

Institution: University of Aberdeen

Unit of Assessment: 6 - Agriculture, Veterinary and Food Science

a. Context

Impact in the Biological Interactions in Soil (BIS) programme at the University of Aberdeen builds upon world-class research conducted by an internationally-recognised team of researchers, with major strengths in soil science, plant science, microbiology, biogeochemistry, ecosystem modelling environmental impacts and global environmental change but linking to wider interdisciplinary teams. Strategic strengthening of these research areas, combined with a philosophy, culture and mechanisms to encourage and facilitate applied research, naturally generate findings whose major beneficiaries are policy makers and governments, food and agricultural industries, farmers, land managers and the public. Impacts from BIS science encompass: *impacts on the environment; awareness of health risks and benefits by consumers; changing clinical and dietary guidelines; improved public health; improved well-being; changes to public behaviour, public health policies, public and international policies and guidelines; decisions by regulatory authorities; and impacts on production and commerce.* The success of our approach to impact is exemplified by, but not restricted to the three impact case studies (ICS), and derives from embedding impact and knowledge exchange (KE) in our research groups and University-wide research themes.

b. Approach to impact

Building on a tradition of following strategic research through to its benefits to society within the Institute of Biological and Environmental Sciences (IBES), BIS contributes to, and benefits from, encouragement within the University to exploit research strengths and maximise 'the contribution that research makes to society and the economy' at all levels. This ethos is created and communicated by the Directors of Research for Colleges, IBES and University-wide multi-disciplinary research themes (particularly the Environment and Food Security (EFS) theme). Our approach begins with inception and design of appropriate research strategy, programmes and projects, details of which are outlined in the School of Biological Sciences (SBS) strategic plan. At the outset, potential for impact, and the mechanisms and partners (within and outside BIS) necessary to deliver impact, are identified in order to deliver and communicate impact. Support and training are provided to BIS staff to facilitate impact. This overall approach is:

1. Development of a high quality research portfolio addressing key societal challenges

The first stage in our approach to generation of impact from research has been to develop and direct a portfolio of internationally excellent research activity focused on key challenges faced by society in the 21st Century. Central to this initiative has been the establishment of the University-wide, strategic EFS theme, based largely on BIS research strengths and led by **P. Smith**. This theme coordinates researchers across disciplines to 'provide stakeholders and policy makers with a robust, evidence base to guide government and other decision-making bodies'. The success of this approach within BIS is demonstrated by the strengthening and expanding of our research portfolio during the REF period, developing existing applied research and recruiting world-leading researchers (**Salt, Hallett, Norton and Teh**) with proven expertise in impact-driven research. Successful impact generally requires collaborative and cross-disciplinary research, which has been actively promoted and enabled via a wide range of collaborations that include: staff returned in UoA5 through IBES and staff at the Rowett Institute of Nutrition and Health (RINH) in the College of Life Sciences and Medicine (CLSM), with staff in other Colleges, internationally through a wide range of competitive funding sources (see REF5); with the James Hutton Institute (JHI) and through the new Scottish Food Security Alliance-Crops (SFSAC), a partnership between the Universities of Aberdeen (mainly BIS staff) and Dundee, and the JHI. These collaborations have been directly supported by joint appointments and secondments (**Taylor [JHI], P. Smith [JHI]**), shared facilities (e.g. sequencing and bioinformatics within the Centre for Genome Enabled Biology and Medicine) and 27 joint PhD students during the REF period.

2. Identification, interaction and collaboration with key stakeholders or research and policymakers

BIS benefits from University-wide development of impact through its University Committee for Research, Impact and Knowledge Exchange (CRIKE), with representation from researchers across all Colleges and the University Court. This Committee oversees research grant income, commercialisation, postgraduate research students and researcher development, and is responsible

for the institutional impact strategy. Key stakeholders are identified by CRIKE, the Directors of Research, University Themes and IBES, and principal investigators. CRIKE feeds into the CLSM Research and Commercialisation Committee which in turn feeds into the institutional research committees. Engagement with stakeholders is supported by: (i) *Participation in Boards, Committees and Advisory Committees*: BIS researchers are actively encouraged by Directors of Research to contribute their research experience and enhance the impact of their work at national and international levels, e.g. **Woodin** (NERC Biodiversity & Ecosystem Service Sustainability Committee, UN Economic Commission for Europe, SNH), **P. Smith** (IPCC, Scottish Government, Defra Science Advisory Council, International Union for Conservation of Nature [IUCN]), Committee on Climate Change, **Price** (BBSRC, EU FP7), **Burslem** (Royal Society, IUCN, BES), **Nicol, Paton and Johnson** (NERC), **Prosser** (NERC, Society for Biology), **Baggs** (BBSRC, NERC SISB, BSSS); **Hallett** (International Union of Soil Science, BSSS; Agriculture & Horticulture Development Board), **Strachan** (MRC, ESRC, NSF); (ii) *Briefings of Members of Scottish Parliament and Select Committee advice* – BIS researchers regularly provide expert advice and evidence to the Scottish and UK Parliaments e.g. **P. Smith** to Scottish Parliament Rural Affairs, Climate Change and Environment Committee on peatlands and climate change; **Woodward** on ash dieback. **Hastings** will spend a period seconded with the local MP at Westminster in December 2013 through a Royal Society Science-Policy pairing scheme. **P. Smith** is Science Director of *ClimateXChange*, which is Scotland's Centre of Expertise connecting climate change research and policy, ensuring policy impact of climate related research.

3. Communications and public engagement

BIS researchers are keen to raise public awareness of issues related to their research, so vigorously pursue public engagement. Reports of BIS research appear regularly in written and broadcast media (e.g. extensive press coverage of ash dieback; **Woodward**; ICS examples in section d). This active public engagement is complemented by outward facing web sites, including (i) *University Public Research Profile*, which details the University's research publications and specific research activities with links to newspapers, radio, television and other media (e.g. **Salt, Woodward, P. Smith, Taylor**); (ii) *EFS* [www.abdn.ac.uk/environment-food-security] and *IBES* [www.abdn.ac.uk/ibes]; (iii) *Public Engagement with Science Team*, which supports BIS researchers presenting their work to the public at events such as Café Scientifique and the May Festival (**Woodward, P. Smith**), TechFest (Aberdeen's annual science festival; **Woodward**), the British Science Festival (in Aberdeen in 2012; **Woodward, Paton**), primary and secondary schools (**Price**), community groups (**Burslem, Price, J. Smith, P. Smith, Woodward**) and farmers' groups (**Hillier, Hastings, Price, Baggs**).

4. Commercialisation, business and research training, support and knowledge transfer

BIS researchers receive support, guidance and training on commercialisation of research from the University Research and Innovation unit (R&I), where BIS-dedicated staff facilitate collaboration with business, partnerships with industry and exchange of researchers where this is possible. This process has generated and developed spin-out companies such as Remedios Ltd and EPONA Technologies Ltd (**Paton**) and NCIMB Ltd (National Collection of Industrial, Food and Marine Bacteria; **Prosser**). BIS researchers are supported through University Knowledge Exchange and Transfer Fund awards for projects with an emphasis on current or future knowledge exchange or knowledge transfer (e.g. **J. Smith, Hillier** and **Prosser**). The Cool Farm Institute was established between leading agri-businesses and the University of Aberdeen to promote use of the Cool Farm Tool (**Agriculture ICS**).

c. Strategy and plans

Strategy: BIS members contribute extensively to the CRIKE and CLSM Impact and Engagement Strategy. World leaders have been appointed to further strengthen the team during the REF period (see section b, 1). EFS has developed a Knowledge Exchange strategy and has a KE champion, who liaises with public engagement teams (section b) to ensure that EFS research benefits from external stakeholder input and is available in a usable form by stakeholder communities including government, industries, NGOs, land owners and managers and the public. The Aberdeen Biodiversity Centre in SBS forms a core part of the EFS theme, and specialises in engagement with schools and teachers in the North East of Scotland. Impact is integral to BIS and EFS research and excellent ICSs (in addition to those submitted) could not be presented here, but include research underpinning: a) the setting of critical loads for tundra in the Gothenburg Protocol and Directive 2001/81/EC (**Woodin**); b) release of new rice varieties in India through marker assisted selection (**Price**) and c) policies to retard ash dieback in the UK (**Woodward**). Three from six very strong case studies are presented. The impact

strategy is monitored by the CLSM Director of Research who maintains a register of impacts. SFSAC will enhance capacity to deliver impact in food security. BIS members participate in a BBSRC Excellence with Impact competition and have secured a Sparking Impact Award of £100k which funds knowledge exchange and commercialisation (KEC) activities required at the earliest stages of progressing research outcomes towards impact.

Plans: Plans are well advanced for contributions to TechFest and the British Science Festivals in 2014. We recently launched an interaction with primary schools on rice and water, giving presentations and tools for class experiments (**Price**). Several public engagement events have been organised around RINH Centenary celebrations in 2013. All such events showcase research impact. SFSAC provides enhanced opportunities for KE and policy influence through an augmented network of contacts and through links in Scotland Food and Drink. BIS-dedicated staff in the University's R&I unit work to facilitate collaboration with business, partnerships with industry and exchange researchers. Funds accessible through the SFC Innovation Voucher Scheme and through Interface will be used to maximise research impact by providing the support of the Technology Transfer Team for intellectual property, assessment of inventions, development of project funding, commercialisation and marketing. We will continue to apply for further KE Research Fellowships, and develop our impact.

d. Relationship to case studies

The three ICS reflect our approach to recruiting internationally recognised researchers carrying out research for impact (**Meharg (Arsenic in Rice ICS)**, **P. Smith (Agriculture ICS)**, **J. Smith (Windfarm ICS)**), and through encouragement of their involvement in relevant committees and policy-making bodies (see section 2). Evidence for the success of this approach is provided below, and demonstrates how the third strand of the SBS and EFS impact strategies (communication, public engagement) is now generating significant impact affecting (i) policy makers and governments; (ii) food and agricultural industries; (iii) farmers and land managers; (iv) the public.

(i) *Policy makers and governments:* BIS research has changed environmental and food safety legislation, and the way this legislation is implemented. Examples include work that formed the basis of the IPCC assessment of climate mitigation potential in agriculture and led to guidance on meeting climate targets (**Agriculture ICS**), work that has led to new Scottish Government planning guidance for windfarms (**Windfarm ICS**), and work that has changed UK Food Standards Agency guidance on the consumption of rice milk for children under 4 (**Arsenic in Rice ICS**). BIS' approach to impact facilitated 1) world leading science, 2) opportunities for KE with policy makers and government (e.g. UK FSA, DECC, Defra and Welsh and Scottish Governments).

(ii) *Food and agricultural industries:* Research has supported systemic change in the food and agricultural industries, including improvements in food safety and reduced environmental impact. Examples for BIS include research that has been used to reduce the climate impact of farming in a range of food chains in 18 countries around the world by a consortium of the world's leading agri-food companies (**Agriculture ICS**), and work that has led to changes in guidance on arsenic in foods globally (**Arsenic in Rice ICS**). BIS' approach to impact facilitated 1) opportunities for KE with food and agricultural industries (through our KE units and PI networks, 2) appointment of a KE fellow (**Hillier**) to facilitate BIS-industry collaboration.

(iii) *Farmers and land managers:* Research has underpinned the development of practical tools and guidance for farmers and land managers, and has allowed them to reduce adverse environmental impact, to produce safe and nutritious food and to improve farm profitability. Examples described in the ICSs for BIS include work that led to a software tool (made freely available under a creative commons licence) that allows farmers and land managers to improve efficiency and reduce the climate impact of their farms (**Agriculture ICS** on which **Hillier** is engaged as a NERC KE Fellow), and a carbon calculator to assess impacts of siting windfarms on peatlands (**Windfarm ICS**). BIS' approach to impact facilitated 1) opportunities for KE with agricultural and wind energy industries, 2) appointment of a KE fellow (**Hillier**) to facilitate BIS-farmer collaboration.

(iv) *The public:* Research has delivered long term societal benefits such as reduced greenhouse gas emissions that cause climate change (**Agriculture ICS**) and protected habitats and ecosystems for future generations (**Windfarm ICS**), and work has led to better protection of children and babies from previously unknown threats from arsenic in rice-based products (**Arsenic in Rice ICS**). BIS' approach to impact facilitated 1) world leading science, 2) public engagement with schools via the EFS theme, 3) public engagement which is coordinated through the University's Communications Team.