Annual Review 2018/19

The James Hutton Institute

hutton.ac.uk

Vital Statistics

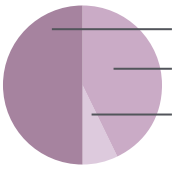
Our work is inspired by James Hutton: Scottish innovator and polymath

559 Employees

25 Professors

341 Peer reviewed papers

125 PhD Students



50% Male
43% Female
7% Other/ Prefer not to say

418 Press articles

5 Sites (Hartwood until Dec 2019)

224 PhD qualified employees

275 TV/radio broadcast features

47% Waste recycled

Employees from over **29** countries

64 Staff with 30+ years scientific experience

615 Online media articles

6077 Years of scientific experience

Timeline of our Year

2018

April

Cabinet Secretary Fergus Ewing visits Hutton

May

Land access identified as critical barrier for new farmers in Scotland

June

Alternative splicing effects on plant responses to cold revealed

July

Crop mixtures and evolution shown to improve agricultural productivity

August

IGS Ltd opens Scotland's first vertical indoor farm at Dundee site

September

Hutton shows Scottish rivers warming

October

Hutton scientists welcome launch of IPCC special report on global warming

November

£62m Tay City Deal funding confirmed for IBH and APGC

2019

December

Hutton analysis finds Mars and Mull share similar soil

January

Specialists team up on Water Test Network in Aberdeen

February

New Scotland-Malaysia crop science collaboration

March

Hydro Nation International Centre unveiled in Aberdeen

Some Research Highlights

In the *Journal of Environmental Quality*, Institute researchers provided a synthesis on riparian management and an editorial of 16 new papers. The collection focussed on attaining benefits for diffuse pollution mitigation, enhancing biodiversity and providing biomass. It incorporates four papers that place Hutton at the forefront of research into managing river corridors and agricultural buffer areas.

Ben Butler of EBS found that soils from Skye and Ulva have similar basaltic mineralogy to those on Mars. The Scottish soils' minerals reflect the basalt's chemical weathering by water over thousands of years. Evidence from the Curiosity Rover showed basaltic rock on Mars was similarly weathered when parts of that planet were covered in water. Understanding the alteration of basalt in Scottish soils can help define if conditions on ancient Mars may have been suitable for life.

Hutton Researchers contributed to a study which found that pollutants cause 'worrying' changes in sheep livers. Exhaustive environmental chemical analyses by Zulin Zhang's team and partners raised questions about the potential effect of environmental chemicals on human health and the environment.

ICS researchers launched a 3DRNA-seq app which enables non-specialists to preform RNA-seq analysis in a matter of days as opposed to around 3 months: a 'game changer' in plant biological research.

SEGS researchers were appointed to leading scientific positions. Tony Craig is now President of the International Association for People-Environment Studies. Maria Nijnik received a Scientific Achievement Award from the International Union of Forest Research Organizations.

Hutton ecological researchers led a global assessment of the role of organic phosphorus (published in *Plant & Soil*). The work set out critical research priorities and engaged the global Phosphorus research community in addressing key areas toward understanding biogeochemical cycles, dynamics and function of natural ecosystems and the management of agricultural systems. Cited by peers already.

Hutton research contributed to the first global assessment of soil nematodes, published in *Nature*. Soil is the second largest carbon store but ignorance of the distribution of life below-ground had prevented soil biological activity's inclusion in climate models. Datasets and modelling were used to generate high-resolution maps of the actual abundance of soil nematodes, which are an excellent indicator of soils' health and functioning.

SEGS group research into farmer experiences of the bovine viral diarrhoea (BVD) eradication scheme and stakeholder views of the challenges to BVD eradication in the UK and Ireland has attracted interest from policy-makers and contributed to shaping the future eradication scheme in Scotland.

Her research investigating potential new approaches to implementing environmental policy after Brexit led to social scientist Kirsty Blackstock providing expert testimony to the Scottish Parliament's first Citizens' Jury on how funding and advice for land management should be designed to help improve our natural environment research investigating potential new approaches to implementing environmental policy after Brexit.

In the ICS Group Review, the external assessors described ICS as *"world leading"* and the team as "*a brilliant group of highly talented, knowledgeable, skilled scientists and research software engineers".*

CMS research sparked a joint project with Intelligent Growth Solutions to develop a risk assessment for microbial hazards associated with total controlled environment agriculture, to better understand where microbes come from and develop. There is no existing data on plant microbes that thrive in this environment. It is important for plant health and food safety and is directly relevant to those developing and using the technology.

We identified that plants' photosynthetic capacity is the most significant cause of yield instability in the UK blueberry crop. It's saturated at the light intensity on a cloudy day. This understanding led to growers using highly reflective mulches to increase light supply to the crop. Yields rose by up to 50%, worth up to £20,000 per hectare. Understanding photosynthetic plasticity will let us identify genes and markers to breed better-adapted UK varieties.

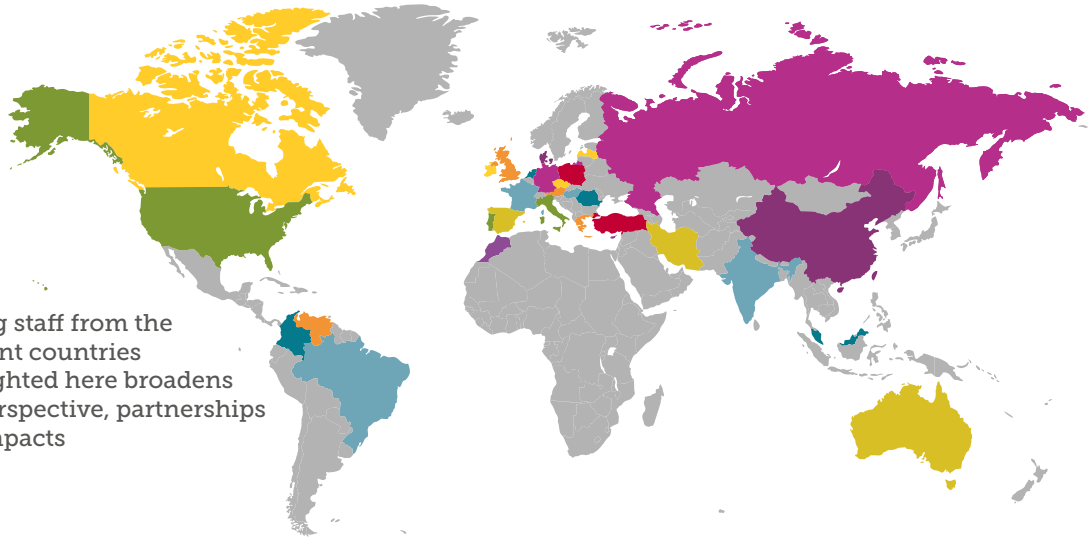
Scientists from Hutton are helping growers and agencies in Kenya cope with a new infestation of the highly damaging potato cyst nematode (PCN). Our work is helping to understand how the PCN biology has adapted to Kenyan conditions and to develop new potato varieties that combine PCN resistance with other desirable characteristics.

We have shown that blackleg disease can arise directly from *Pectobacterium* contamination in the field and from producers' growing practices, contrary to the accepted belief that it arises from contaminated seed tubers. It means that stopping practices such as over-irrigation could reduce the disease significantly in ware crops and improve the reputation of Scottish seed, worth an estimated £65 million per year.

Analysis of the first 6-year rotation results for the Centre for Sustainable Cropping showed that an integrated cropping system successfully enhanced biodiversity and reduced environmental impact without jeopardizing crop yields. A summary for farmers helps inform their decisions on alternative management strategies for lower environment impact farming.

Our spatial barley modelling work predicting average barley yields in Scotland given future climate scenarios was among a trio of projects that won a prestigious VIBES award for climate change adaptation.

International impact from our multinational staff

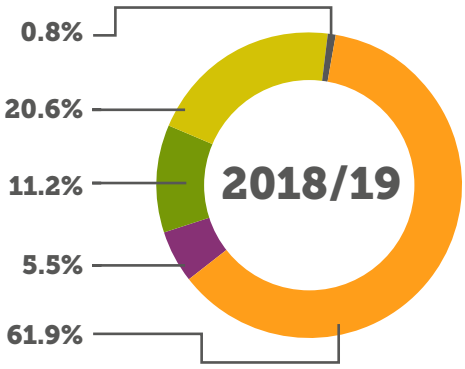


Having staff from the different countries highlighted here broadens our perspective, partnerships and impacts

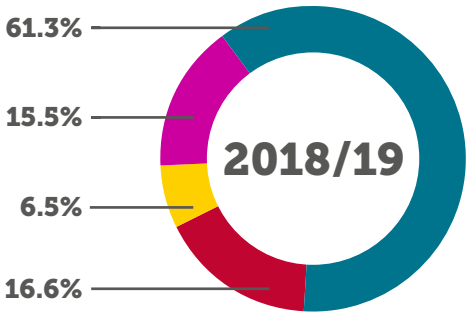
Accounts

Group Annual Report Figures (£000)

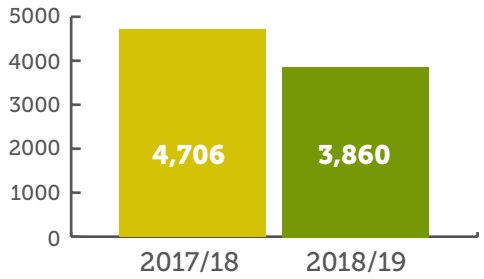
Income (£000)	2018/19	2017/18
Scottish Government Strategic Research Programme	22,766	22,930
Capital	299	599
	23,065	23,529
Research grants & contracts	7,560	7,593
Trading income from subsidiaries	4,123	3,835
Other income	2,011	1,952
Total income	36,759	36,909



Expenditure (£000)	2018/19	2017/18
Staff costs	23,468	23,574
Scientific consumables	5,946	6,216
Depreciation	2,485	2,304
Support costs	6,357	5,506
Total expenditure	38,256	37,600
Surplus/(deficit) for the year	(1,497)	(691)



Institute CO_2 emissions (tonnes CO_2)



= 18% reduction

James Hutton Institute Board changes

Outgoing Board members:
Prof Andrew Millar (resigned 3/10/18)

A Summary from the Chief Executive

Last year we sustained similar income to 2017/18 but increased costs meant an operational surplus before depreciation produced a larger deficit. While this was a reasonable financial performance against strong headwinds and uncertainty we need to improve; notably to gain more investment in infrastructure and facilities to match our world-leading science. In our first year as an Independent Research Organisation, eligible under all seven UKRI Research Councils, we had success with BBSRC and NERC. This will continue to be important financially but also for retaining and attracting talent to the Institute.

Late in 2018, we celebrated being allocated awards totalling £62m from the Tay Cities Deal for the International Barley Hub and the Advanced Plant Growth Centre: a fillip given our need for capital income. Implementing these projects requires considerable work but this significant milestone boosts our much-needed infrastructure development plans. This is the first major investment since 1990 and the largest in our infrastructure ever. These projects are also the largest inward investment in Scotland in our sector: we have an opportunity and responsibility to ensure they deliver for all.

With mass public engagement stoking the urgency of tackling climate change, our work to mitigate emissions and adapt to more extreme weather is gaining profile. Our excellence in waters was recognised with Hutton Aberdeen becoming headquarters for Hydro Nation International and an EU Water Test Network. Our crop science attracts innovative partners to work with us and it has been hugely – mutually - stimulating to have one of the world's most advanced indoor vertical farms on our doorstep at Invergowrie courtesy of IGS Ltd. Our delivery of real-world solutions has hit the headlines on several occasions and our reputation for impact has continued to grow.

Thanks to our staff, Board, stakeholders, customers and funders for helping Hutton build a long-term future founded on great science, innovation and challenging conventional wisdom.

Professor Colin Campbell
Chief Executive

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