challenges with data collection and analysis if all LLs are implementing different practices and measuring different outcomes, highlighting the need for clear aims, objectives and protocols for the LLs and governance at the national scale (see section 3.2.2.2)

Participants agreed that a clear workflow for data storage should be developed and implemented if funding for a LL network is secured. There was extensive discussion on how best to establish a data repository for all LLs in the network, with key considerations including:

- The need for a clear quality control process for all data.
- A standardised reporting procedure to ensure consistency.
- The inclusion of metadata with all collected data.
- Farm management data to help interpret other collected datasets, such as soil health, GHG emissions, and biodiversity data.
- Anonymisation of data in compliance with GDPR regulations.
- Formatting data in a way that enables efficient collation and analysis—potentially using AI and machine learning. It was suggested that involving data analysts from the outset could help guide database setup and software selection, ultimately saving money in the long run, e.g. Enterprise Data Platform.

Participants felt that these considerations could be addressed within a Data Management Plan, overseen by a Data Manager responsible for maintaining data quality, consistency, and metadata standards. There was limited discussion about which organisation should host the central database, though UKCEH was mentioned as a potential option.

At the network level, the commissioning body for the LLs network could appoint an organisation to collate and analyse the data collected by individual LLs and stored in the central database. Individual LLs should involve research partners and data consultants to analyse its data and answer its specific research questions. These research partners would likely be active participants within the LL network.

Participants also highlighted the importance of engaging with long-term networks already collecting relevant data, as this could provide a broader spatial and temporal context for the LLs network.

There was broad agreement that members of the individual LLs forming part of the network, as well as Defra and the devolved nations, should have access to the data. Participants also agreed that farmers should have access to their own data and retain some control over how and by whom their data is used. There was debate over whether the data should be open access to everyone, including the public, or whether access should be restricted with different permission levels. Some participants expressed concerns that unrestricted access might discourage farmers from joining the LLs network due to issues of data ownership and the risk of misuse by external actors.

Several participants suggested developing an interactive online Geographic Information System (GIS) map, hosted on a dedicated LLs network webpage, to make certain data publicly visible. However, concerns were raised about anonymisation and ensuring that precise data collection locations were not exposed. Additionally, the idea of an online dashboard was discussed—potentially restricted to LL participants rather than being fully open to the public. While there was no detailed discussion on whether data could be downloaded directly, it was suggested that external parties could request access through a data manager, central data centre, or the commissioning body. Alternatively, another possible approach was discussed, where there is restricting access to raw data while making key findings and analysed results more widely available.

Views were mixed on whether private sector companies should be allowed access to the data for commercial purposes. Some participants felt that companies should pay for access under a licensing model, while others believed the data should not be used for profit. Some also pointed out that commercial access could drive innovation and funding for LLs. Despite these differing views, there was consensus that clear data-sharing protocols should be developed both for individual LLs and the broader LL network.

Finally, it was emphasised that the cost of data storage and analysis should not be underestimated and must be accounted for when securing funding for the LL network (see section 3.2.4).

- ***Key messages:***
- There should be a central database for the LLs network and a need for a data management plan and data manager to oversee it, with clear protocols around data sharing.
- Data storage and analysis should occur at multiple levels (individual LL and for the network), but there is added value in analysis of the data across the network.

3.2.3.4 Data use

Participants identifying several key priorities on how to effectively use the data collected by the LLs network. First, building a strong evidence base is essential to demonstrate the effectiveness of regenerative and sustainable farming practices. Findings should be widely shared through knowledge exchange events and translated into actionable insights for farmers. Second, the data must inform policy and decision-making, with calls for faster policy responses to emerging insights. Schemes such as Environmental Land Management (ELMs)

could help accelerate the shift toward sustainable agriculture. Third, engaging the food supply chain is crucial, as industry actors currently do not pay fair prices for sustainable practices. LL-generated data should highlight environmental benefits and advocate for fairer pricing mechanisms. Finally, improving models and assessments is necessary to ensure usability and transparency. The data should contribute to refining conceptual models and Life Cycle Analysis (LCA), helping assess the broader regional and national impacts of different farming practices.

Overall, there was consensus that data from the LLs network should drive change at multiple levels, from influencing individual farmers to shaping national agricultural policies and supply chain dynamics. The importance of stronger institutional links was highlighted to ensure that insights from the network are acted upon in a timely and effective manner.

- ***Key messages:***
- Data needs to be used to build an evidence base on the efficacy of sustainable / regenerative practices, for knowledge exchange, build models, in life cycle analysis, and inform policy making.

3.2.4 Funding requirement for a living labs network

There was strong consensus among participants that a LLs network should be fully funded, with no costs imposed on those running or implementing the research in the individual LLs. Many participants emphasised that farmers' time and expenses should be covered for carrying out trials in a LLs network.

Participants highlighted the need for funding to cover all operational costs of the LLs, including:

- Consumables (e.g., equipment, materials, and resources).
- Personnel costs for organising meetings, events, and peer-to-peer learning activities.
- Time for collaboration with other projects and learning about new or alternative farming practices.
- Mentoring and networking, which are key aspects of LLs but are often not fully funded in current initiatives.

To ensure maximum impact, participants emphasised the need for long-term funding for critical roles, such as:

- A network coordinator/facilitator/team (see section 3.2.2) to oversee LLs network operations.
- A database manager (see section 3.2.3.3) to ensure data quality and accessibility.

Additionally, funding should support:

- Participants' attendance at events, conferences, and field trips to enhance knowledge exchange.

- Time for providing impartial advice to all farmers involved in a LLs network.

Participants stressed that a LL network must operate on a long-term basis, but the scale of ambition would influence its total annual running costs. A cost-effective model, including consistent protocols across individual LLs, was suggested to streamline efforts, reduce costs, and improve efficiency in delivering both scientific research and peer-to-peer knowledge exchange.

Many participants emphasised the cost-effectiveness of a LLs network, highlighting that the environmental and socio-economic benefits it generates would outweigh the costs of running it. In this sense, participants felt that LLs should be recognised as value for money.

Participants expressed contrasting views on how the LLs network should be funded. Many felt that Defra and devolved authorities should provide financial support, arguing that the environmental and socio-economic benefits of transitioning to sustainable farming are critical to society as a whole. Some suggested that Defra could purchase farms and run them as demonstration sites, similar to how ADAS farms were previously managed when in public ownership. Others believed that LL demonstration farms should not operate commercially but instead focus on sharing knowledge with commercial farms. There was concern over the lack of research/demonstration farms, with some proposing that university and college farms could serve this role.

In contrast, some participants felt that businesses — particularly those in the supply chain — should contribute financially to the LLs network. Landscape Enterprise Networks (LENs) were cited as a successful model, where public and private-sector organisations collaborate to fund nature-based solutions in each geographical area. One suggestion was to explore fundraising mechanisms, such as introducing paywalls for data access, with revenues reinvested into the LL network (e.g., through a Community Interest Company).

Despite the potential benefits of private investment, participants raised several concerns:

1. Data ownership and accessibility – Ensuring data remains open and available for the 'greater good', rather than becoming exclusive to commercial interests.
2. Power imbalance – Large agribusinesses could exert influence over farmers and skew priorities if they controlled funding.
3. Transparency – Clear governance structures would be necessary to prevent conflicts of interest and ensure equitable decision-making.

Participants discussed various approaches for how individual LLs should apply for and receive funding. One option is for stakeholder groups to collaboratively apply for funding through a LLs funding call. In their proposals, applicants would need to outline the practices and technologies they plan to trial, the specific research questions they aim to answer, the data collection strategy and metrics, the knowledge exchange events they intend to deliver, and a detailed budget for implementation. A key funding criterion would be that all collected data and information must be shared within the national LLs network database to ensure broader impact.

Thoughts about funding duration and oversight were also explored. Participants emphasised that funding should be for a minimum of five years to provide stability and allow for long-term research and that there should be periodic reviews (potentially carried out by the network facilitator/team) to ensure funds are being used appropriately and achieving intended outcomes. The discussion also addressed how best to compensate host farmers for their participation. Some participants felt that advance payments could be difficult to justify but acknowledged that asking farmers to pay upfront would shift financial risk onto them—when the LLs should bear that risk instead. A quarterly payment system was suggested to ensure consistent cash flow for farmers, enabling them to effectively carry out trials and research.

- **Key messages:**
- The LLs network should be adequately funded over the long-term
- While public funding was seen as the preferred option, there is interest in exploring private sector contributions if data ownership, accessibility, and power dynamics were carefully managed.
- A key funding criterion for individual LLs should be that all collected data and information must be shared within the national LL network database to ensure broader impact.

3.2.5 Knowledge sharing and scaling up

3.2.5.1 Knowledge sharing and communication strategies

Participants explored various ways to effectively share results, knowledge, and information across individual LL and the national network. Key proposed knowledge exchange methods included:

- Field trials and on-farm demonstrations to showcase real-world applications of new technologies, sharing both successes and failures for maximum learning.
- Peer-to-peer learning, including field visits, study tours, and farmer-led events, to foster direct exchange among practitioners, while national and international LLs collaborations expand knowledge-sharing globally.
- Establishing mentorship networks to support farmers in adopting new practices, complemented by digital platforms such as webinars and online forums to build a community of practice.
- Digital knowledge sharing through videos, podcasts, and blogs—integrated with existing platforms like 'Agricology', 'Innovative Farmers' and 'British On-Farm Innovation Network (BOFIN)' to help address fragmentation.
- A dedicated communications strategy to include press releases, social media engagement, an annual LLs conference, and a specialized LLs journal or magazine.
- User surveys and interviews to provide ongoing evaluation and insight into new technologies.

Addressing the UK's extension service gap, LLs should fund technical advisory support for farmers while engaging with policymakers to ensure LL generate evidence informs agri-environment schemes. Additionally, integrating LLs networks into further and higher

education curricula will equip future farmers, advisors, and agronomists with the skills needed for sustainable agriculture.

One of the main challenges in knowledge exchange is ensuring the continued engagement of busy farmers and other stakeholders over time. Many participants highlighted that while some farmers are actively involved, others remain less engaged, often leading to the same groups attending events and benefiting from knowledge-sharing opportunities.

It was agreed that knowledge exchange plays a crucial role in fostering trust, confidence, and collaboration among farmers, researchers, and industry stakeholders. Therefore, participants said that to maximise participation and impact, it is essential to (i) tailor outreach strategies to reach a broader audience, particularly those who are less engaged and (ii) use existing farmer networks to encourage participation and peer-to-peer learning.

Participants agreed that a hybrid approach, combining online and in-person activities, would be most effective. In-person group discussions were seen as irreplaceable for meaningful exchanges, hands-on learning, and building strong relationships. Online platforms (e.g., webinars, social media, and podcasts) provide accessible and flexible options for farmers who may not be able to attend in-person events. A well-structured approach to knowledge exchange will help ensure that a diverse range of stakeholders stay informed and engaged over the long term.

Key messages:

- *There are already multiple ways to share information/knowledge including farm visits, online platforms, social media, newsletters, workshops and conferences, with a range of stakeholders (including farmers, researchers, businesses, NGOs, policy makers and education establishments).*
- *There can be challenges maintaining engagement and reaching busy, less engaged stakeholders.*

3.2.5.2 Ensuring scaling up and impact of the living labs network

Discussions explored how to best use data and insights from a LLs network to address questions at scale and ensure impact of the LLs network. The following key points were raised:

- Engaging Multiple Organisations for Greater Impact: At the start of the LLs journey, broad engagement with key organisations is essential for momentum and effective knowledge-sharing. Participants recommended partnering with groups like the Woodland Trust, Soil Association, and Rivers Trusts to expand outreach, integrate insights with existing initiatives, and avoid duplication. Collaboration can create a ripple effect, extending LL-driven farming improvements beyond individual farms, influencing broader agricultural landscapes, and generating lasting environmental and socio-economic benefits. Joint events with industry stakeholders can further amplify impact. To ensure success, participants stressed the need for dedicated budgets, clear roles, and structured partnership management. The Sustainable Farm Networks (SFN) is a recent initiative that connects diverse 'demonstration farm networks' across the

UK to share experiences, findings and best practice by bringing network facilitators together and learn from each other and be more than the sum of their parts.

- Leveraging Existing Datasets & Platforms: Participants emphasised the importance of embedding LLs datasets into existing platforms to enhance data value, link with established agricultural databases, and improve decision-making while avoiding duplication. While big data offers insights, clarity on research focus is essential, as context and statistically robust datasets are crucial for meaningful conclusions. Citizen science could support large-scale data collection if clear protocols and farmer-friendly tools ensure quality. Farmers access information through various platforms such as Google, podcasts, webinars, and social media, highlighting the need for a multi-channel dissemination approach.

- Engaging with European Living Labs: Participants highlighted the value of engaging with European LLs, particularly through European Network of Living Labs (ENoLL), to share best practices, accelerate innovation, and adapt proven frameworks to the UK context. Learning from existing initiatives can help overcome challenges, build research partnerships, and secure funding, enabling the UK to scale its LL network more efficiently and maximize impact.

- Economic Justification of Sustainable Farming Systems: There was a consensus that cost-effectiveness is key and farmers need to see clear economic benefits for transitioning to sustainable farming systems. The LLs network needs to analyse and share economic business cases and models that justify change in order to speed up adoption of sustainable farming.

- Ensuring Living Labs Drive Real-World Change: There was consensus that outputs must lead to action and the LLs network must translate research into tangible on-farm changes. Again, there was mention of the lack of a UK farm extension service in comparison to the USA. There was discussion about whether a UK LLs network could play a similar role to the USA University Farm Extension model that provides non-formal, research-based education to farmers. Many participants felt research dissemination is currently poor in UK and that the LLs network could significantly improve knowledge transfer and practical adoption.

Key messages:

- Scaling up and impact can be best achieved by (i) engaging with multiple organisations/stakeholders from the beginning, (ii) engaging with existing databases/platforms, (ii) engaging with other LLs networks in other countries
- Sharing economic business cases from different farming systems to reduce risk to transitioning is important.

3.2.6 Measuring the success of a living labs network

Participants agreed that the ultimate measure of success for the LLs network would be the development of evidence to contribute to an economically strong, environmentally sustainable, and socially resilient farming systems across the UK. As the LLs network aims to accelerate the transition to sustainable agriculture, evaluating the rate of adoption of new practices and technologies over time is crucial. In addition, participants highlighted the need for key performance indicators and an evaluation framework, as outlined below.

Participants emphasised that key performance indicators (KPIs) and success metrics should be measured holistically rather than focusing on a single factor like GHG reduction. Suggested KPIs included:

1. Engagement & Adoption Metrics:

- **Farmer participation**: Number of farmers attending events, engaging in knowledge exchange events, and adopting new practices / technology.
- ***Mentorship programme impact***: Establishment and longevity of mentor-to-mentee relationships as a post-funding legacy.

2. Economic & Financial Metrics

- ***Farm profitability & resilience***: Measuring improvements in economic viability of farms adopting sustainable practices.
- ***Cost-effectiveness***: Evaluating the return on investment (ROI) of LL-funded initiatives.

3. Environmental & Agricultural Metrics

- ***Land use changes***: Proportion of farmland under different, more sustainable management practices.
- ***Soil health indicators***: Proportion of >2mm water-stable aggregates as a sign of improved soil structure.
- ***Nutrient efficiency***: Reduction in nitrogen pollution and increased Nitrogen Use Efficiency (NUE).
- ***Carbon sequestration & biodiversity***: Using baseline farm data (carbon, biodiversity, water quality) to track improvements over time.

4. Social & Wellbeing Metrics

- ***Farmer wellbeing***: Tracking physical, mental, and financial health improvements at both the individual and community level.
- ***Ecosystem services impact***: Considering water quality, flood mitigation, biodiversity improvements, and broader social welfare benefits at the landscape and regional scale.

However, the feasibility of measuring these metrics was not discussed in detail, for example there are a range of spatial and temporal scales over which the environmental and agricultural metrics could be measured.

A structured evaluation framework should be embedded into the programme from the outset to ensure effective assessment of its impact. The Farming in Protected Landscapes Programme (FIPL), funded by Defra, was highlighted as a strong example, where independent evaluations included interviews with programme officers and funding recipients. Additionally,

the Northern Ireland Soil Nutrient Health Scheme was noted for its emphasis on measuring behavioural change and farmer acceptance of new practices over time, providing valuable insights into the long-term effectiveness of sustainability initiatives.

Participants emphasised that LLs networks must be accountable for the effective use of both public and private funding. Evaluations should go beyond assessing outputs and instead focus on measuring real-world outcomes achieved through the LLs network, ensuring transparency and demonstrating the tangible impact of investments.

Key messages:

- Evaluation framework should be built into the LLs network from the beginning.
- Key performance indicators should be set out at the beginning that cover a range of social, economic and environmental metrics and the LLs network needs to be accountable and transparent in how its funds are allocated.

3.2.7 Viable Systems Model (VSM) for the governance structure of a living labs network

The Viable System Model (VSM) is useful for developing the organisational structure of complex, multi-stakeholder projects (see Appendix 4 for PowerPoint presentation). The presentation highlighted the following points:

- The VSM empowers LLs within the network to make decisions aligned with overarching goals of the network.
- It provides rapid communication channels that enable quick identification and replication of successes while allowing for swift learning from setbacks.
- It facilitates direct interaction between management and operational staff.
- It is a non-prescriptive process that creates processes as they are needed.
- The VSM provides a network structure for the LLs that is not bureaucratic i.e. eliminates the need for complex rules and makes process and decision-making rapid and straightforward.
- It clearly defines roles, responsibilities, and communication lines needed to ensure harmony and fulfilment of overall purpose.
- It ensures that decisions are taken by those closest to the information or data.

Participants generally viewed the VSM as an efficient and proactive way to structure an organisation but emphasized that its success would depend on every part functioning effectively. Some questioned how reactive the system would be if delegated authority was misused, while others raised concerns about whether individual LLs might interpret organisational policies differently, similar to the EU, and how this could be addressed. There was also scepticism about the feasibility of 'eliminating' bureaucracy, with concerns about overpromising on its reduction.

Some participants expressed their views that top-down priorities could be beneficial, others preferred a fully stakeholder-led approach to setting the network's aims and research objectives. Some participants shared their views that the aim and goals of a LLs network should be articulated before looking at governance implementation.

The discussion then shifted to the types of stakeholders involved and who would decide their inclusion. It was suggested that stakeholder participation should involve a diverse group, including farmers, scientists, consumers, businesses, and NGOs. The discussion also touched on building trust and securing stakeholder buy-in. After further discussions, it was found useful that governance and decision-making powers should stay with a LLs network. This led to a broader conversation about how success should be defined. Some participants questioned whether, since LLs are co-designed and co-developed, stakeholders should collectively determine what success looks like, or if it would ultimately be a political decision. The outcome of this discussion was that the success is better measured through a collaborative process.

It was clarified that an evaluation team would be responsible for designing the data collection framework for a LL network, identifying key trade-offs to be investigated, and ensuring evaluation is embedded at the operational management level.

A question was raised about the role of the policy development unit, and Defra explained that it exists to address unanswered questions from lower levels and develop internal guidelines for the LL network, rather than external-facing policy.

Finally, concerns were raised about the potential for funding to be withdrawn. Presently, Defra is exploring the potential of existing networks of LLs across UK to understand how the outcomes can be effectively used to develop or introduce any future policies. If there will be plans, it needs to be at least a five-year programme to ensure the outcomes make an effective evidence base to inform any future policy.

Key messages:

- The aim and goals of a LLs network should be articulated before looking at governance implementation.
- All the devolved nations should have an equal stake in a LL network.

4. Key recommendations

In this section we summarise the main findings and make recommendations from the outputs of the survey and workshop with regard to 'what could a national network of LLs for sustainable farming look like and how it should function'.

Feedback from the Scottish and Welsh Governments states that they are keen to support a network of 'living labs/farm demonstrators' as a vehicle to maximise stakeholder engagement and ultimately impact. Therefore, they would like to be involved in any further scoping, particularly regarding funding and governance aspects that would need to be considered.

4.1 Aim, goals and name of the living labs network

The aim and goals of a network needs to appeal to a range of different stakeholders. For example, farmers want to improve the financial viability of their farm business, have access to training, and gain new knowledge and skills. Whereas other stakeholders are more interested in supporting the transition to sustainable agriculture and reducing the impact of

farming on the environment. The three main goals discussed at the workshop centred on:

- Increasing the adoption of agricultural practices and technologies that will increase the environmental and socio-economic sustainability and resilience of agriculture (and agri-food systems) to mitigate and adapt to climate change.
- Measuring and quantifying the impact of adopting new practises and technologies on environmental, economic and social outcomes to build an evidence base.
- Knowledge production and exchange across and beyond the network.

What was not discussed in any detail was whether the primary purpose is to test practices and technologies and ensure that there is robust evidence available and/or build farmers' practical understanding and trust in evidence. These are not mutually exclusive but there is potentially a trade-off between scientific rigour and how attractive participating in a LL will be for farmers. In addition, there was little discussion on what specific barriers the LLs network could address and the potential use of a behavioural model like COM-B.

There was a consensus that the main aim of a LLs network should be to support the transition to sustainable farming systems by focusing on innovation and knowledge exchange, and that the overall aim and goals for a LLs network could be determined at either the four nations level or UK level. However, what was not discussed is who should set the aim – the funder, advisory board or LLs network facilitation lead/team.

- **Recommendation 1**: The overall aim and goals of the network should be set at the national level, but individual LLs can decide how to achieve this for their context.
- **Recommendation 2**: The aims and goals of the LLs network should be articulated before looking at governance implementation.

The Welsh Government are not currently using the term 'Regenerative Farming' and would like to be involved in discussion about what the network could be called that makes its aims and goals clear and encourages participation. For example, in Canada the network of LLs is referred to as 'The Canadian Agroecosystems Living Labs Network' and its goal is to accelerate the development and adoption of sustainable practices and technologies by Canadian farmers (McPhee et al., 2021). Other agricultural LLs include terms such as 'agroecology', 'regenerative', 'climate smart' and 'farming with nature'.

- **Recommendation 3**: Ensure the network has a name that attracts large-scale participation, particularly from farmers.

4.2 Governance, structure and operation

There is need for a well-structured governance framework for the LLs network to ensure stakeholders work effectively together to achieve the aim and goals of the network. This could be the Viable Systems Model (VSM).

- **Recommendation 4**: Set up a well-structured governance framework for both the network and individual LLs.

With regard the structure of the LLs network, there was much discussion about building on established structures and expertise to avoid reinventing the wheel as well as the value of a number of new 'hub and spoke' LLs across the UK. A 'hub and spoke' LL would be made up of a research-intensive hub farm that conducts detailed comparative research trials surrounded by a number of working farms (satellites) carrying out field trials.

- **Recommendation 5**: Map out existing initiatives, conduct a stakeholder analysis (to identify level of involvement, interest, and influence), identify organisations already delivering similar outcomes, and integrate, where possible, these efforts into a national LLs network.
- **Recommendation 6**: Make a national LLs database that catalogues (existing and new) individual LLs, including details on location, size, main aim and focus.
- **Recommendation 7**: Fund a number of new 'hub and spoke' LLs that comprise of a research intensive farm hub with a satellite of working farms carrying out trials. This could consist of, for example, six LLs (one in each of the devolved nations and three in England that represent regional/sector hubs) phased in over a period of years.

The LLs network should be overseen by a coordination team / organisation to help maximise its value. It was considered crucial to select a network coordinator/team or organisation that speaks the right 'language' and has the trust of the wider agri-food community. There was also mention of the value of an advisory board made up of a range of stakeholders (including farmers, farm advisors, researchers, government, NGOs, agri-businesses and supply chain) to provide guidance, act as a sounding board and offer insights to inform decision-making to the LLs network initiative.

- **Recommendation 8**: Fund a team / organisation to facilitate and coordinate the LLs network to maximise its value.
- **Recommendation 9**: Fund and set up an advisory board to provide guidance and expertise to the LLs network coordination team / organisation.

The LLs network should focus on a bottom-up co-designed approach, where stakeholders, and particularly farmers, can shape what approaches they want to test via LLs that are relevant locally but aim to achieve the main aim and goals of the LLs network.

Three main activities were identified as the main routes that each LL could take to answer the main aims and goals:

- Development and testing of technologies and best management practices,
- Knowledge and knowledge sharing, and

- Collection and collation of data to provide robust evidence on socio-economic and environmental outcomes.

4.3. Context

The LLs network should include representatives from all farm systems, as these systems operate differently and will be impacted by adopting new agricultural practices and technologies in different ways.

- **Recommendation 10**: Ensure the LLs network encompasses different farming systems, farm sizes, research scales, and locations (varying climates, soil types), possibly being organised around sectoral and geographical foci.

The spatial scale of research, measurements, and trials conducted by the individual LLs should depend on their specific research question. All spatial scales are important and relevant, ranging from plot to field to farm to catchment to landscape to region. It is important to consider the temporal scale (i.e., the time required to observe change), as this can vary depending on the variables being measured.

- **Recommendation 11**: Acknowledge that multiple spatial scales have a role to play in LLs (from field to catchment) and that long-term funding is required to capture the temporal variability in response of different outcomes.

4.4. Participants

For the LLs network to function effectively, fostering diverse stakeholder collaborations is essential. Therefore, multiple stakeholders should be involved in the operation and decision-making of the LLs network, including a range of users (i.e., farmers), researchers and external partners (e.g., NGOs, trusts, charities, governmental institutions, industry representatives, farm advisors, and the public). Farmers are needed to ensure that new practices and technology are both financially and practically viable, while remaining relevant to local conditions. Researchers from multiple disciplines (natural and social sciences; data analysts; economists) are needed to help design trials, data collection and data analysis. Supply chain businesses are important to include, but there was concern that they may dominate or steer the interests of the LLs network in their favour, resulting in a power imbalance. It was suggested that this risk could be mitigated through the design of a well-structured governance framework for both the network and individual LLs (see Recommendation 4).

- **Recommendation 12**: Ensure multiple stakeholders are participants of the LLs network and involved in the operation of the LLs network.
- **Recommendation 13**: Ensure researchers from different disciples are involved in the LLs network - including social scientists, to measure whether the LLs lead to behavioural change, data analysts, economists and natural scientists.

4.5. Data collection, analysis, storage and use

The types of data collected should align with the aims and goals of the LLs network and help provide farmers with actionable insights to help create sustainable and profitable farming systems. However, it was noted that individual LLs are unlikely to all be collecting the same data, given different sectors, scale, priorities and farm contexts. Therefore, the collection of a set of common metrics (baseline data) using standardised protocols was proposed. Who decides what metrics are included in this framework was not discussed at the workshop, but individual LLs would have the flexibility to collect additional data beyond this baseline data to address their specific research questions.

- **Recommendation 14**: Establish a framework of minimum indicators and standard operating procedures that all LLs could follow to establish relevant baselines.
- **Recommendation 15**: This framework should include environmental, agronomic, and economic data, but also, and this is deemed as important, social factors.

A range of stakeholders could collect data, including farmers and researchers. The potential role of citizen science in the data collection process was highlighted but not explored in depth. In line with the proposed LLs network structure (see Recommendation 7), more intensive data collection could take place at the 'hub farm', while lighter-touch, less intensive monitoring and data collection could occur at satellite farms, primarily carried out by farmers.

- **Recommendation 16**: Data should be collected by a range of stakeholders that includes farmers, scientists and potentially the public (via citizen science).
- **Recommendation 17**: Training and financial support should be given to ensure data is collected according to standard protocols.

Data storage and analysis should be structured across multiple tiers, including, individual farm, individual LL and the LLs network. For example, some farmers may already use tools or calculators to capture and store data. The survey highlighted that while 75% of LLs included costs for taking measurements / collecting data, only 56% included costs for data collation, analysis and reporting. This highlights that the full potential of the data being collected is not being realised and that there is potential for more effective data collection and analysis, if funds allow.

The value of a shared data repository and data analysis across the LLs network would provide additional value beyond what is currently achieved, where individual LLs analyse their own data in isolation. However, the cost of data storage and analysis should not be underestimated and needs appropriate resourcing.

A clear workflow for data storage should be developed and implemented, which included a clear quality control process, a standardised reporting procedure, inclusion of metadata, compliance with GDPR regulations, and formatting data in a way that enables efficient collation and analysis. This could be addressed within a Data Management Plan, overseen by a Data Manager.

Access to the data could be controlled via a number of different permission / security levels, where farmers should have access to their own data and retain some control over how and by whom their data is used, scientists have access to analyse the data, and participants of a LL have access to their LLs data. External parties could request access through a data manager, or have access to key findings and analysed results.

- **Recommendation 18**: An Enterprise Data Platform (EDP) should be used to manage and integrate data across the LLs network, offering tools for data acquisition, storage, preparation, delivery, governance, and security, enabling data-driven decision-making.
- **Recommendation 19**: A data manager should oversee the EDP and there should be a data management plan with clear protocols around data sharing.

Effective use of the data collected by the LLs network should include building a strong evidence base, informing policy and decision-making, engaging the food supply chain, improving and refining conceptual models and Life Cycle Analysis (LCA), to help assess the broader regional and national impacts of different farming practices.

- **Recommendation 20**: Ensure the data collected is used (i) to build an evidence base on the efficacy of sustainable practices and technology, (ii) for knowledge exchange, (iii) for improving and refining conceptual models, (iv) in life cycle analysis, and (v) to inform policy making.

4.6. Funding

The LLs network should be fully funded, with no costs imposed on those running or implementing the research in the individual LLs. However, securing long-term funding and financial viability was identified as the most common challenge in running a successful LL in the survey. The survey identified that the most common range of annual cost for running LLs is £10,000 - £50,000 per year, but one in ten LLs cost more than £100,000 per year. The number of involved farmers does not appear to be a strong determinant of the cost of running LLs. This probably reflects that less than 30% of the LLs make payments to participating farmers and only 45% cover the cost of implementing new agricultural practices. It is more likely that the amount of data collection and analysis has a big impact on the annual running costs as it needs appropriate resourcing.

Funding should cover all operational costs of the LLs, including, consumables, facilitator time, mentoring and networking, and farmers' time and expenses should be covered for carrying out trials in the LLs network. To ensure maximum impact, funding need to cover the following critical roles:

- A network coordinator/facilitator team/organisation (see Recommendation 8) to oversee LLs network operations.
- A database manager (See Recommendation 19).

The LLs network must operate on a long-term basis, but the scale of ambition would influence its total annual running costs. For example, the French Government launched the 'Territoires

d'Innovation', in 2019 and committed €45 million to 24 regional LLs over 10 years that are focussed on six different 'transitions': digital, sustainable energy, clean mobility, skill adaptation in an evolving labour market, the evolution of health systems, and the transformation of agricultural systems through agroecological practices (McPhee et al., 2021). While in Canada, 13 LLs are supported by $185 million from the government for 10 years and are focussed on co-development, experimentation and accelerated adoption of best management practices that store soil carbon and reduce GHGs (McPhee et al., 2021).

The survey identified that government is the most common funding source of LLs (47%), followed by NGOs, trusts or charities (25%), research institutes (25%) and self-funded by farmers (22%). Despite the potential benefits of private investment, participants raised several concerns: data ownership and accessibility, power imbalance and transparency. The need for clear governance structures (Recommendation 4) were stressed again to prevent conflicts of interest and ensure equitable decision-making.

One option for how individual LLs should apply for and receive funding, is for stakeholder groups to collaboratively apply for funding through a 'LLs funding call'. In the proposals, applicants would need to outline the practices and technologies they plan to trial, the specific research questions they aim to answer, the data collection strategy and metrics, the knowledge exchange events they intend to deliver, and a detailed budget for implementation. A key funding criterion would be that all collected data and information must be shared within the national LL network database to ensure broader impact. The 'hub and spoke' LLs could also have smaller pots of money to distribute via proposals to their steering group for trials on their LLs.

- **Recommendation 21**: A LLs network should be adequately funded over the long-term (at least 5 years).
- **Recommendation 22**: While public funding was seen as the preferred option for the LLs network, there is interest in exploring private sector contributions if data ownership, accessibility, and power dynamics were carefully managed.
- **Recommendation 23**: A key funding criterion for individual LLs should be that all collected data and information must be shared within the national LLs network database to ensure broader impact.

4.7 Knowledge production and exchange

A well-structured approach to knowledge exchange will help ensure that a diverse range of stakeholders stay informed and engaged over the long term. There are a wide range of effective in-person and on-line knowledge exchange methods, including:

- Field trials and on-farm demonstrations to showcase real-world applications of new technologies, sharing both successes and failures for maximum learning.
- Peer-to-peer learning, including field visits, study tours, and farmer-led events, to foster direct exchange among practitioners.
- Establishing mentorship networks to support farmers in adopting new practices.

- Webinars and online forums to build a community of practice.
- Digital knowledge sharing through videos, podcasts, and blogs.

Knowledge exchange should happen at the individual LL level as well as the network. At the network level, a dedicated knowledge exchange and communications strategy should be developed to include, among other things, press releases, social media engagement, an annual LLs conference, communication for specialised magazines.

One of the main challenges in knowledge exchange is ensuring the continued engagement of busy farmers and other stakeholders over time. While some farmers are actively involved, others remain less engaged, often leading to the same groups attending events and benefiting from knowledge-sharing opportunities.

- **Recommendation 24**: Ensure that 'hub and spoke' LLs as well as the LLs network have a knowledge exchange manager that oversees the knowledge exchange and communication strategies.
- **Recommendation 25**: Integrate the LLs network into further and higher education curricula to equip future farmers, advisors, and agronomists with the skills needed for sustainable agriculture.
- **Recommendation 26**: Outreach strategies should be tailored to reach a broader audience, particularly those who are less engaged and use existing farmer networks to encourage participation and peer-to-peer learning.
- **Recommendation 27**: Engage with (i) multiple organisations/stakeholders from the beginning, (ii) existing databases/platforms, and (iii) LLs networks in other countries, to scaling up and ensure impact.

4.8. Evaluation and impact

The ultimate measure of success for the LLs network would be the development of economically strong, environmentally sustainable, and socially resilient farming systems across the UK. As the LLs network aims to accelerate the transition to sustainable agriculture, evaluating the rate of adoption of new practices and technologies over time is crucial. This could be achieved via key performance indicators.

While the survey showed the top three outcomes of involvement in a LL are increased farmer environmental awareness (75%), wider adoption of best/sustainable management practices (64%), and increased farmer confidence (62%). It also highlighted that the least reported outcomes were increased farmer welfare (24%), adoption of new technology/products (36%) and increased application to agri-environment schemes (44%). These numbers seem relatively low and calls for in-depth exploration on whether engagement with LLs does actually lead to substantial behavioural change (as it would be expected, Okumah et al. 2021), or whether there is not sufficient capacity within the LLs to measure behavioural change (which requires the involvement of social scientist), or whether financial constraints and need for financial support is the limiting factor to change (Tyllianakis et al., 2023).

A structured evaluation framework should be embedded into the programme from the outset to ensure effective assessment of the LLs network's impact. As the LLs networks must be accountable for the effective use of both public and private funding. Evaluations should go beyond assessing outputs and instead focus on measuring real-world outcomes achieved through the LLs network, ensuring transparency and demonstrating the tangible impact of investments.

- **Recommendation 28**: Key performance indicators should be set out at the beginning that cover a range of social, economic and environmental metrics.
- **Recommendation 29**: An evaluation framework should be built into the LLs network from the beginning to determine if the money has been well spent (accountable and transparent) and what changes have happened over time.
- **Recommendation 30**: Share economic business cases from different farming systems to reduce risk for farmers transitioning to a more sustainable farming system.

Acknowledgements

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Appendix 1: Survey

Introduction
This survey is addressed to anyone **in the UK** involved in a demonstration farm or farmer-research network/cluster or equivalent structure that undertakes knowledge exchange of best practise and/or testing and experimentation on real farms. For ease, we refer to these in the questionnaire below as 'Living labs'.

Defra have commissioned the University of Leeds, to explore the potential for developing a network of 'living labs' to conduct applied research and demonstration of sustainable farming practices in the UK. The results of this survey will help determine whether a network of living labs would be valuable for the UK, and the proposed focus of any living lab network that may be established. Joining existing farmer clusters/demonstration farms and new activity into a national network could strengthen the impact achieved (e.g. through scale, and shared learning).

Based on your experience, you are invited to respond to this voluntary survey to inform this project. This survey will take you approximately 10 minutes to complete.

Before proceeding with this survey please read the ethics notice below (*end of this document*).

By proceeding, you are agreeing that you have read the ethics note and are voluntarily participating in this survey.
Click here to proceed

This project is funded through the Land Use for Net Zero (LUNZ) programme (www.lunzhub.com) which is a partnership between Defra, UKRI, DESNZ and the Devolved Administrations.

For any further information or questions, please contact Prof Pippa Chapman (p.j.chapman@leeds.ac.uk) or Dr Ruth Wade (r.wade@leeds.ac.uk) at the University of Leeds.

Accessibility needs
You can change the size of the text in a survey by using the zoom functionality in your browser. The survey is available in Welsh language at …..

If you belong to more than one living lab, please fill in one survey per living lab.

1. **In what region of the UK is your living lab?**
    a. South West England
    b. South East England
    c. London
    d. West Midlands
    e. East Midlands
    f. East of England

g. Yorkshire and the Humber
h. North West England
i. North East England
j. North Wales
k. Mid-Wales
l. South-Wales
m. North East Scotland
n. Highlands of Scotland
o. Scottish Islands
p. Tayside
q. Central Belt of Scotland
r. Dumfries & Galloway
s. Scottish Borders
t. Northern Ireland

2. What is the name of the living lab you are involved in?

_____

3. What is your main role in the living lab (Please select all options that apply)?

a. Facilitator/leader
b. Member/participant - farmer
c. Member/participant - other
d. Researcher
e. Funder
f. Other, please specify:
_____
g. Not involved in a living lab (Go to "Thank you for your interest but this survey is only for those involved in a living lab in the UK. If you know anyone involved in a living lab in the UK, please forward this survey to them. Thank you")

4. What is your main occupation (Please only select one option)?

a. Farmer
b. Farming advisor
c. Researcher
d. Business
e. NGO, trust or charity
f. Other, please specify:
_____

If answering "Farmer or Farming advisor" to Q4:
4a. What is your major motivation for participating in the living lab (choose all that apply)?

a. Improve financial viability of farm business
b. Access to training to gain new knowledge and skills
c. Access to new technology/equipment
d. Help with access to financial support
e. Requirement of the supply chain

f. Reduce impact on the environment
g. Better connection with social support network
h. Explore new business opportunities
i. To have a voice on relevant issues
j. Other, please specify:
_____

If answering other, researcher, Business, NGO to Q4:
4b. What is your major motivation for participating in the living lab (choose all that apply)?

a. Improving resilience of the supply chain
b. Supporting the transition to sustainable agriculture
c. Reducing impact of farming on the environment
d. Exploring new business opportunities
e. Engage with a wider range of stakeholders
f. Exchanging information and knowledge
g. Increase visibility of your organisation within the agri-food community
h. Demonstrating and quantifying the impacts of sustainable farming practices on environmental, economic and social factors.
i. Other, please specify:

5. How many farmers are there in the living lab?

a. Less than 10
b. 10-25
c. 26-50
d. 51-100
e. More than100
f. Don't know

6. **How many years has the living lab been running?**

a. Less than 1 year
b. 1-5 years
c. 6-10 years
d. More than 10 years
e. Don't know

7. What types of farms are in the living lab (Please choose all that apply)?

a. Arable
b. Livestock
c. Dairy
d. Mixed farming
e. Horticulture
f. Other, please specify: _____

8. At what spatial scales does the living lab operate (Please choose all that apply)?

a. Plot
b. Tramline

c. Split field
d. Field
e. Whole Farm
f. Landscape
g. Other, please specify:

_____

9. What are the main sources of funding for the living lab (Please choose all that apply)?

a. Government (e.g. agri-environment grants)
b. Agri-businesses
c. Agri-food supply chain
d. Water industry
e. Research institute (e.g., University)
f. Farmer association
g. NGOs, trust or charity
h. Self-funded by farmers
i. Other, please specify:

_____

j. The living lab does not receive any funding
k. Don't know

10. Beside farmers, which other organisations are involved in the living lab?

a. Government agencies
b. Agri-businesses
c. Agri-food supply chain
d. Water industry
e. Research institutes (e.g., University)
f. Farmer association/group
g. Local community
h. NGOs, trust or charity
i. Other, please specify:

_____

11. What is the main focus of the living lab? (Please select all that apply)

a. Training and sharing best practise
b. Researching specific issues & challenges via trials
c. Other, please specify

12. What are the main aims of the living lab? (Please choose all that apply)

a. Knowledge exchange/sharing best practice among participants
b. Testing new farming practices or combinations of farming practices
c. Testing new technology
d. Testing new products
e. Improving farm productivity,
f. Improving farm economics,
g. Improving environmental conditions, sustainability
h. Reducing GHG emissions

i. Improving resilience of farm business to climate change
j. Public engagement/education
k. Other, please specify:

_____

13. Which of the following objectives does the living lab have? (Please choose all options that apply):

a. Improving conservation of biodiversity
b. Improving water quality
c. Improving soil health
d. Reducing GHG emissions
e. Reducing ammonia emissions
f. Promoting natural flood management
g. Promoting regenerative agriculture/agroecology practices
h. Promoting changes to grazing management practices
i. Increasing crop health, yield, and quality
j. Reducing inputs of pesticide
k. Reducing use of synthetic fertilisers
l. Promoting organic farming methods
m. Promoting animal welfare
n. Other, please specify:

_____

14. Are any of the following data collected by the living lab? (Please choose all options that apply)?

a. Crop yield (e.g. quality, quantity)
b. Crop health (e.g. disease, pests, weeds)
c. GHG emissions (e.g. carbon dioxide, nitrous oxide, methane)
d. Soil health (e.g., structure, chemistry, biology, soil organic matter)
e. Biodiversity indicators (e.g. pollinators, birds, mammals, plants)
f. Water quality
g. Economics (e.g. farm profits, costs)
h. Practical experience of implementing new practices or using new technology/products (e.g. problems encountered, time to carry out, changes required to machinery)
i. Changes in application rates of fertiliser/pesticides by members of the living lab
j. Changes in uptake of different farming practise/products/technology by members of the living lab.
k. Other, please specify:

_____

l. Don't know
m. No, we do not collect any data (Go to Q 15)

15. Who does the living lab share data/information with (Please choose all that apply)?

a. Members of the living lab
b. Farmers outside of the living lab
c. Researchers

d. Agri-businesses
e. Agri-food supply chain
f. Government agencies
g. NGOs, trusts, charities
h. Other, please specify:

_____

i. Don't know

16. How are the findings/results of the living lab communicated/shared (Please choose all that apply)?

a. Verbally on farm walks or at meetings
b. Newsletter
c. Reports or project briefs
d. Via websites
e. Farmer magazines
f. Social media (e.g. YouTube, twitter/X, etc).
g. Other, please specify:

_____

17. What types of cost are involved in running the living lab (Please choose all that apply)?

a. Payment to participating farmers
b. Payment to facilitators/advisors
c. Payment to researchers
d. Costs of measurements (e.g. sampling, lab analysis)
e. Cost of implementing new practices (e.g. seeds, inputs, equipment)
f. Data collation, statistical analysis and reporting
g. General running costs (e.g. meeting rooms, travel and subsistence)
h. Dissemination/education events
i. Other, please specify:

_____

j. Don't know

18. What is the approximate total annual cost of running the living lab (we refer to the <u>actual</u> running cost not total funding you may have received)?

a. <£1,000
b. £1,000 - £10,000
c. £10,000 - £50,000
d. £50,000 - £100,000
e. >£100,000
f. Are there any comments that you would like to add to explain the above figure?
g. Prefer not to say
h. Don't' know

19. Has involvement in the living lab led to any of the following actions or outcomes (Please choose all that apply)?

a. Wider adoption of best/sustainable management practices
b. Wider adoption of new products/technologies

c. Increased application to agri-environment schemes
d. Increased farmer environmental awareness
e. Increased evidence-based decision making on farm
f. Increased farmer confidence
g. Increased farmer welfare
h. Other, please specify_____
i. Don't know
j. None of the above

20. What are the major challenges in running a successful living lab (Please choose all that apply)?

a. Securing long-term funding and financial viability of the living lab.
b. Lack of support from the agri-food supply chain and consumers.
c. Collecting and analysing data to assess economic and environmental benefits.
d. Collecting evidence of changes in practices and uptake of technology by farmers.
e. Difficulties in scaling up the impacts of the changes in practices beyond the farm scale.
f. Continued engagement and commitment of participants of the living lab
g. Finding/engaging with researchers with relevant expertise
h. Finding farmers willing to participate in research trials
i. Other, please specify:

_____

21. How much do you agree or disagree with the following statement "Living labs have a critical role to play in the transition to sustainable farming system at National level"?

a. Strongly agree
b. Agree
c. Neither agree nor disagree
d. Disagree
e. Strongly disagree

22. Are there any further comments you would like to make about your experience of being a member of a living lab?

_____

23. **In the coming months we will be analysing the responses to this survey, we will hold a workshop and potentially carryout some interviews to further explore the opportunities and benefits of a national living lab network. Would you be interested in participating in any of the following?**

1. Workshop – Yes, No
2. Interview – Yes, No
3. Receive summary of survey results – Yes, No

24. **As you answered "Yes" to the last question (about follow-up interview and participation in a workshop), can you please give us contact details:**
Name:
Email:

Telephone number:

_____

If you belong to more than one living lab, please click here to access the survey again.

Thank you for your time in completing this survey, we really appreciate it.
If you know of participants in other living lab in the UK, we would be grateful if you could forward them this survey.

If you have any questions about this survey or this project, please email Pippa Chapman p.j.chapman@leeds.ac.uk or Ruth Wade r.wade@leeds.ac.uk

Ethics Notice

Risks: There are no known risks from participation in this study.

Benefits: Through participating in this survey, you will inform the research team about the current practice of living labs, as a basis to shape the future of a potential national living lab network in the UK.

Use of data: We will use results from this survey to produce written and oral outputs, including (but not limited to): project report, academic papers, presentations at workshops and conferences, or policy brief. Anonymised, non-personal data associated with such outputs will be made open access to other researchers through the Research Data Leeds Repository.

Confidentiality/Anonymity: Results from this survey will be stripped of any personally identifying information about you. No one but members of the research team at the University of Leeds will be able to link the information that you provide to your name, and it will not be shared with anyone else. If due to your role, or that of your organisation, it might be possible that you are identified even if your name is not revealed, we will seek your permission for the publication of any of the information that you have provided to us, unless you release us from that obligation. All information and data will be kept on password protected computer and cloud storage systems in line with University of Leeds protocols and the UK Data Protection Act.

Withdrawal of consent: The survey is anonymous and therefore we will not be able to withdraw your responses after you have submitted the survey, unless you provide us with your contact details and contact us within 30 days after submitting the survey. In that case, any information you provide will be destroyed and not used for the research. However, if you contact us more than 30 days after your participation, we will not be able to delete your responses.

You are welcomed to consult the University of Leeds **Privacy Notice for Research**

Appendix 2: List of organisations represented at the workshop and consultation

Rothamsted Research
3Keel Consultancy
James Hutton Institute
Helix North Host for Hutchinson's
Nature Friendly Farming Network
Green Farm Collective
North York Moors National Park
NIAB
Pasture for Life
ADAS
Defra
RSPB
AHDB monitor farm
Organic Research Centre
Soil Association
AHDB
Natural England
Dairy Science Forum
University of Sheffield
Cranfield University
Harper Adams University
Scottish Government
Welsh Government

Appendix 3: Facilitation guide: living labs workshop

Time	Length	Topic	Activity	Leading person	Materials	Facilitation notes
10:00-10:30	30mins		Registration & refreshments		Refreshments. Agenda slide	Tea, coffee, & biscuits available Registration desk & consent forms
10:30-10:45	15mins		Welcome, & setting the scene for day	**Facilitator 1**	Agenda slides, Facilitator 1 slides	**Facilitator 1** to introduce team. Briefly talk about workshop purpose, agenda & housekeeping.
10:45-11:45	1hr 1st station 20mins 2nd station 10min 3rd station 10mins	**Management, operation & scale**	**Break-out Group discussion 1:** Carousel, people moving around	**Facilitator 2** **1 facilitator per table**	Facilitator 2's slides Flipchart paper 4 tables Facilitator scribes on the flip-chart and summarises for the next group.	**Carousel Discussion 4 tables (topics)** **Facilitator 2** briefly explains the session From their experience... **Topic 1:** Where should the living labs be? On working farms, university farms? Using existing networks/creating new ones? Pros & cons. **Topic 2:** What scale should the living lab be? Field, farm, cluster?

Time	Length	Topic	Activity	Leading person	Materials	Facilitation notes
	4th station 10mins				Facilitator 2 record info and keep time	**Topic 3:** Who should design the focus/topic of them & manages them? **Topic 4:** How do we deal with different types of farms? Arable, livestock & mixed?
11:45-12:00	15mins	**QUIZ**	Results from questionnaire	**Facilitator 1**	Quiz slides	Quiz on data from survey.
12:00-12:30	30mins **15 mins** per topic	**Data collection, analysis & database**	Breakout tables group (people don't move) discussion 2: Prompt questions. Sticky notes	**Facilitator 1 – leads** **Facilitator 2, Facilitator 1, Facilitator 3 and Facilitator 4** facilitate	Slide Flipchart paper Sticky notes	**Discussion in groups** Facilitator 1 briefly explains the session **Topic 1:** What should the living lab measure/record? **Topic 2:** Who should collect/collate the living lab data?
12:30-13:00	30mins	LUNCH	EATING!		FOOD	

Time	Length	Topic	Activity	Leading person	Materials	Facilitation notes
13:00-13:30	30 mins 15 mins each topic	***Continued…*** **Data collection, analysis & database**	Breakout tables group discussion 2: Prompt questions. Sticky notes	**Facilitator 2 leads** **Facilitator 5 – time keeping**		**Topic 3:** Where should the data be stored (database)? **Topic 4:** Who should analyse the data?
13:30-14:30	1hr 5mins to explain 20 mins on the interview 30 min feedback	**Funding structure & costs**	Interview: Facilitator 3 & Facilitator 2 Facilitator 3 to explain activity and Facilitator 3 and Facilitator 2 do interview & people asked to write their thoughts on post it notes	**Facilitator 3** **&** **Facilitator 2**	Interview script Sticky notes Two chairs at the front for Facilitator 3 and Facilitator 2 Facilitator 4 and Facilitator 5 to pick up all post it notes	**Facilitator 3 to interview Facilitator 2** Facilitator 3 briefly explains the session. Ask participants add thoughts to sticky notes throughout the interview. **Topic 1:** What types of costs are needed for running the living labs? **Topic 2:** What is the most efficient funding structure? **Topic 3:** How would the funding work? **Topic 4:** How should it be rolled out? When should it be paid and how?

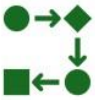
Time	Length	Topic	Activity	Leading person	Materials	Facilitation notes
			After interview – Facilitator 3 leads discussion with open floor. Facilitator 5 to record the interview			**Topic 5:** What should the funding cover? **Topic 6:** How should it become self-sustaining in the long term? **Topic 7:** How do we monitor the success of the living labs? **Discussion:** What did you think about Facilitator 2's answers? What/how else could be done? What other questions should Facilitator 3 have asked?
14:30-15:10	40mins	**Knowledge sharing & education: Impacts, scaling up & partnership**	Whole group discussion	**Facilitator 1** Main scriber – Facilitator 2	Facilitator 1's slide Flipchart paper	**Whole group discussion** **Topic 1:** How to share information from living lab to the wider stakeholders? **Topic 2:** How does the information from the living labs get scaled up?

Time	Length	Topic	Activity	Leading person	Materials	Facilitation notes
				All others to take note**s**		**Topic 3:** How do the living labs lead to change and how do we measure success/change?
15:10-15:25	15mins	**VEM**	Power point	**Defra**		5 min presentation and 10min discussion
15:30-15:45	15mins	**Summary and what next**	Thank you & next steps	**Facilitator 1**	Facilitator 1's slides	Feedback sheets

Appendix 4: Presentation on the Viable Systems Model (VEM)

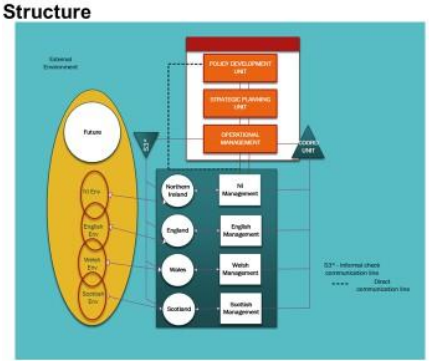
What is the Viable Systems Model (VSM)

autonomy, cohesion, and synergy



flexible, adaptive, and agile,

VSM Map of the Network's Organisational Structure

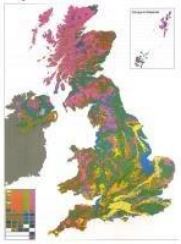


Systems 1 – 5 within the model

- Operational units – These conduct farm-based research and gather data.
- Harmonisation - This is the secretariat responsible for coordination, it ensures compliance with rules, guidelines.
- Operational management – It maximizes the synergy between operational units and optimizes the allocation of resources.
- Strategic Planning - It identifies future threats and opportunities and develops a strategy for the network's future state.
- Policy Development Unit - This function takes decision in areas that are not well defined.

Recognition of Regional Variations

Soil map of the United Kingdom



Readiness for Future Changes

- Changes in the Environment
- Threats and Opportunities
- Catalysts of Change

Participatory Decision-Making

- Synergy
- Cohesion
- Accountability

VSM Eliminates Bureaucracy


LAND USE for
NET ZERO
HUB