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Spotlight on SEFARI Strategic Research 2018-19

The Scottish Government's Strategic Research Programme (SRP) for environment, land, agriculture, food and rural communities 2016-2021 is delivered by the Scottish Environment, Food and Agriculture Research Institutes (SEFARI). The SRP is the mid to long term research component of the Scottish Government Strategic Portfolio, which in addition to the SRP includes the underpinning of SEFARI national capability resources and, in partnership between SEFARI, Scottish Universities and Agencies, the policy facing Centres of Expertise.

SEFARI structures its research and Knowledge Exchange (KE) under eight Leading Ideas, namely 'Climate & Environment', 'Agriculture', 'Plant and Animal Health', 'Land & Communities', 'Food & Drink Innovation', 'Healthier Foods', 'Rural Economy' and 'Science Education'. Each category, underpinned by research excellence, delivers to policy and practice, sustainable economic development and building national and international partnerships contributing to Scotland's National Outcomes and aligned United Nations Sustainable Development Goals (SDGs).

This report provides SRP research and allied knowledge exchange highlights for 2018-2019.

SEFARI Gateway

SEFARI Gateway is the Knowledge Exchange and Impact hub for SEFARI. Gateway works to enhance access to the individual and interdisciplinary expertise within the Strategic Portfolio, strengthening and building new partnerships with policy, agencies, sector organizations and across civic society.

Gateway provides a range of bespoke Fellowships, Think Tanks and Response Opportunity KE projects developed in partnership with stakeholders to ensure delivery to National Outcomes and SDGs. Examples of these are:



Supporting Scotland's Arctic Policy Framework



Connecting researchers, farmers and land users on new approaches to sustainable use of antimicrobials and antiparasitics



Supporting national and international biodiversity (genetic biodiversity) targets



Changing farmer practice on sustainable parasite control



Providing new tools engaging the public on peatland restoration



Supporting woodland creation in Scotland



Supporting capacity for Scotland's Just Transition [for net zero carbon] Commission



Supporting social and economic resilience within Scotland's remote communities



Supporting food chain integrity monitoring strategies for Scotland's food and drink sector



Working with farming to support effective greenhouse gas reduction



Engaging the public on the importance of animal disease management



Helping to share knowledge and build connections between users of UK Climate Projections within Scotland

Scientific Excellence



Conserving Scotland's native oaks and the species they support:

SEFARI's SRP and externally-funded collaborative research has shown that over 500 species which are dependent on or highly associated with oak may decline. Alternate species that could replace those found on oaks have also been identified. The findings were used by Defra within the Action Oak initiative and in an Action Oak Knowledge Review and are helping woodland managers to conserve woodland biodiversity.



Identifying important barley genes:

A new resource has been developed to enable rapid and accurate quantification of gene expression datasets. For barley, this identified changes in gene expression associated with cold stress. This work has national and international relevance for sustainable crop production in response to climate change.



Grouse moor management:

Helping to deliver a Programme for Government commitment, SEFARI scientists led the evidence review examining the socio-economic impacts of land estates involved in driven grouse management - as well as the options, impacts, limitations and restrictions of potential alternative land uses.



Importance of place-based policy and tackling inequalities:

To improve access to local-level data, an interactive online mapping tool to visualise socio-economic indicators has been developed. This tool will contribute to an improved evidence base for understanding how place-based policy has tackled economic and social inequalities in rural Scotland, and how it could continue to do so in the future.



Livestock vaccines:

SEFARI scientists have successfully demonstrated the ability of two new approaches to elicit immune responses in sheep. This has the potential to provide a vital new strategy for creating vaccines against a range of sheep diseases. This technology should be transferable to cattle and other livestock species, delivering multiple benefits for livestock welfare, the environment and the economic competitiveness of the industry.



*publications across the Portfolio, fully or partly funded by Scottish Government strategic research funds

**collaborative projects that involve SRP-related work with non-SEFARI organisations

Policy & Practice



Water policy integration:

SEFARI research on how river basin management and flood risk management plans interact was presented to and fed into the European Commission's Water Framework Directive Fitness Check conducted as part of a comprehensive assessment of whether current EU Water Legislation is fit for purpose and in looking at the future of the Water Framework Directive beyond 2027.



Tackling antimicrobial resistance (AMR):

SEFARI scientists are making key contributions to understanding the complexities of AMR within the One Health framework. A SEFARI Gateway Responsive Opportunity event engaged seventy-three delegates representing the Scottish Government, university sector, industry and publicly funded agencies to prioritise action to meet commitments to the new UK 5-year 'Action plan for antimicrobial resistance 2019 to 2024'.



Aligning policy instruments, engaging the public:

Supporting deliberative democracy in action, a SEFARI researcher presented "Scotland's Multiple Land-Uses: Objectives, Benefits and Trade-offs" to the inaugural Scottish Parliament Citizen's Jury on Land Management. This was informed by SRP research on delivering multiple environmental benefits using existing Scottish policies and steering strategies, such as the Land Use Strategy.



Understanding the Brexit challenge for agriculture:

SEFARI researchers presented evidence to Scottish Government, MSPs, MPs, UK peers, Defra, local councillors, bankers, farmers and crofters to support a wider understanding of the consequences and opportunities posed by Brexit for the agriculture sector. This included the implications for labour, tariffs, Common Agricultural Policy support and regulations.



Supporting remote and sparsely populated areas (SPA):

Communities within remote areas face pressure from population decline. However, conventional estimates of migration are blunt tools for exploring localised trends which might be better assessed through engagement with local stakeholders and communities. SEFARI Gateway funding for 'Islands Revival', collected the experiences of population change in the Scottish Islands leading to communities identifying policy approaches which could mitigate and adapt to population trends.



Innovation & Improved Practices for Sustainable Economic Development



Supporting Scotland's potato industry:

SEFARI scientists have developed new genetic tools (dRenSeq, PenSeq) to support potato breeding e.g. through a better understanding of disease resistance and plant-pathogen interactions. SEFARI researchers, as part of an international collaboration, have also identified a mechanism by which high temperature leads to reduced potato tuber yield. These findings will collectively be used in developing climate-resilient varieties, improving yields and environmental sustainability with ensuing benefit for Scotland's agricultural and wider rural economy, in particular supporting export markets for this economically important crop.



Improving beef production efficiency:

SEFARI research has shown the value of faster-growing animals in creating feed savings per day during their growing and finishing phase. This delivers benefits both in terms of reducing the cost and the environmental impact of beef production.



Improving pig welfare:

Through Innovate UK grants arising from SRP research, an early warning sign (low tail posture) for a tail-biting outbreak is being developed as a behaviour alert to improve pig welfare. The development of a farm-ready prototype 'TailTech' has led to widespread agricultural and media interest, providing positive indications that there will be uptake when "TailTech" early warning is commercialised.



Rural Business Survey 2018-19:

SEFARI researchers delivered a Rural Report 2018-19 surveying over 1,200 businesses in Aberdeenshire, Dumfries & Galloway, Scottish Borders and Tayside, helping improve the understanding of Scotland's rural business base at a time when rural economies are receiving considerable policy attention (e.g. through the recent work of the National Council of Rural Advisers and the creation of South of Scotland Enterprise).



Food waste:

A SEFARI researcher authored a review of the UN Sustainable Development Goal for Responsible Consumption and Production as part of the University of West of Scotland-Oxfam Partnership: Collaborative Research Reports Series 'On Target for 2030? An independent snapshot review of Scotland's progress against the United Nations Sustainable Development Goals'. This review included a case study on food waste, revealing the importance of the level of understanding of date marking on the food waste behaviour of consumers in the European Union.

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Enhancing Resilience & Research Partnerships



Ecosystems, greenspace and resilience:

As a partner in the 'Creating Natural Connections in Cumbernauld' project (£1.3M from National Lottery Heritage Fund), SEFARI scientists are applying social research methods developed in the SRP to evaluate local people's perspectives on and engagement with greenspace. SEFARI expertise on resilience has also contributed to the award of National Centre for Resilience funding on 'Hot Spots and Not Spots', which looks at areas of resilience across Scotland (£25k, funding to SEFARI) and the EU H2020 project 'Digitisation: Economic and Social Impacts in Rural Areas' (€ 364k funding to SEFARI).



Nutrient modelling:

The need to tackle phosphorus pollution led SEFARI researchers to develop a Decision Support Tool compatible with the Scottish Environment Protection Agency modelling systems. This has helped to secure international collaborations, including a project with Teagasc (Ireland) to implement a modelling approach in the Irish Agricultural Catchments Programme. This versatile approach was also applied to water quality modelling as part of the Scottish Government Hydro Nation International-funded 'River Ganga Health Project'.



Stopping food waste:

Food waste is estimated to cost Scotland over £1bn per year and exerts an extensive environmental burden. Funding has been secured to identify: use of new and waste fruit in the biological control of pests and disease (EU LIFE funding, €2.9m); opportunities for turning crop wastes into high value chemicals and feed stocks (Zero Waste Scotland funding, £50k); new routes to limit food wastage through control of acrylamide formation during cooking (Genomia funding, £50k). These approaches support Scotland's circular economy ('Making Things Last'), and food and drink ('Becoming a Good Food Nation') policies as part of driving sustainable economic growth.



Vertical farming:

A SEFARI organisation is at the forefront in developing vertical farming as part of the systems change that can support our response to the climate emergency. SEFARI scientists have secured Innovate-UK Knowledge Transfer Partnerships funding with Intelligent Growth Solutions that will further enhance the efficiency of growth conditions in vertical farming.



International child welfare:

A £19.8m project 'Action against Stunting Hub' (includes over £1m to SEFARI research in epigenetics and microbiota), brings together an interdisciplinary team from 18 institutions to tackle stunting in children. The project aims to reduce child stunting by up to 10% across communities in India, Indonesia and Senegal, and will support regional efforts on maternal and child nutrition proposed by UNICEF, linking the work of the Food and Agriculture Organisation, The World Bank, and the World Health Organisation.

The Strategic Research Programme may be accessed in full at
<https://sefari.scot/research/objectives>

