DAERA Innovation Strategy 2021-2025

An innovation ecosystem delivering for the environment, societal wellbeing and the rural economy

Sustainability *at the heart of a living, working, active landscape valued by everyone.*

Department of
Agriculture, Environment and Rural Affairs
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INVESTORS IN PEOPLE

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DAERA - Innovation Strategy - Our Mission

An innovation ecosystem delivering for the environment, societal wellbeing and the rural economy

Create an Innovative Culture

Provide Effective Leadership

Enable Connectivity

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Ministerial Foreword

We are facing significant global challenges and the world is on the brink of further technological transformation that will impact us all.

DAERA is ready to play its part. We have recently published a Science Strategy Framework to transform how we use and exploit science. This recognises the pivotal role innovation will play in affecting this change.

This Innovation Strategy builds on the foundation provided by the Science Strategy Framework. It focuses on two aspects: (i) the establishment of an enabling environment within DAERA to support innovation and the implementation of innovation actions within the Department; and (ii) the development of an enabling, external environment to encourage and support the implementation of innovation actions across the sectors it serves. Overall, it will support the development of an innovation ecosystem which helps deliver for Northern Ireland's environment, societal wellbeing and rural economy in line with the NI Executive's Green Growth Agenda.

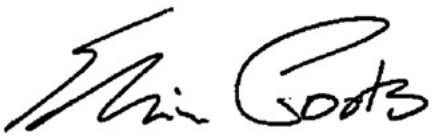
Northern Ireland has a rich history of innovation. For example, we are immensely proud of the achievements of Harry Ferguson who invented the three-point linkage system which underpinned the modernisation of farming practice worldwide, and we have witnessed the local invention of some of the most globally important farm animal vaccines of the past decade. This Innovation Strategy aims to stimulate that same innate capability to innovate in a new generation and direct it towards finding solutions to modern challenges.

The ability of our people and sectors to address challenges through exploitation of technology, is evidenced in our response to the COVID 19 pandemic. This has seen the widespread and rapid adoption of digital and socially distant working practices to safeguard human health, bringing fundamental change to how our society, organisations and businesses operate.

There are many innovative opportunities out there, particularly involving rapid advances in technology. The exploitation of Big Data, Artificial Intelligence and Transformative Bioeconomy initiatives can play a key role in our quest for Green Growth, with the aim of transforming our society to achieve Net Zero Greenhouse Gas emissions by 2050, protect and enhance our environment and sustainably grow our economy.

This Strategy has been developed following extensive consultation and I am grateful to those organisations and individuals who contributed. Their input has helped us focus on key priorities.

I am convinced that by exploiting innovation, we can achieve a living, working, active landscape, valued by everyone that has sustainability at its heart and I commend this Innovation Strategy to you.



Edwin Poots MLA
Minister for Agriculture, Environment and Rural Affairs

Section 1

Preface

The Department of Agriculture, Environment and Rural Affairs (DAERA) is a science based, data driven department, which invests around a quarter of its annual budget on science services. These services involve monitoring and surveillance testing and research and development (R&D). Science outputs are used to inform policy development, meet statutory obligations, measure outcomes, provide advice and information, manage risks to society and the environment, support rural development and promote innovation. Having left the European Union, a renewed domestic focus on science and innovation will be even more important in driving economic growth.

DAERA is currently implementing a Science Transformation Programme. This programme aims to ensure that the science DAERA secures and uses is innovative, collaborative and transformative and will support a healthy and sustainable economy, environment and rural community, including delivering on Programme for Government (PfG) outcomes.

As part of the Science Transformation Programme, a high level DAERA Science Strategy Framework (SSF) has been established. This will guide how DAERA optimises its use of science to help deliver Departmental and PfG objectives. This Innovation Strategy, derives from the Science Strategy Framework and is integral to its implementation.

Innovation is *'the successful generation and exploitation of new ideas. It is about transforming creative thinking into new products, new and improved processes and technologies to support new ways of doing business'* [1].

Innovation can support and drive beneficial change in the sectors DAERA serves and to support this, there is a sound rationale for encouraging and supporting innovation within the Department itself.

1 NI Executive (2014), Innovate NI Innovation Strategy for Northern Ireland 2014 - 2025.

Section 2

Introduction

2.1 Innovation is a broad concept. It can be the invention, creation or discovery of something truly novel and useful or more simply, it can be a new idea, method or device. For innovation to be of value, creative thinking has to be transferred into new or improved products, processes or new ways of doing business.

2.2 Innovation will be essential to address key societal and environmental issues, including dealing with climate change and ensuring sustainable food production whilst addressing any social implications of these actions. It drives productivity, anchors international investment, helps to raise living standards and lays the foundations for our future. It benefits individual businesses which innovate or adopt innovations, as well as society more widely[2].

2.3 This operational strategy applies across the DAERA remit of agri-food, environment, fisheries, forestry and rural development and is integral to generic sustainability, climate change and Green Growth policies. Going forward, DAERA's sectoral strategies and policy frameworks will embed innovation facilitation as a key theme whilst promoting the integrity, efficiency and quality of our land and sea produce.

2.4 The ambitious Mission of the Innovation Strategy is to develop an innovation ecosystem which delivers for the environment, societal wellbeing and the rural economy. The primary purpose of the strategy is industry focused with a supporting rationale for an internal focus to fit DAERA for the purpose of supporting innovations in relevant sectors and the environment.

2.5 The strategy has a particular emphasis on exploiting opportunities within Big Data, Artificial Intelligence (AI) and Transformative Bioeconomy. This focus will not exclude support for innovative activities falling outside of these priority areas.

2.6 The Innovation Strategy outlines three main goals related to creating an enabling environment for innovation to flourish:

(i) Internally, establishing an enabling environment within DAERA to support innovation and the adoption of innovative actions within the Department;

(ii) Externally, establishing an enabling environment to encourage and support the implementation of innovation actions across all areas within DAERA's remit;

(iii) To set a baseline and monitor and measure progress towards the above two goals, including monitoring how innovations relating to Big Data, Artificial Intelligence and a Transformative Bioeconomy are prioritised.

2 CBI (2016), Making a success of Brexit. cbi-making-a-success-of-brexit.pdf

Section 3

Strategic Context

3.1 Innovation is a key element of many high level strategies globally, at EU and UK levels, in local and central government and within DAERA itself. This is why it is identified as a critical operational element of the DAERA Science Strategy Framework.

A summary of the innovation related strategic context is outlined in Appendix A. The strategic fit of the Innovation Strategy within existing DAERA policies is provided in Appendix B.

Section 4

What is innovation?

4.1 Innovation has many guises and definitions. *Innovate NI, the Innovation Strategy for Northern Ireland 2014 - 2025*, defines innovation as *'the successful generation and exploitation of new ideas. It is about transforming creative thinking into new products, new and improved processes and technologies to support new ways of doing business.'* This can range from incremental through disruptive to radical and include practical and blue-sky innovations. Therefore, innovation is more than R&D. It includes changes to products and processes, introduction of new business models, organisational changes and the exploitation of new markets.

Why should government invest in innovation?

4.2 The *Innovation Strategy for Northern Ireland 2014 - 2025*, highlighted the need for increased innovation within the public sector. However, in addition to it becoming more innovative in how it operates, whether as an intelligent customer or as a partner to drive change, the public service can play a powerful role in encouraging innovation within the sectors it serves. Governments need to be innovative and also create the right conditions for innovation to occur, both within and across systems.[3]

4.3 There are compelling reasons for DAERA to invest in establishing and encouraging an environment conducive to innovation.

- ***To address societal problems***

4.4 Society is facing many challenges. The scale of human impact on the planet has never been greater and innovative solutions are needed to address the wide range of threats. It is estimated that the world's population will increase to more than 9 billion people by 2050, and that 60% more food will be needed worldwide[4]. Increasing demand for food increases demand for land, water, feed, fertilisers and other resources. We need to be able to produce food more efficiently, which means creating and adopting innovations to increase productivity, as well as addressing the environmental footprint of agriculture and agri-food supply chains, and achieving Net Zero emission reduction targets set by UK Government.

3 OECD (2017), Fostering innovation in the Public Sector, OECD, Paris.
4 UKRI (2019), Transforming Food Production www.ukri.org/innovation/industrial-strategy-challenge-fund/transforming-food-production/

4.5 Northern Ireland faces many environmental and agri-food related challenges including:

- Addressing greenhouse gas emissions;
- Reducing waste;
- Improving water, soil and air quality;
- Reversing biodiversity loss;
- Mitigating animal and plant health risks;
- Increasing productivity, resilience and safety of agri-food systems;
- Securing integrated, efficient, sustainable and competitive supply chains.

4.6 Innovation is critical to delivering solutions to these challenges as well as promoting a thriving business sector to increase economic productivity and sustainability in line with the Executive's plan for Green Growth.

• To drive economic growth

4.7 There is a compelling rationale for government to invest in establishing and encouraging an environment conducive to innovation. Investing in knowledge and innovation, including in research and innovation capacity, is vital for achieving inclusive economic growth, for the sustainability of the UK economy and the vibrancy of the innovation system[5]. In the UK, evidence shows that a small number of high-growth businesses are responsible for the lion's share of job creation and prosperity. A study by the Innovation Foundation, NESTA, reported that 6% of all UK businesses with the highest growth rates generated half of the new jobs created by existing businesses. The same study also showed that businesses that innovate grow nearly twice as quickly in both employment and turnover as non-innovators[6].

• To support innovation activities

4.8 It is recognised that national governments can stimulate innovation through providing incentives for R&D and innovation; stimulating knowledge exchange and innovation adoption; supporting facilitation activity to encourage/support innovation; and enabling collaboration. The EU Standing Committee on Agricultural Research (SCAR), recommends that governments should have an innovation policy focusing on capacity building, supporting collaboration, mitigating barriers, incentivising innovation actions/investment and dissemination of information as widely and visibly as practical[7].

5 Department for Business Innovation and Skills (2014), Our plan for growth: Science and Innovation, Evidence Paper.
6 Bravo-Biosca, A. and Westlake, S. (2009), 'The Vital 6%: How high-growth innovative businesses generate prosperity and jobs.' London, NESTA.
7 SCAR (2013), 'Agricultural Knowledge and Innovation Systems towards 2020'.

- ***To support collaboration***

4.9 There is considerable evidence to demonstrate the innovation and performance benefits that accrue to businesses engaging in open innovation that is, undertaking innovation activities with external partners[8]. A study of Northern Ireland micro-businesses that engaged in open innovation had higher innovation success than those that didn't. Also, as the number of types of external partners collaborating with a business increased, so too did the sales derived from innovation. Government has a critical role in facilitating and supporting collaboration.

- ***To optimise returns on innovation investment***

4.10 There is evidence that publicly funded Research and Development and Innovation (R&D&I) activity, elicits a higher business response than private sector investment, via substantial spillovers to other businesses, whereas private sector investment is almost wholly captured by the original investors. Research on the returns to public investment in R&D science suggests an economy-level rate of return of around 20%[9]. Also there is a crowding-in impact of publicly supported R&D&I. Evidence suggests, an extra £1 of public investment will lead to an increase of between £1.13 and £1.60 private investment in R&D&I[10].

Innovation in Northern Ireland

4.11 The *UK Innovation Survey: Northern Ireland Results* give an indication of the level of innovation in Northern Ireland businesses[11]. In the UK Innovation Survey 2017: Northern Ireland Results, Northern Ireland is the lowest ranked region of the UK in the Regional Innovation Scoreboard. It ranked 12th out of the 12 UK regions and 104th out of 238 EU regions. The UK Innovation Survey estimated Northern Ireland to be the least innovation active country in the UK during 2014-2016[12]. However the Northern Ireland Executive has set the ambitious target of Northern Ireland being ranked in the top four of the 12 UK regions by 2025.[13]

Innovation in the areas within DAERA's remit

4.12 DAERA is a Government Department with a diverse scope of responsibility including agri-food, environment, fisheries, forestry, rural development and cross-sector issues including sustainability, climate change and Green Growth. Awareness of, and approaches to, innovation vary considerably across this scope. Within farming for example, advances in technology have led to a heralding of what is being termed Agriculture 4.0, the fourth

8 Hewitt-Dundas, N. and Roper, S. (2018), 'Exploring market failures in open innovation'. International Small Business Journal: Researching Entrepreneurship, 36(1), 36 - 40

9 https://sciencebusiness.net/news/80354/R%26D-pays%3A-Economists-suggest-20%25-return-on-public-investment-for-research-and-innovation

10 Economic Insight (2015), 'What is the relationship between public and private investment in science, research and innovation?'

11 These surveys sample enterprises with 10 or more employees and include Small and Medium Sized Enterprises (SMEs) and larger companies. They cover a wide range of enterprises including manufacturing, food, transport, retail, hotels and construction. While not specific to the areas within DAERA's remit, they reflect the innovation culture and activities across Northern Ireland's businesses. It must be noted that the survey does not include micro-businesses which are the dominant grouping within the Northern Ireland agri-food sector.

12 NISRA (2019), UK Innovation Survey 2017: Northern Ireland Results.

13 NI Executive (2014), Innovate NI Innovation Strategy for Northern Ireland 2014 – 2025.

agricultural revolution[14]. It suggests that there is likely to be a pervasion of advanced information technology into all aspects of farm business management and that IT will facilitate a food supply chain that is more connected than ever before[15].

4.13 How we produce our food will change significantly in the coming years with robotics, telecommunications advances, digital innovation, Internet of Things (IoT), blockchain, data capture devices (e.g. drones) becoming common place. These technologies will not solely relate to productivity growth however, they will also facilitate the reconciliation of our agricultural activities with their environmental consequences. Digitisation of production processes, data capture and analysis, modelling, machine learning and integration of new inventions into our working systems will be highly important enablers of carbon neutral food, forestry and fish production.

4.14 Some areas of Northern Ireland agriculture are significant adopters of new technologies, for example, the installation of robotic milking systems on dairy farms; use of GPS mapping; use of farm data management software; apps to help crop disease identification and tracking; and apps to monitor pig feeding systems.

Barriers to innovation

4.15 Many barriers to innovation in business have been identified. For innovation to thrive systemically, support is needed to help overcome these barriers. Examples of barriers to innovation include:

- Lack of leadership, technological, R&D and creative thinking skills[16];
- Risk aversion and low levels of entrepreneurship;
- Reluctance to collaborate;
- Perceived economic risk;
- Availability of finance;
- Regulation and Intellectual Property (IP);
- Lack of capacity and/or capability;
- Insufficient market intelligence;
- Poor communications infrastructure;
- Failure to identify opportunities.

14 World Government Summit (2018), 'Agriculture 4.0: The Future of Farming Technology'.
15 Williams, C. and Wootton-Beard, P. (2019), 'On the Farmer's Radar: Top 10 Tech Trends for Agriculture'. Farming Connect. Aberystwyth University.
16 Northern Ireland Executive (2014), Innovate NI Innovation Strategy for Northern Ireland 2014 - 2025.

4.16 The structure of businesses in Northern Ireland is also a significant barrier to innovation, with a large number of Small and Medium Sized Enterprises (SMEs), together with a high proportion of sole traders. Micro-businesses (having less than 10 employees), are estimated to make up over 95% of local businesses. Research into the barriers facing micro sized food producers has been carried out by University of Ulster Business School, as part of the EU Interreg project 'LOCFOOD'. This project identified barriers to innovation such as a lack of understanding of the support that is available; how to access it; trust issues; and a perception that innovation is something that larger companies do[17].

4.17 Within the public sector the Organisation for Economic Co-operation and Development (OECD)[18] highlights a lack of innovation within the public sector. This has emerged as another key barrier to innovation within those sectors which are supported, facilitated and incentivised through government departments. Risk aversion, bureaucratic structures and skills shortages are seen as key issues. Public organisations often struggle to generate enough ideas, partly due to a conservative approach to risk management, related to the use of public funding. There is a clear need for governments to *'not only be innovative; they must also create the right conditions for innovation within and across systems'.* An innovative and enterprising public sector is vital to help address the industry, environmental and societal challenges ahead.

What priorities should a DAERA Innovation Strategy address?

4.18 To inform consideration of the priorities for this strategy, high-level SWOT (Strengths, Weaknesses, Opportunities and Threats) assessments were undertaken, both for innovation within DAERA and within the areas for which it has responsibility. The results of these analyses are shown diagrammatically in:

FIGURE 1 - SWOT analysis for innovation within DAERA;

FIGURE 2 - SWOT analysis for innovation in the areas within DAERA's remit.

17 Quinn, B., McKitterick, L., McAdam, R. and Dunn, A. (2014), 'Barriers to Micro Food Enterprise Engagement in Business Support Programmes'. International Journal of Entrepreneurship and Innovation, Vol. 15, No 3, pp. 205-217.
18 OECD (2017), Fostering Innovation in the Public Sector.

Figure 1 - SWOT analysis for innovation within DAERA

- Good governance structures.
- Organisation structures which link knowledge generation to knowledge exchange processes.
- Strong links with industry stakeholders.
- Currently delivering schemes to support innovation in agri-food.
- Access to DoF Innovation Lab.

- Conservative risk appetite.
- Organistion culture.
- Lack of dedicated teams, budgets, processes and skills.
- Limited engagement between government, industry and academia.
- Limited innovation provision in education.
- Silo working.
- Limited influence on UK innovation strategies and funding.
- Awareness of barriers.
- Risk averse culture.

- Training to encourage staff to engage in innovation.
- Dedication of resources to supporting innovation within DAERA (and its sectors of interest).
- Establishment and growth of UK/EU networks.
- Developing a culture supportive of innovation.
- Open innovation - sharing of data.
- Targeting and prioritisation of effort to optimise innovation impact.

- Change too slow to exploit opportunities.
- Necessary work post EU transition may consume attention and resources.
- Funds not made available to progress innovation measures.
- Lack of dedicated innovation leadership.
- Limited engagement.
- Insufficient influence on national funding priorities.
- Fragmentation across the NICS, and between devolved authorities in relation to driving, and sharing lessons, from innovation.

Figure 2 - SWOT analysis for innovation in the areas within DAERA's remit

- Some innovators already operating in industry.
- Currently agri-food industry can avail of DAERA RDP innovation schemes.
- Availability of R&D funding.
- Support through DfE and Invest NI.

- NI has the lowest level of innovation in the UK.
- Funding environment is opaque and difficult.
- Lack of skills and understanding of innovation.
- Lack of coordination and networking within the supply chain inhibiting innovation.
- Fear of failure.
- Lack of access to information.

- Big Data, Artificial Intelligence and Bioeconomy present opportunities to significantly change approaches.
- Create an environment which encourages innovation.
- Establish and promote the many funding streams available for innovation activities.
- Technological advancement relevant to all sectors.
- Establishment of resources and structures to encourage, guide and support innovation has the potential to increase innovation uptake.

- Uncertainties following EU departure.
- Relevant sectors/industry fall behind in technological advancements.
- Barriers to collaborative innovation include mistrust, data sharing issues and IP rights.
- Lack of leadership and support at government level.

Priority Overarching Themes

4.19 The world is facing many pressing global challenges and we are on the brink of technological transformations that impact us all[19]. In the development of this strategy, three overarching technological themes have been identified which are likely to be at the forefront of innovation change within the sectors under DAERA's remit. These themes are **Big Data, Artificial Intelligence (AI) and Transformative Bioeconomy**.

4.20 The UK Industrial Strategy has a set of four Grand Challenges to put the UK at the forefront of industries in the future, one being 'AI and Data'[20]. The importance of AI in underpinning future prosperity was further addressed in the UK Government AI Sector Deal Policy[21] Paper. The Northern Ireland draft Industrial Strategy, Economy 2030[22], identified digital technologies as an area where Northern Ireland has world class capabilities.

4.21 In addition, a strong bioeconomy could transform the way we address challenges in food, fuel, chemicals, materials, energy, waste, environment and health and remove our reliance on finite fossil fuels. The increasing importance of the bioeconomy in terms of Green Growth and its value in growing the economy's Gross Value Added (GVA) and potential for job creation, was reflected in the production of the UK Growing the Bioeconomy Strategy 2030[23]. Furthermore, with Horizon Europe's Strategic Plan 2021-2024,[24] Bioeconomy is prioritised within one of six global challenge areas. Global challenges and research frontiers are shifting rapidly. To take full advantage of the opportunities this presents, the UK Bioeconomy Strategy stresses that in terms of bioeconomy we must aim to be 'transformative'.

4.22 Importantly, while the Innovation Strategy prioritises these themes to provide a focus, it will not exclude other areas of innovation where appropriate. Through expert oversight and horizon scanning, it will closely monitor all innovative developments for their value to DAERA and the areas within DAERA's remit.

4.23 Further details of these priority areas is provided in Appendix C.

19 HM Government (2019), International Research and Innovation Strategy.
20 BEIS (2017), UK Government Industrial Strategy.
21 HM Government (2019), AI Sector Deal Policy Paper.
22 Department for the Economy (2017), Economy 2030 - Northern Ireland Draft Industrial Strategy.
23 HM Government (2018), Growing the Bioeconomy: A National Bioeconomy Strategy to 2030.
24 European Commission (2021), Horizon Europe Strategic Plan (2021-2024).

Section 5

DAERA Innovation Strategy - an operational strategy of the DAERA Science Strategy Framework

5.1 The Innovation Strategy Mission is:

An innovation ecosystem delivering for the environment, societal wellbeing and the rural economy, through:

- creating an enabling environment for innovation to flourish;
- enhancing the impact of knowledge generation and science investments;
- collaboration and exploitation, ensuring positive, measureable outcomes for the Northern Ireland environment and economy.

5.2 Innovation Strategy Scope

This strategy will apply to DAERA and all the areas within DAERA's remit including agri-food, environment, fisheries, forestry, rural development[25] and cross-sector issues including sustainability, climate change and Green Growth (including activities relating to animal and plant health, biodiversity, decarbonisation, waste management, natural environment, rural activities and ecosystem management).

25 For the purpose of the Innovation Strategy rural businesses are defined as businesses that specifically use **local** rural land and water resources. This includes use of produce from farming, horticulture, forestry, food and drink and fishing and the use of local land and water resources for social or educational purposes. Innovation in rural businesses is the introduction of new techniques, equipment or processes to make them more productive and to make a positive climate related contribution.

Section 6

Principles

6.1 The principles defined in the DAERA Science Strategy Framework[26] apply to this Innovation Strategy. Additional principles specific to innovation are:

What?

6.2 DAERA investment in innovation will support the development of an innovation enabling culture, capability and capacity to improve economic performance whilst improving resource efficiency, enhancing the sustainability of the environment and mitigating the effects of climate change.

Why?

6.3 To stimulate and support innovation that contributes to Northern Ireland being a modern, creative, adaptive, sustainable and climate resilient society, which prospers through having a strong, competitive, sustainably balanced economy.

How?

6.4 DAERA will seek to optimise the value of its investment in innovation through always:

- Providing effective, skilled leadership that can drive change and create the values and behaviours that promote and reinforce the culture of innovation;
- Engaging with stakeholders, experts and funders to inform a comprehensive and accurate understanding of innovation needs, barriers and opportunities;
- Targeting DAERA investment in innovation, to optimise the beneficial impact for NI;
- Working across government, to facilitate and remove barriers to innovation;
- Building and maintaining DAERA credibility and influence with UK and international funding bodies, to optimise the relevance of opportunities to the areas under DAERA's remit;
- Encouraging and supporting a culture, capability and capacity, both within DAERA and the business sectors within DAERA's remit, to maximise innovation;
- Applying effective and efficient governance mechanisms for DAERA-supported innovation investment;
- Evaluating the impact of DAERA's investment in innovation, through measuring industry and environment outcomes.

26 DAERA (2019), Science Strategy Framework https://www.daera-ni.gov.uk/sites/default/files/publications/daera/DAERA%20Science%20Strategy%20Framework%20Final.PDF

6.5 The general principles determining funding considerations are:

- Innovation will need to be a key theme of every new strategy, policy and programme initiated by DAERA;
- There will be a greater need for public innovation investment where the innovation primarily provides for wider societal, environmental or public goods, or is novel and carries significant risk, and therefore, is unlikely to be progressed by commercial organisations;
- There will be a focus on addressing the barriers to promoting and leveraging private innovation investment, particularly when the innovation provides benefits to commercial organisations e.g. increased market access, industry growth or profitability;
- All opportunities to use public funding to leverage and complement private investment in innovation (i.e. where this would not otherwise happen) will be explored;
- The strategy will be implemented through collaboration and co-design (internal and external), utilising relevant sectoral mechanisms, policy frameworks and funding streams where available and developing standalone mechanisms where necessary.

6.6 For innovation to flourish in the public sector, there will be a need for a greater risk appetite. This will involve assessing and managing the level of risk more effectively, to balance the potential benefits and threats.

6.7 These principles have been forefront in the development of the goals of this strategy, which are aimed at addressing issues and grasping opportunities identified in the strategic context and through the research and stakeholder engagement processes conducted.

Section 7

Goals

7.1 This Innovation Strategy identifies three goals to deliver the change needed.

These are:

Goal 1 - Internal Focus

DAERA is an effective leader for innovation adoption.

Goal 2 - External Focus

(i) Innovation is encouraged, supported, and facilitated by DAERA in a balanced manner across its remit.

(ii) Big Data, Artificial Intelligence and the Transformative Bioeconomy are priorities for DAERA innovation support.

Goal 3 - Measurement

50% more businesses (within the scope) are exploiting opportunities in Big Data, Artificial Intelligence and Transformative Bioeconomy across the sectors in DAERA's remit by 2025, (as measured through a Baseline Survey and Monitoring and Evaluation Framework which will also develop further innovation metrics and measures).

Section 8

Milestones

8.1 Milestones associated with Goal 1 are:

- Establishment of appropriate senior and dedicated resource and governance mechanisms in DAERA by spring 2021, to provide direction and leadership and to champion and govern the implementation of the Innovation Strategy.
- Development of appropriate, effective engagement mechanisms, with key relevant stakeholders and authorities, including funding bodies, to (a) inform DAERA on relevant innovation trends and new technologies and (b) explore key issues and identify opportunities to better facilitate innovation from summer 2021.
- Establishment of discrete Task Forces involving relevant departments, experts and DAERA stakeholder representatives, to explore opportunities and develop proposals for exploiting Big Data (including IoT), Artificial Intelligence and the Transformative Bioeconomy related opportunities, by the end of 2021.
- Development of capability and capacity of staff to support innovation and grow an 'open innovation' culture within DAERA, including improving access to and encouraging use of relevant data and insights from academia, the private sector, the third sector and the public; so that DAERA can effectively support innovation uptake in the sectors within its remit from summer 2021.

8.2 Milestones associated with Goal 2 are:

- Implementation of an Innovation Communication and Promotion Plan by the end of 2021, to raise awareness and generate interest in the role of innovation within DAERA and by its stakeholders.
- Evaluation and consideration of an Innovation Support Network/Service (similar to the Scottish RISS)[27] to support collaboration and encourage an innovation culture from summer 2021. The network/service would facilitate the provision of professional support, through facilitation, to groups of like-minded individuals from sectors under DAERA's remit, who want to test new ideas and find feasible, sustainable solutions to common challenges.
- By spring 2023 CAFRE will incorporate innovation within its portfolio of education and knowledge transfer programmes to those entering and within the agri-food industry.
- Completion of a review and report on the barriers to innovation for businesses across the sectors within DAERA's remit, by spring 2022.

27 A Rural Innovation Support Service (RISS) is led by the Soil Association in Scotland and funded through the Scottish Rural Development Programme. RISS in Scotland provides professional support to groups interested in innovation.

8.3 Milestones associated with Goal 3 are:

- Prioritisation of DAERA R&D innovation funding to projects utilising Big Data, Artificial Intelligence or progressing opportunities relating to the Transformative Bioeconomy, by summer 2022.
- Development and implementation of a Monitoring and Evaluation Framework to enable the reporting of progress against targets for all the areas within DAERA's remit from summer 2021. This will involve data collection from a range of sources across DAERA (including CAFRE) and our collaborative partners, and the development of innovation metrics.

Section 9

Benefits

9.1 The benefits of implementation of an Innovation Strategy by DAERA are detailed in Table 1.

Table 1 Benefits of implementation of an Innovation Strategy by DAERA

Benefit	Examples of impact
Increased innovation resulting in new products, new or improved processes and technologies to support new ways of doing business in the areas in DAERA's remit.	- Increased adoption and exploitation of innovative technologies particularly in Big Data, Artificial Intelligence and the Transformative Bioeconomy, to drive sustainable productivity growth, mitigate against climate change and environmental degradations and achieve net zero emissions targets from sectors within the scope.
Better value for money for the public purse.	- Increased impact from investment in innovation and R&D by relevant industries; - Increased draw-down of external, competitive funding.
Improved collaboration and strategic alliances to address common challenges and reduce the barriers to innovation within DAERA and in the areas within DAERA's remit.	- Increased engagement, leading to an increasing number of collaborations across government departments in Northern Ireland, across the UK, Republic of Ireland, EU and further afield; - Increased credibility and influence with UK and international funding bodies to optimise the funding opportunities for the areas within DAERA's remit.
Improved staff expertise in innovation leading to better ways of working within DAERA and improved facilitation of innovation in the areas within DAERA's remit.	- A well trained workforce with skills in innovation and creativity that will lead to increased productivity, improved policies and practices; - Embedding of more innovative ways of working leading to increased adoption of innovation both within and external to DAERA; - Improved culture, capacity and capability within DAERA, including better strategic alignment to key objectives relating to innovation, improved leadership and management processes.

9.2 Baselines to facilitate measurement of benefits will be established at an early stage of strategy implementation utilising existing data and results of an Innovation Survey specific to Northern Ireland. Qualitative and quantitative measures will be included within the subsequent Monitoring and Evaluation Framework.

9.3 The first iteration of the Innovation Strategy runs from 2021 to 2025. A DAERA Innovation Report will be produced at the mid and end points of strategy implementation and will include:

- an evaluation of progress against goals and milestones to ensure the strategy is on track for delivery and that necessary adjustments can be made in a timely manner;
- an assessment of innovation performance within all areas in DAERA's remit;
- recommendations for future actions and policy direction.

9.4 A retrospective evaluation will also be carried out on this strategy at the end of its term to inform future needs.

Section 10

Key actions to achieve goals

10.1 The essential components needed for innovation to thrive have been considered. These are shown in:

Figure 3 - Key actions to achieve Goal 1

Figure 4 - Key actions to achieve Goal 2

Figure 5 - Key actions to achieve Goal 3

Figure 3 - Key actions to achieve Goal 1

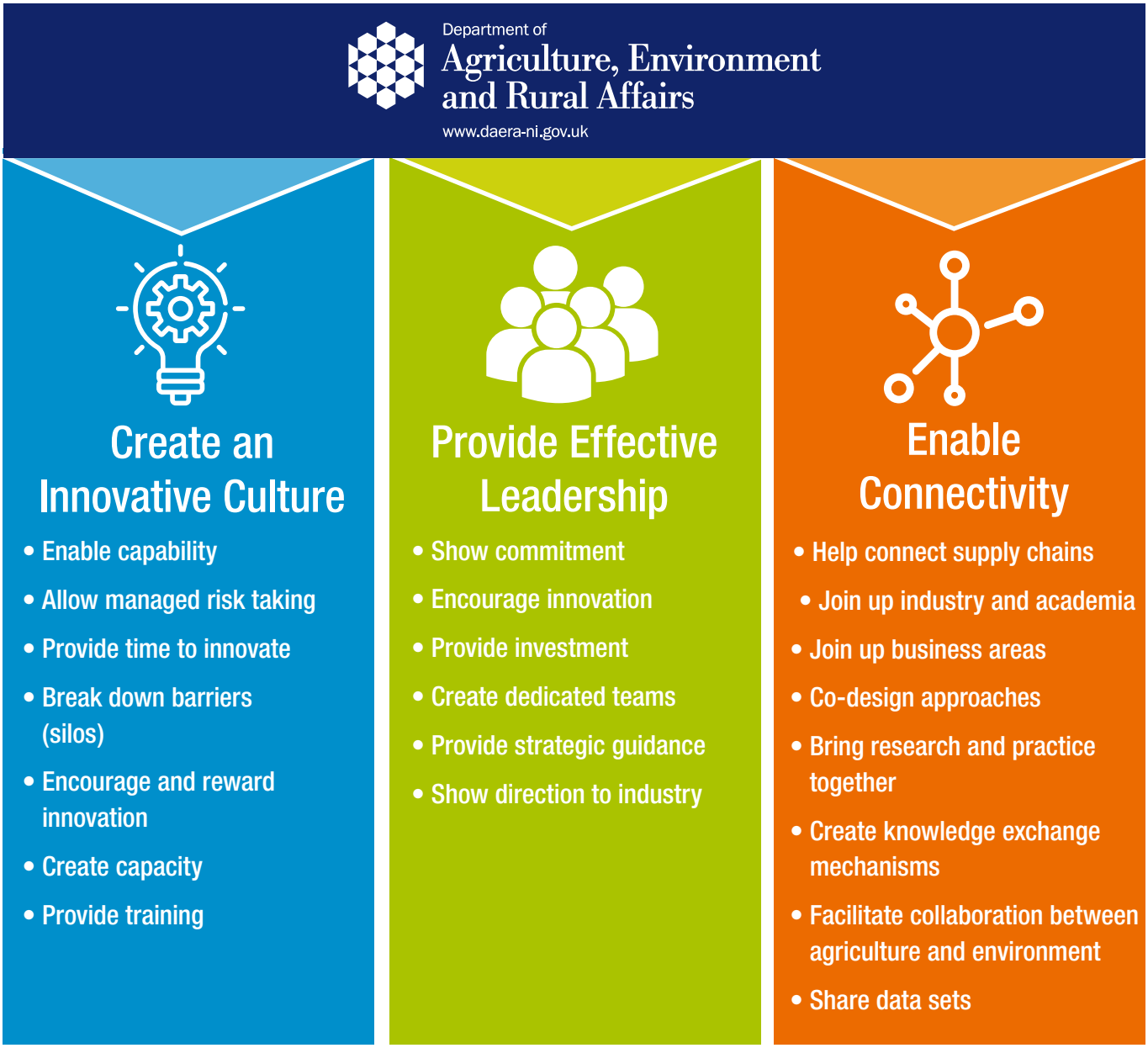


Figure 4 - Key actions to achieve Goal 2

DAERA Stakeholders

Education/Training/Skills

- Include innovation training in all DAERA education programmes.
- Prioritise innovation in DAERA's Post Graduate Studentship Programme.
- Investigate innovation scholarships and apprenticeships.
- Collaborate with universities and colleges to encourage innovation education.
- Support innovation related Knowledge Transfer Partnerships.
- Encourage employer support programmes for innovation.
- Evaluate and build on existing DAERA innovation support schemes such as Farm Innovation Visits, Technology Demonstration Farms, European Innovation Partnership Operational Groups and the Rural Micro Business Growth Scheme.

Collaboration and Networking

- Establish and build effective engagement with innovation related organisations at NI, UK and international levels.
- Explore options for an Innovation Support Network/Service to support and encourage the uptake of innovation.
- Collaborate with other Departments, such as DfE for example, to encourage participation in the DfE Innovation Accreditation Scheme, Small Business Research Initiative, the Employer Support Programme, and Skills Strategy implementation.

Communication and Promotion

- Implement an Innovation Communication and Promotion Plan.
- Showcase innovation excellence and best practices and share success stories.
- Identify and promote funding channels and opportunities.
- Report and promote the economic impact of innovation.
- Increase awareness of innovation education and knowledge transfer opportunities.

Knowledge Exploitation

- Showcase innovation solutions in Big Data, Artificial Intelligence and Transformative Bioeconomy.
- Create a knowledge generation through to exploitation feedback loop.
- Identify and mitigate barriers to innovation.
- Better understand industry R&D and innovation needs, facilitating better signposting to potential opportunities.
- Explore government capital finance for scaling up, including proofs of concept/pilots/seed funding approaches, as well as sectoral capital support programmes.

Figure 5 - Key actions to achieve Goal 3

10.2 A summary of proposed activities for exploration, and where determined as feasible and affordable, for implementation subject to the availability of funding, are provided in Appendix D.

Section 11

Rural needs considerations

11.1 DAERA has a statutory duty to screen decisions to consider the likely impacts of the proposed decisions on rural areas.

11.2 A Rural Needs Assessment has been completed and is available here.

11.3 While potential impacts of the strategy on rural areas have been identified, the Rural Needs Assessment template is a living document and will be reviewed regularly.

Section 12

Equality considerations

12.1 A High Level Impact Assessment has been completed for this Innovation Strategy, to evaluate the equality issues as set out in the Section 75 equality legislation. All policies that will cascade from this strategy will be equality screened and where necessary, a full Equality Impact Assessment will be completed. This is in line with the DAERA Equality Scheme.

Section 13

Abbreviations

AI	Artificial Intelligence
AFBI	Agri-food and Biosciences Institute
CAFRE	College of Agriculture, Food and Rural Enterprise
DAERA	Department of Agriculture, Environment and Rural Affairs
DfE	Department for the Economy
DoF	Department of Finance
EU	European Union
FE	Further Education
GPS	Global Positioning System
GVA	Gross Value Added
HE	Higher Education
IoT	Internet of Things
IP	Intellectual Property
IT	Information Technology
NESTA	National Endowment for Science, Technology and the Arts
NI	Northern Ireland
OECD	Organisation for Economic Co-operation and Development
PfG	Programme for Government
QUB	Queens University Belfast
R&D	Research and Development
R&D&I	Research and Development and Innovation
RISS	Rural Innovation Support Service
RPD	Rural Development Programme
SCAR	Scientific Committee for Agricultural Research
SME	Small and Medium Sized Enterprises
SSF	Science Strategy Framework
SWOT	Strengths, Weaknesses, Opportunities and Threats
UK	United Kingdom
UU	University of Ulster

Appendix A

Summary of the strategic context for the DAERA Innovation Strategy

Strategy/Policy	Description and strategic fit with wider national, EU and world strategies
Government Technology Innovation Strategy (2019)[28]	This strategy wants to make sure that the people who are leading and delivering public services can continue to find opportunities for technology that help meet user needs. This requires a culture where good ideas are encouraged and rewarded and new processes refined. The strategy identifies appropriate actions including: • Recruiting specialist professionals and training current staff; • Establishing digital talent at all levels; • Ensuring Government's procurement and business case processes promote **innovation using emerging technologies**; • Increasing access to data; • Sharing best practice in emerging technology.
A guide to using artificial intelligence in the public sector (2020)[29]	**'Artificial Intelligence and data'** was named as one of the four Grand Challenges in the UK Industrial Strategy White Paper, which are global trends that will transform our future and contribute to the Government's long term plan to boost productivity in the UK. A review published as part of the Government Technology Innovation Strategy revealed that leaders across the public sector could benefit from better understanding the technology, the opportunities it presents and the limitations of its use.
Industrial Strategy - Building a Britain fit for the future (2017)[30]	This strategy sets out the UK's ambition to be the world's most **innovative economy** with the five foundations of ideas, people, infrastructure, business environment and place. It targets a number of Grand Challenges which include Clean Growth and AI and the Data Economy.

28 Cabinet Office (2019), Policy Paper: The Government Technology Innovation Strategy (2019).
29 Government Digital Service and Office for Artificial Intelligence (2019), A guide to using artificial intelligence in the public sector.
30 Department of Business, Energy and industrial Strategy (2017), Policy Paper: Industrial Strategy - Building a Britain fit for the future.

Strategy/Policy	Description and strategic fit with wider national, EU and world strategies
Growing the Bioeconomy: A National Bioeconomy Strategy to 2030[31]	The bioeconomy represents the economic potential of harnessing the power of bioscience to produce **innovative products, processes and services** that rely on renewable biological resources instead of fossil fuels. The vision is that by 2030 the UK is a global leader in developing, manufacturing, using and exporting bio-based solutions. The goals are to: • Capitalise on our world class research, development and innovation base to grow the bioeconomy; • Maximise productivity and potential from existing UK bioeconomy assets; • Deliver real, measurable benefits for the UK economy; • Create the right societal and market conditions to allow innovative bio-based products and services to thrive.
Orientations towards the first Strategic Plan implementing the research and innovation framework (2019)[32]	Food, **bioeconomy**, natural resources, agriculture and environment are one of the six general orientations to be targeted with the future Horizon Programme Strategic Plan. **Innovation** is considered to be key to accelerate the transition towards sustainable management of natural resources and achievement of climate neutrality of sustainable primary production, value chains and bio-based industries, halt biodiversity decline and restoration of ecosystems and the sustainable and circular management and use of natural resources.

31 HM Government (2018), Growing the Bioeconomy, improving lives and strengthening our economy: A National Bioeconomy Strategy to 2030.

32 Horizon Europe (2019), Orientations towards the first Strategic Plan implementing the research and innovation framework programme. Horizon Europe web open consultation.

Strategy/Policy	Description and strategic fit within other NICS strategies/ policies
Programme for Government 2016-2021[33]	The Northern Ireland Executive's draft Programme for Government (PfG) 2016 - 2021 outlines priorities to be delivered in Northern Ireland for the purpose of *'improving wellbeing for all - by tackling disadvantage and driving economic growth'.* This includes a range of priorities relevant to DAERA, including those focused on achieving a strong, competitive, regionally balanced economy (Outcome 1); living and working sustainably - protecting the environment (Outcome 2); enabling the enjoyment of long healthy lives (Outcome 4); becoming an **innovative**, creative society, where people can fulfil their potential (Outcome 5) and creating a place where people want to live, work, visit and invest (Outcome 10).
Economy 2030: A consultation on an industrial strategy for Northern Ireland[34] **Draft**	The industrial strategy outlines five 'Pillars for Growth' including **'Accelerating innovation** and research'. The strategy provides priorities under this pillar and identifies agri-food as one of the six broad sectors of the economy where Northern Ireland has world class capabilities.
Economic Strategy for Northern Ireland 2012[35]	This strategy identified **innovation**, R&D and creativity as one of its five strategic themes. The strategy provides priorities under this pillar and identifies agri-food as one of the six broad sectors of the economy where Northern Ireland has world class capabilities.
Innovate NI, Innovation Strategy for Northern Ireland 2014 - 2025[36]	The Innovate NI strategy takes forward the ***'Stimulating innovation,*** *research and development and creativity'* theme identified in the Northern Ireland Economic Strategy 2012. Innovate NI aims to stimulate a step change in **innovation across the economy**. This strategy also highlights the fact that skills, design and collaboration between sectors locally, nationally and internationally are essential for **innovation**.
Investment Strategy NI 2011-2021[37]	This strategy sets a key priority to create a modern economy driven by business and targeted on higher value added and more innovative products and services. One priority is to provide suitable financial support, infrastructure and advice to assist indigenous businesses to make further investments - **increasing innovation**, R&D and capability development.

33 Northern Ireland Executive (2016), Draft Programme for Government 2016-2021.
34 Department for Economy (2017), Economy 2030: A consultation on an industrial strategy for Northern Ireland.
35 DETI (2012), Northern Ireland Economic Strategy.
36 Northern Ireland Executive (2014), Innovate NI: Innovation Strategy for Northern Ireland 2014 - 2025.
37 Northern Ireland Executive (2011), Investment Strategy for Northern Ireland 2011 - 2021.

Appendix B

Summary of the strategic fit of the Innovation Strategy within existing DAERA policies.

Strategy/Policy	Description and strategic fit within DAERA policies
DAERA's Vision	*Sustainability at the heart of a living, working, active landscape valued by everyone.* **Innovation** is a key enabler for the achievement of this vision. DAERA will put a significant focus on encouraging and supporting innovation across the breadth of its remit.
DAERA Science Strategy Framework[38]	DAERA's Science Strategy Framework (SSF) envisages the science secured and used by DAERA will be **innovative**, collaborative and transformative, supporting a healthy and sustainable economy, environment and rural community, helping deliver the Programme for Government outcomes and contributing to a sustainable, living, working active landscape valued by everyone. A goal of the SSF is that DAERA optimises its investment in science. The implementation of an Innovation Strategy to encourage and support innovation through fostering an enabling environment for knowledge generation, exchange and exploitation, including adopting an appropriate risk appetite is a key activity in the achievement of this goal.
DAERA Knowledge Framework[39]	This aims to ensure that individuals, organisations and businesses within the agri-food industry have access to high quality, relevant and accessible education, training and technology exchange provision to improve productivity, resilience, environmental performance and sustainability. It makes a commitment that the enhancement of knowledge and skills will be an integral component of any of DAERA's policy interventions, and acknowledges that investment in science and **support of innovation** can only generate a return if its outcomes are communicated through education and lifelong learning and adopted by industry.
Environment Strategy for Northern Ireland (Draft)[40]	Science and **innovation**, including new technologies, radical approaches and solutions to environmental issues, are identified as key drivers to support the development of a strong, competitive, sustainable economy and the sustainable use of resources.

38 DAERA (2020), Science Strategy Framework.
39 DAERA (2019), Knowledge Framework.
40 DAERA (2019), Environment Strategy for Northern Ireland - Public Discussion document.

Strategy/Policy	Description and strategic fit within DAERA policies
Northern Ireland Future Agricultural Policy Framework (Draft)[41]	This policy framework recognises science and **innovation** as important drivers of long term productivity growth. A Productivity Grand Challenge approach towards science and **innovation** was recommended, aiming to secure more value from existing and additional resources, including: Use of a multi-actor approach of science, **innovation**, knowledge transfer, education, policy and industry.
NI Executive Green Growth Strategy (in development)	The Executive's Green Growth Strategy aims to transform society towards net zero by 2050; protect and enhance our environment and sustainably grow our economy. Achieving this aim will not only require **innovative** technologies but crucially **innovative** approaches to partnership and collaboration.

41 DAERA (2018), Northern Ireland Future Agricultural Policy Framework.

Appendix C

Further detail on Big Data, Artificial Intelligence and Transformative Bioeconomy

• *What is Big Data?*

In today's world there is a constant and rapidly expanding accumulation of data. More data has been created in the last two years than in the entire history of the human race. Vast amounts of data, in numerous formats, can now be generated at high speed. To be of value this data needs to be rapidly interpreted and actioned. Big Data relates to capturing the relevant data available and translating it into actionable information to improve business processes and help to solve a wide range of problems quickly.

A wide range of Big Data technologies have been developed. Big Data technology can be used to gather data and interpret information on topics such as natural heritage, water, land use, climate change, soil moisture and nutrient density, forage, livestock genetics, animal activity and performance, the marine environment, to name a few. In arable production for example devices have been created to measure soil moisture and nutrient density; tractor mounted sensors can assess crop yields; GPS can control slurry spreading and pesticide application; predictive weather stations and image capturing satellites are also utilised.

Drones can be used to gather data to map out land and monitor crop health. Through data science and valid algorithms, arable farmers can now use this data to predict significant risk factors such as pests and diseases and the impact of extreme weather on crops. LiDAR (Light detection and ranging) is a remote sensing technology that can be used to generate detailed maps of land topography and retrieve digital elevation data. It has already been used by DAERA to collect dense and accurate elevation data to enable monitoring and evaluation of land and marine environments.

Increasing computational capacity both in terms of speed and volume allows for novel analyses previously not possible. The information obtained can be accessed via software programmes on smartphones, computers, and tablets.

Information can be used at a macro level to provide industry or market level analysis; or at a micro scale to give information on fertilisation of a crop or tracking a beef carcase through to the final consumer. The Big Data generated through environmental monitoring can provide robust evidence for planning and investment decisions, which drive resource efficiency and the protection, enhancement and use of our Natural Capital[42].

Big Data technology is developing rapidly in data generation and communication with low cost sensor production, progress in satellite and drone based imaging, the Internet of Things (IoT), blockchain technology and DNA biobanks. Analytics and decision support tools are also moving

42 Natural capital can be defined as the world's stocks of natural assets which include geology, soil, air, water and all living things.

forward based on quantum computing and computer learning creating new opportunities for livestock and plant breeding from new traits and genotype specific medicines.

• *What is Artificial Intelligence?*

Artificial Intelligence or 'AI', is an area of computer science that involves machine learning based on statistical analyses, to develop 'intelligent machines'. AI has the potential to change the way we live and work, improving the efficiency of daily tasks.

AI can be defined as the use of digital technology to create systems capable of performing tasks commonly thought to require intelligence. While AI is constantly evolving generally:

- It involves machines using statistics to find patterns in large amounts of data;
- It is the ability to perform repetitive tasks with data, without the need for constant human guidance[43].

AI has a wide range of applications across food, farming, environment, fisheries, forestry and rural development. It can also be applied to cross cutting issues including sustainability, climate change and Green Growth. For example, AI is driving forward our knowledge of the natural environment, including the assessment of natural capital, habitat condition, change detection and ecosystem services. Earth observation technologies and machine learning algorithms are now used to deliver regional scale habitats and land cover mapping. This technological capability can improve our understanding of the environment and the services it provides, formulating innovative solutions to complex issues.

In forestry, AI combined with satellite imagery can be used to monitor forest health and to detect forest threats.

• *What is Transformative Bioeconomy?*

Traditionally we have relied on the use of oil and other fossil fuels to produce many of the goods we need. Global challenges like climate change, land and ecosystem degradation, coupled with a growing demand for food, feed and energy mean that we have to look for new ways of producing and consuming. The bioeconomy represents the economic potential of harnessing the power of bioscience, using renewable biological resources and innovative technologies, to replace unsustainable fossil resources in products, processes and services. The bioeconomy contributes to sustainable and resource efficient solutions to the challenges we face in food, materials and energy production, health and environmental protection.

The bioeconomy is the production of biomass[44] and the conversion of renewable biological resources into value added products. It is based around a set of activities that involve transformative processes. A Transformative Bioeconomy requires us to make lasting changes to the resources we use and adopt creative and innovative techniques to make the products we require from renewable resources and waste streams.

43 HM Government (2019) A guide to using Artificial Intelligence in the public sector.

44 Biomass is plant or animal material used for energy production (electricity or heat), or in various processes as raw material for a range of products (eg textiles, packaging, biofuels). It can be purposely grown energy crops (eg Miscanthus), wood or forest residues, waste from food crops (eg wheat straw), horticulture (compost), food processing, livestock (animal slurry) or human waste from sewage plants.

Within the UK, the main components of the Transformative Bioeconomy are agriculture and fishing, forestry, water and remediation, manufacture of food and drink and industrial biotechnology and bioenergy.

In order to meet the world's challenges, cutting edge biological and technological knowledge and methods for sustainable production, provision and processing of biomass are needed, to bring about the transformative changes necessary to develop the bioeconomy.

The bioeconomy is already part of everyday life for many people. In Northern Ireland the Transformative Bioeconomy is reported to have contributed 17.4% of the total regional GVA in 2014[45]. It is estimated that more than 13,000 jobs could be created by 2030, if Northern Ireland moved to a circular economy[46]. Jobs would be at various skills levels within a number of sectors including food and drink, bio-refining and the wider bioeconomy[47].

The *HM Government Growing the Bioeconomy: a National Bioeconomy Strategy to 2030*[48] aims to double the UK bioeconomy within 10-15 years to £440bn contribution to GVA by 2030.

45 Capital Economics (2016), Evidencing the Bioeconomy - An assessment of evidence on the contribution of, and growth opportunities in, the bioeconomy in the United Kingdom.
46 Circular economy is a system that minimises its input of resources and output of emissions and waste. It recognises and seeks to reduce both resources taken and waste disposed of by changing the way we consume.
47 ReNEW Network (2015), Job creation in the circular economy - increasing resource efficiency in Northern Ireland.
48 HM Government (2018), Growing the Bioeconomy: A National Bioeconomy Strategy to 2030.

Appendix D

Implementation of the Innovation Strategy

This appendix provides examples of activities that will be explored and where determined as feasible and affordable, will be implemented, subject to the availability of funding.

Goal 1 - Internal Focus

DAERA is an effective leader for innovation adoption.

	Milestones	Activities
1.	Establishment of appropriate senior and dedicated resource and governance mechanisms in DAERA, to provide direction and leadership and to champion and govern the implementation of the Innovation Strategy.	Establish an Innovation Champion role in DAERA to support the development of an enabling culture and provide visibility of commitment to innovation. Establish an Innovation Advisory Board, to provide expert (internal and external) advice on innovation trends and new technologies relevant to all aspects of the DAERA remit. Establish a dedicated Innovation Division, to lead, champion and support the implementation of the Innovation Strategy.
2.	Development of appropriate and effective engagement mechanisms with key relevant stakeholders and authorities, including funding bodies, to (a) inform DAERA on relevant innovation trends and new technologies and (b) explore key issues and identify opportunities to better facilitate innovation.	Build and maintain DAERA relationships with a broad scope of relevant networks with the aims of: - Exploring key innovation issues; - Addressing barriers to innovation; - Developing collaborative networks and improving co-funding and training opportunities; - Improving uptake of national funding streams; - Horizon scanning.

	Milestones	Activities
3.	Establishment of discrete Task Forces, involving relevant departments, experts and DAERA stakeholder representatives, to explore opportunities and develop proposals for exploiting Big Data (including IoT), Artificial Intelligence and the Transformative Bioeconomy.	Establish three specialist Task Forces for Big Data, Artificial Intelligence and the Transformative Bioeconomy.
4.	Development of the capability and capacity of staff to support innovation and grow an 'open innovation' culture in DAERA, including through improving access to and encouraging use of relevant data and insights from academia, the private sector, the third sector and the public; so DAERA can effectively support innovation uptake in the sectors within its remit.	Provide a programme of training on creativity and innovation to all DAERA staff, to address training needs. Align with DAERA Digital Transformation Strategy, DAERA Data Strategy and NI Open Data Strategy in terms of growing an 'open innovation' culture in DAERA and its sectors. Establish a resource that can assess and exploit data to yield sector relevant intelligence; and translate complex data into accessible, information; that can be used by DAERA stakeholders.

Goal 2 - External Focus

(i) Innovation is encouraged, supported, and facilitated by DAERA in a balanced manner across its remit.

(ii) Big Data, Artificial Intelligence and the Transformative Bioeconomy are priorities for DAERA innovation support.

	Milestones	Activities
1.	Implementation of an Innovation Communication and Promotion Plan to raise awareness and generate interest in the role of innovation within DAERA and by its stakeholders	Develop and implement an Innovation Communication and Promotion Plan both within DAERA and to the areas within DAERA's remit.
2.	Explore options for an Innovation Support Network to support collaboration and encourage an innovation culture.	Explore options for an Innovation Support Network/Service to support innovation by groups of stakeholders from the areas within DAERA's remit. The Network/Service will help: • stimulate and encourage the development of existing innovation related industry groups, as well as the formation of new innovation related groups; • explore particular challenges and/or opportunities and identify innovative solutions; • support identification of relevant funding sources.
3.	Capacity and capability building for innovation (aligning with the DAERA Knowledge Framework), made available through promotion and encouraging participation in appropriate programmes of learning at all education levels and through Continuing Professional Development.	Engage with relevant DAERA and Department for Economy FE/HE course providers, with the aim of ensuring relevant learning programmes have elements or modules relating to innovation; and that innovation-relevant industry linkages/ placements are available. Engage with Department for Education to inform on the potential benefits of stimulating creativity and innovation in respect of agriculture, food, environment and rural affairs at primary school level. Investigate provision of Masters level innovation centric programmes, relevant to the areas within DAERA's remit. Investigate opportunities for collaboration between DAERA and UU, QUB, AFBI and Competence Centres to provide courses necessary to allow skills shortages in innovation and creativity in the areas within DAERA's remit to be addressed. Explore opportunities for apprenticeship schemes, internships and scholarships in innovation and creativity.

	Milestones	Activities
		Review the DAERA Post Graduate Studentship Scheme, to ensure that innovative projects are targeted and prioritised. Identify and support a network of centres, for innovation competence development; and where innovative Big Data, AI and Transformative Bioeconomy solutions can be showcased and demonstrated to DAERA stakeholders.
4.	Completion of a review and report on the barriers to innovation across the sectors within DAERA's remit.	Liaise with stakeholders to review barriers to innovation across DAERA's remit. Collaborate with Department for Economy on the Innovation Accreditation Scheme, Small Business Research Initiative, Employer Support Scheme and innovation audits, to enhance the benefits delivered in areas within DAERA's remit. Investigate barriers to attaining Intellectual Property (IP) and identify mitigation measures to increase the number of stakeholders within DAERA's remit attaining IP rights. Review barriers to 'scaling up of innovations'. Investigate and report on capital funding opportunities for innovation adopters. Consider proposing proofs of concept/ pilots/seed funding approaches to achieve early momentum.

Goal 3 - Measurement

50% more businesses (within the scope) are exploiting opportunities in Big Data, Artificial Intelligence and Transformative Bioeconomy across DAERA remit sectors by 2025, (as measured through a Baseline Survey and Monitoring and Evaluation Framework which will also develop further innovation metrics and measures).

	Milestones	Activities
1.	Prioritisation of DAERA R&D innovation funding to projects utilising Big Data, Artificial Intelligence and progressing the Transformative Bioeconomy.	Prioritise projects and expenditure related to Big Data, Artificial Intelligence and the Transformative Bioeconomy in the commissioning of DAERA R&D.
2.	Development and implementation of a Monitoring and Evaluation Framework to enable the reporting of progress against targets for all the areas within DAERA's remit. This will involve data collection from a range of sources across DAERA (including CAFRE) and our collaborative partners, and the development of innovation metrics.	Establish quantitative baseline innovation information within DAERA and in the areas within DAERA's remit. Collate quantitative innovation data from across DAERA and from the sectors within DAERA's remit and review against targets annually. Utilise the information to monitor progress with the Task Forces and other Innovation Strategy activities and take actions to address performance.

‘Innovation is making creativity tangible’

‘Innovation is change that unlocks new value’

‘Culture eats strategy for breakfast and innovation for lunch’

‘Innovations occur where the right conditions exist’

‘Innovation is about turning ideas into invoices’

‘Innovation is a state of mind’

‘Creativity is the price of admission, but it’s innovation that pays the bills’

‘The best innovators persist and adapt to turn failures into successes’

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