

# SEFARI

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FOR BETTER LIVES



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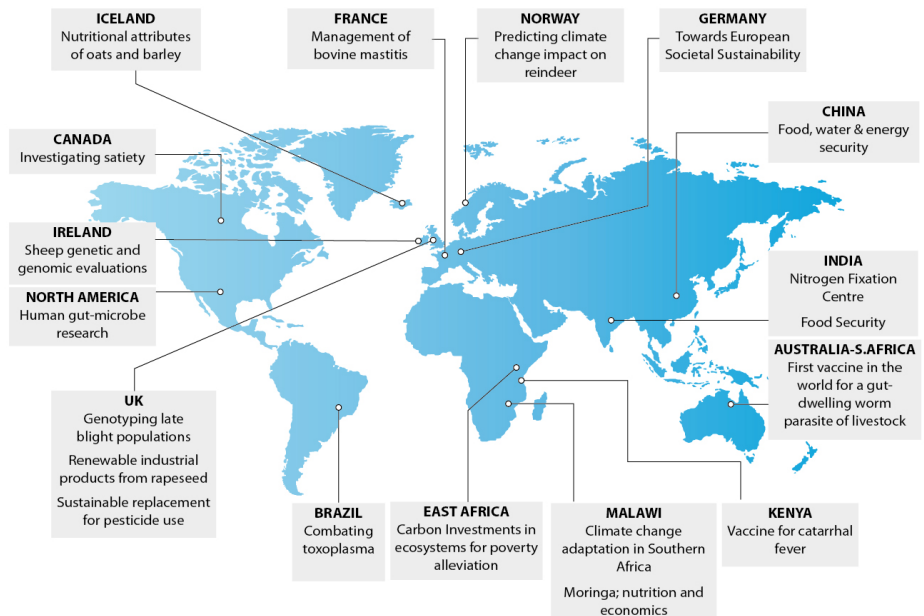
## Spotlight on SEFARI 2016-2017

SEFARI (Scottish Environment, Food and Agriculture Research Institutes) is the collective of Scotland's internationally renowned Scottish Government supported research institutes: Biomathematics and Statistics Scotland, The James Hutton Institute, the Moredun Research Institute, Scotland's Rural College, the Rowett Institute and the Royal Botanic Garden Edinburgh. SEFARI undertakes fully collaborative, interdisciplinary research on the mid to long term (strategic) needs for Scotland's environment, food, farming, land and rural communities. The SEFARI Gateway brings policy, industry and the public into direct interaction with SEFARI research, both to be informed by and inform research direction. This Spotlight document highlights research from the first year (2016-17) of the current 5 year strategic research programme (SRP: a £34.2 million investment by Scottish Government for 2016-2017) and illustrates how SEFARI research is making a difference within Scotland, the UK and globally.

### Research local to global

SEFARI has links with researchers in over 70 countries and is delivering research innovation worldwide. In 2016-17 SEFARI was engaged in 356 external collaborative projects, over a half of which involve international partners.

### Examples of current national and international collaborative projects



\* Project lead organisation varies. Many projects include partners in more than one country.

## Innovation & sustainable economic development



### Enhancing late blight protection in potatoes

Researchers have produced a new national warning system, called 'The Hutton Criteria', designed to improve the reliability of potato blight risk reporting. The new system helps growers to be more efficient in spraying against late blight, making significant savings for the farming industry while also reducing the use of chemical sprays.

### Livestock & wildlife disease management

SEFARI is a key contributor to protecting Scotland against animal disease. It has developed new epidemiological tools providing critical insights into wildlife disease surveillance, better use of disease diagnostics and improved understanding of the effects of animal movements on common farm animal diseases.

### Enhancing livestock performance

SEFARI scientists have undertaken genetic evaluations of 3 cattle breeds (Ayrshire, Guernsey and Jersey) for indicators of critically important livestock diseases, including mastitis and tuberculosis. The data is now a valuable tool for Scotland's livestock farmers and will help in selecting animals for improved disease resistance and further provide environmental, economic and farm-animal welfare benefits.

### Cereal research meeting the need for industrial innovation

With the recent rise in craft brewing there is revived commercial interest in the characteristics of Golden Promise, the once dominant spring barley variety grown in Scotland in the 1970s & early 1980s. SEFARI scientists, in collaboration with industry, have identified the genes responsible for Golden Promise's key characteristics. This is timely, as its early maturity and resistance to the loss of grain husk (grain skinning), remain attractive for Scottish agriculture, especially if climate shifts result in low summer rainfall. This and allied SEFARI strategic research is essential to generate varieties that will meet emerging agricultural and industry needs.

### Supporting sustainable development in the food & drink sector

Scotland's food & drink industry is currently worth £14.4bn and the aim is to grow this to £30bn by 2030. SEFARI food reformulation (changing ingredients to provide health benefits) research seeks to align public health priorities with the sustainable development of the food and drink industry. SEFARI scientists have contributed to industry facing workshops organized jointly with Scotland Food & Drink and Food & Drink Federation Scotland to showcase the expertise and support available from SEFARI to companies across the agri-food supply chain.



## New research advances



### Crucial new findings for animal disease treatment and control

Arboviruses (e.g. insect borne viruses) are increasingly causing important human and veterinary diseases but there is a critical lack of understanding about the arbovirus-host interaction. Published in Proceedings of the National Academy of Sciences, researchers have used bluetongue virus, a hemorrhagic arbovirus of sheep, to understand the early stages of infection and discover how the virus impairs immune response and spreads.



## Understanding how barley responds to climate change

Sequencing of the barley genome, for which the UK team within the international research consortium was led by a SEFARI researcher during the 2011-16 SRP, has led to a far greater understanding of this important crop's response to environmental pressures. New findings by SEFARI researchers have shown significant correlations between days to flowering and height with variations in seasonal temperature and dryness. These findings, published in Nature Genetics, have major potential to improve the barley crop to cope with climate change.

## Dietary fibre, the gut microbes and healthy weight management

Obesity is a critical burden on public health. SEFARI scientists are discovering how the type of food we consume can help weight management and improve health. Dietary fibre is now acknowledged as a key factor in this approach. We have shown that the microbes in the gut respond differently to the type of fibre eaten, opening up new opportunities to provide health benefits to consumers. This has considerable commercial potential and the findings are underpinning SEFARI research relevant to Scotland Food and Drink's Ambition 2030 strategy.

## Enhancing resilience & research partnerships



## Major boost for vaccine research

SEFARI's livestock researchers play key roles in initiatives supporting food security worldwide. New collaborations will see SEFARI researchers in the development of a network of European High Containment facilities to meet the challenges of (re) emerging infectious diseases that affect livestock. Through a new international network, SEFARI researchers will also tackle challenges to veterinary vaccine research supporting agricultural resilience for low to middle income countries.

## Diet & healthy ageing

The protein needs of an ageing population are not adequately met by mainstream food products. SEFARI researchers in a collaborative project with academia and industry, will help identify and develop guidelines for protein products that are environmentally sustainable, cost effective and enjoyable. This information will be used to develop new products and reformulate existing ones so they are more appropriate for an older population.

## Using legumes for improved primary produce

Building on strategic research, SEFARI researchers are coordinating two major EU projects (EU Horizon 2020) and contributing to a related EU project on the development of legume crops (sources of highly nutritious food requiring no inorganic nitrogen fertiliser), as economically, environmentally sustainable foods and farm animal feeds.

## Responding to the threat of wormer resistance

Gastro-intestinal worms affect the health and welfare of livestock and horses across Scotland. Worryingly, there are increasing reports of worms becoming resistant to the anthelmintic (wormers) used to combat them. SEFARI scientists teamed up with Blobina Animations to create a film that highlights key elements in the development and spread of resistance, as well as the crucial messages on sustainable control. Livestock and equine health industry are actively promoting the use of this film to help combat wormer resistance.

## Peatlands & climate change mitigation

Peatlands cover nearly a quarter of Scotland, containing over half of the total carbon in Scottish soils at 1620 million tonnes, equivalent to ca. 100 years of Scotland's total greenhouse gas emissions. Recent SEFARI research has dramatically improved the ability to model peatland carbon stocks and emissions, with a direct effect on how formal emission factors are calculated for the UK. In collaboration with the Centre of Expertise on Climate Change our research has shown the benefits of peatland restoration on carbon management, helping to support statutory emission reduction targets required by the Climate Change (Scotland) Act 2009.



## Flood management

SEFARI scientists have contributed to the development of a Scottish Flood Management Network. Its long-term datasets have been used in Catchment Partnerships to give guidance about the functionality and placement of Natural Flood Management measures, which in combination with traditional flood defences can help to mitigate the threat of flooding.



## Food poverty & household food insecurity

Rising food prices, and the high cost of fuel and rent are all factors affecting household food affordability. SEFARI research has contributed to questions generated for the Scottish Health Survey 2017 which will help provide a measure of food poverty in Scotland for the first time. Our scientists are actively engaged with Scottish Government Equality, Poverty and Social Justice policy teams to ensure that food insecurity research adapts to emerging priorities.



## Supporting agriculture policy

SEFARI researchers provided key assessments and advice to Scottish Government on the transition to a new agricultural payment regime under the Common Agricultural Policy: modelling scenarios and impacts on farm sectors and regions for the move from the Less Favoured Area Support Scheme (LFASS) to the Areas of Natural Constraint Scheme. After the European Union (EU) referendum, the option of continuing with LFASS was analysed, including the EU LFASS reforms from 2017.



## Bovine viral diarrhoea eradication

Bovine viral diarrhoea (BVD) is a contagious disease of cattle, which is amongst the highest economic and welfare concerns of many livestock farms. SEFARI's work on BVD, including with the Centre of Expertise on Animal Disease Outbreaks, significantly supports the development and delivery of a Scottish Government supported ambitious industry-led scheme to eradicate BVD from Scotland. Recent research has developed approaches for better BVD screening.



## Delivering to the UK national action plan and the sustainable use directive

SEFARI scientists are working with the Scottish Government, the Voluntary Initiative in Scotland and National Farmers' Union of Scotland on the development of a web tool for Integrated Pest Management (IPM). The new approach will discourage the development of weed, pest and disease populations and so minimise the use of pesticides and enable pesticide usage that is more cost effective and ecologically justified. IPM is a vital part of delivering the UK National Action Plan (Sustainable Use of Pesticides) and SEFARI's expertise in IPM is helping Scottish Government meet its obligations under the EU Sustainable Use Directive.



**New knowledge & innovation**

SEFARI researchers published  
**536**   
peer-reviewed publications in 2016


 **274**

Publications co-authored with international collaboration.

**268** publications were in Open Access journals

**Inspiring the next generation**

  
**345**  
full time PhD students were being trained by SEFARI

 **95%**  
of SEFARI PhD students graduated within one year of completing studentship

**Expertise & advice**

**122**   
Policy briefings were produced including 85 to Scottish Government and Scottish Agencies

 **258**  
Expert advisory groups benefit from SEFARI representation

**Building capacity & resilience**

Income from industry across SEFARI was  
**£9.5 million**

 **£15.8 million**  
Extra income (additional to SRP funding) was gained for research (non-industry) and public good consultancy

## SEFARI Gateway

SEFARI's research is supported by knowledge exchange, ensuring the right research and expertise gets to the right people, at the right time and in the right format. This is underpinned by the SEFARI Gateway, the new Knowledge Exchange and Impact Hub for SEFARI.

- Providing cross-institute mechanisms for Knowledge Exchange
- Working with SG funded Centres of Expertise to maximise access to SEFARI expertise
- Developing partnerships across the policy, commercial and public landscape
- Providing dedicated sector contacts for 'environment', 'crops and soils', 'livestock', 'food & drink' and 'communities' research
- Providing bespoke briefings, consultation responses, mapping research to policy
- Creating Think Tanks for interdisciplinary perspectives on national and global issues
- Funding innovative knowledge exchange through a Responsive Opportunity Fund
- Delivering a Fellowship Scheme enabling researchers to work closely with decision takers

### Contact us

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