
SEFARI
LEADING IDEAS
FOR BETTER LIVES
SRUC
Royal
Botanic Garden
Edinburgh
BioSS
Moredun
The Rowett
Institute
The James
Hutton
Institute
Scottish Government
Riaghaltas na h-Alba
gov.scot

Spotlight on SEFARI & the Strategic Research Programme 2017-18

Scottish Environment, Food and Agriculture Research Institutes (SEFARI) is the collective of Scotland's internationally renowned Scottish Government supported research institutes: the James Hutton, Moredun and Rowett Institutes, Biomathematics and Statistics Scotland, Scotland's Rural College, and the Royal Botanic Garden Edinburgh. SEFARI are responsible with HEI partners for delivering the Scottish Government funded Strategic Research Portfolio on environment, food, agriculture, land and communities. The Portfolio includes the Strategic Research Programme (SRP 2016-2021), the policy facing Centres of Expertise, Innovation partnerships and underpinning capacity for strategically important projects and national resources.

SEFARI delivers fully integrated and interdisciplinary research on the mid-to long- term needs for Scotland's environment, food, farming, rural economy and communities; providing expertise to policy, industry-sector and civic society. The SEFARI Gateway, the Knowledge Exchange and Impact Centre for SEFARI, links stakeholders and researchers from across the Strategic Research Portfolio in direct partnership, including through its Think Tank, Responsive Opportunity Fund and ground-breaking Fellowship schemes.

This Spotlight focuses on highlights from the second year of the SRP.

Interdisciplinary research

Responding to greenhouse gas emissions and a changing climate

SEFARI's long term inter-institutional relationships underpin the interdisciplinary research of the SRP providing, for example, a major capacity and capability within climate change research.

- The natural environment
- Biodiversity
- Soils
- Peatlands
- Grasslands
- Crop breeding
- Plant health
- Livestock breeding
- Livestock health & welfare
- Food supply chains
- Food & consumers
- Rural industries

New Advances and Research Excellence

Charting the changing face of Scottish grassland:

To assess progress towards international biodiversity targets, such as the Aichi Targets (Convention on Biological Diversity 2010) and the UN's Sustainable Development Goals (United Nations 2015) it is important to identify long-term changes in Scotland's landscape and environment. Based on a re-survey of semi-natural grasslands SEFARI-SRP researchers showed that in *Nardus* grasslands species that do not suit acid soils were increasing. This is one of the first studies to indicate that 40 years since the peak of sulphur pollution (which causes soil acidification) there is now evidence of recovery.

Ensuring barley withstands climate change:

SEFARI-SRP researchers are key members of an international consortium that has published detailed insight into the barley genome. This is a critical step towards breeding barley to cope with climate change and to combat cereal diseases both now and into the future.

New insights on potato disease control:

SEFARI-SRP researchers have discovered a novel means by which the economically damaging potato late blight fungus affects plant growth and development, boosting infection. This connection between growth and disease resistance raises a crucial point that a push toward one may be at the expense of the other, showing a need to maintain a whole-plant view to achieving both yield and better disease resistance in agricultural systems.

Long-term benefits from dairy research:

The Langhill Dairy Experiment was awarded the Queen's Anniversary Prize in 2017. This is a unique international resource for dairy cattle genetics, providing vital information on production, fertility, welfare standards and dairy farming's impact on climate change. This research capability has led to new breeding goals for dairy cattle and is estimated to have benefited the British dairy industry by more than £400 million.

Prize winning science to reduce methane emissions from cattle:

Methane is a greenhouse gas with a global warming potential 28-times that of carbon dioxide. SEFARI-SRP researchers were awarded the prestigious PLOS Genetics Research Prize 2017 for their work opening up the possibility of breeding to select for low methane-emitting animals.

Advances in Healthier Foods:

SEFARI-SRP researchers have published on the potential benefits from compounds in soft fruit (polyphenols) crossing the blood-brain barrier, possibly aiding protection in age-related diseases such as Alzheimer's and Parkinson's disease.

Food & drink scientist of the year:

A SEFARI-SRP researcher was recognised nationally by the UK Food and Drink Federation (Food and Drink Scientist of the Year - FDF Awards 2017) for her work with the industry to create opportunities for producing healthier food options including from under-utilised plant species, cereals and from unused crop materials.

Policy & Practice

Soils risk maps: Risk maps for much of Scotland's cultivated land have been developed to help farmers identify areas vulnerable to erosion, compaction, leaching and runoff. These integrate work including from the SRP and Scotland's Centre of Expertise for Waters (CREW) to improve water quality by reducing diffuse pollution from land-based activities. SEPA, Scottish Water and SNH have been provided with these maps, and are accessible via Scotland's Soils website for use by land agencies and managers.

Reintroduction of a rare plant to the Cairngorms: Studies of the rare Alpine blue sow-thistle (*Cicerbita alpina*) have enabled the reintroduction of the species at three new locations in the Cairngorms, contributing to both the Cairngorms Nature Action Plan and the Priority Project 9 of the 2020 Route Map for Scotland's Biodiversity.

Capercaillie conservation: In a collaboration with stakeholders, a participatory Geographic Information System– CaperMap – to promote capercaillie conservation and to support the Cairngorms National Park Authority Capercaillie Framework has been produced. CaperMap allows users to interactively explore the likely impact of disturbance on capercaillie habitat and to identify mutually agreeable options to support coexistence of people and wildlife.

Improving environmental management: A report by SEFARI-SRP researchers summarising the analysis of monitoring schemes for the Water Framework Directive, Natura 2000 and Agri-environment measures is now available drawing on nine EU case studies. This facilitates learning from European examples of good practice, sharing good practice from Scotland and can inform which data are monitored and how these are used in improving Scotland's management of soil, water and biodiversity for the future.

Policy impacts on farming: In parallel to developing a farm-level model (ScotFarm) that is used to assess the impact of policies on the agricultural sector, SEFARI-SRP agricultural economists are contributing to further development and use of a European wide farm-level model (IFM-CAP), developed by the Joint Research Centre (JRC) of the European Commission. The latest version of the model is being used by JRC and the EU Directorate-General for Agriculture and Rural development for policy analyses such as assessing the financial and environmental impact of Common Agricultural Policy reforms and Brexit.

Post-2015 Common Agricultural Policy (CAP) analysis: Building on datasets and methods developed in the previous and current SRP we have provided analyses for SG policy, SG Rural Payments and Services officials and key stakeholders on the effects of the post-2015 CAP reforms. This has informed how the CAP has changed, but also in light of the Brexit vote, to create a baseline against which proposals for support may be judged. The analysis was used as the basis for two ministerial briefings: on the 2015 reforms and options for changes to the Less Favoured Area Support Scheme and also in briefing Scotland's Agricultural Strategy Champions.

Changing European Food Safety Authority (EFSA) policy: A FSA(UK)-SRP co-funded study has shown that plant-bound toxin metabolites are not absorbed in the human gut, but will contribute to overall risk following release in the human large intestine. This has led to a change in policy by EFSA and the recommendation that masked mycotoxins should be included in mycotoxin risk assessments, as they pose a toxic risk to consumer health. This will inform European Commission decision-making for maximum levels of mycotoxins in food.

Innovation & Improved Practices for Sustainable Economic Development

Improved water quality monitoring:

Improving water monitoring is key to efficient environmental management and sustainable economic development. Trials of in-situ contaminant monitoring and assessment systems have been carried out for a Scottish catchment, with SRP research showing how water sensors can support industries to regulate water intakes and enable more sustainable treatment regimes (Water Scotland 2017).

Innovation supporting potato production and export:

Using DNA-capture technology developed in the SRP and resources from the SG-underpinning of the Commonwealth Potato Collection, a novel late blight resistance gene has been identified and offers the potential to produce more disease resilient potatoes. SEFARI-SRP researchers also found a version of a gene involved in heat stress, which will assist breeders in developing heat tolerant varieties, of particular importance for Scotland's seed exports to warmer countries.

A new diagnostic test for bovine respiratory disease (BRD):

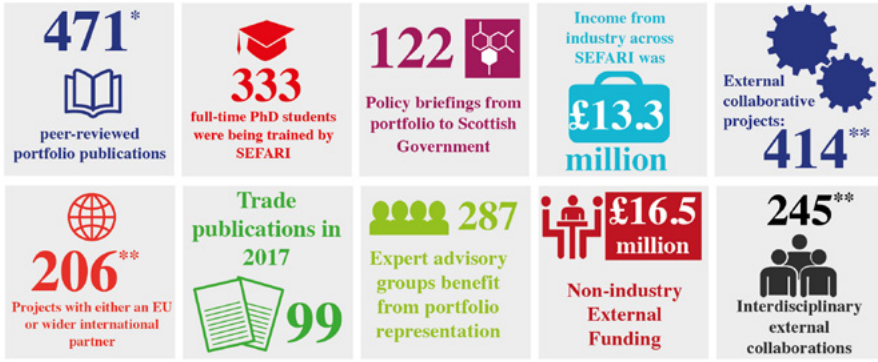
With an estimated economic loss to the UK cattle industry of £50 million a year, BRD is one of the industry's most challenging and costly diseases. Early intervention is key to controlling outbreaks. SRP research has led to a novel diagnostic test enabling faster and more precise outbreak management. This is being offered to veterinarians conducting Scottish disease surveillance.

Protecting small-scale poultry producers:

To achieve effective control of poultry disease outbreaks it is vital to understand backyard and small poultry producers' attitudes to the management and welfare of their birds. Surveys, targeted to backyard poultry keepers and small to medium commercial egg producers, coincided with an outbreak of avian influenza and provided first-hand information about how this was dealt with by poultry keepers. The knowledge gained is being extended to other sectors of backyard producers and made available to the Centre of Expertise for Animal Disease Outbreaks (EPIC).

Food reformulation:

Changing food ingredients offers opportunities for bringing new products to market including for health advantage and waste reduction. SRP research has developed broad bean hull fortified breads that are high in fibre and that have reduced glycaemic index properties; have identified how herbs and spices can improve the stability of vegetable oils, to help ensure that health benefits are maintained; demonstrated the effect of beetroot on stability of processed foods and shown how the β-glucan from spent brewer's yeast can be used as a yogurt thickener.



*publications across the portfolio, fully or partly funded by RESAS strategic research funds
**collaborative projects that involve SRP-related work with non-SEFARI organisations

Enhancing Resilience & Research Partnerships

Green infrastructure research:

Funding from the European Observation Network for Territorial Development and Cohesion (ESPON) worth €618K, was won for the project 'GReen infrastructure: Enhancing biodiversity and ecosysTem services for territoriAl development' (GRETA). This will develop a comprehensive knowledge base for enhancing green infrastructure to benefit different European regions and cities, including an evaluation of case studies in Scotland. It will share good practice about how to design green infrastructure interventions and how to ensure schemes are cost-effective and deliver benefits to society.

Enhanced portfolio of sheep research:

Funding has been won in the EU Horizon 2020 Thematic Network on sheep productivity, 'SheepNet' (Sharing Expertise and Experience towards sheep Productivity through NETworking, €1.99M), as well as two international Sustainable Animal Production 'SusAn' ERA-Net projects, 'SusShep' (Sustainable sheep production, €877K) and 'Animal Future' (Steering Animal Production Systems towards Sustainable Future, €1.24M). This portfolio of hill farming-oriented projects both builds on and places SRP sheep research in a wider UK and European context.

Crop and arable improvements:

SRP research provided leverage for SEFARI teams to win InnovateUK (UKRI) funding (£490K) on improving yield and quality in raspberry and blueberry. An EU ReMIX project (Redesigning European cropping systems based on species MIXtures; total value €6M over 4 years) will also extend research on cereal/legume mixtures in Scotland.

Soils and greenhouse gas (GHG) emissions:

SEFARI-SRP researchers have been awarded a £200K equipment grant from SNH Peatland Action to increase capacity for GHG monitoring. This is now allowing the investigation of ecosystem benefits associated with different peatland restoration options, supporting land managers to implement the most beneficial practices and providing data to UK and Scottish Governments for GHG accounting.

Underpinning global challenges:

Reflecting the strength of SRP's linking of disciplines, extensive funding (circa £1M across 3 projects) has been secured for initiatives under the UKRI Global Challenges Research Fund, bringing SRP expertise to support human nutrition, farming, local economic opportunities and food security within Sub-Saharan Africa. This includes work in Malawi and Zimbabwe to support local and national stakeholders including smallholder farmers and communities.

Charles Bestwick
Interim Director
SEFARI-Gateway

Lorna Dawson
SEFARI Advisor

Contact us

www.sefari.scot
@SEFARIscot
info@sefari.scot