

**Institution: 10007822**

**Unit of Assessment: 6**

**a. Context**

Cranfield is a specialist university leading postgraduate education and transformational research in applied science, engineering and management to support business, government and wider society. Our research strategy is focused on deep engagement with business and government. Our knowledge exploitation and transfer is therefore largely through embedded research partnerships which co-create knowledge directly relevant to the strategic research agendas of our partners. In delivering impact, the University recovers full direct costs and margin from partners where exploitation and protection of IP becomes their direct responsibility. The scale of our exploitation through this route is distinctive in the UK HE sector, with research income from Industry and Commerce (HESA definition) being over four times greater than the sector average (29% of research income compared to a sector average of 6%).

UOA 6 delivers to the agriculture, food and environment sectors, with implications for many others. The European Commission, UK government departments, their executive agencies and non-departmental public bodies (NDPBs), non-governmental organisations (NGOs), and the land-based industries and supply chains are the principal beneficiaries of the research.

Impacts are achieved in the broadest sense by influencing public policy and agricultural strategy, and by guiding technical policy development, corporate business strategies and generating public debate. Through these mechanisms, research is underpinning the allocation and management of land, water and biological resources for food, fibre and biofuel production, while contributing to biodiversity conservation and amenity value, and reducing waste in the food supply chain.

Of £15 million research income related to the UOA in the REF2014 assessment period, £12.4 million was from government, industry and commerce in the UK, EU and worldwide. Major clients included Defra, the Agriculture and Horticulture Development Board (AHDB), European Commission, Teagasc (Ireland), Unilever and PepsiCo. Over 80% of research students associated with the UOA receive some funding from sources other than research councils and grant-awarding charities.

Impacts for our clients include improved national and international policy design (agriculture), better targeted and more effective regulatory intervention, the prevention and management of harm to natural resources (soils, water), improved market penetration and extension (food, plants) and reduced business losses (shelf-life extension and reduced post-harvest food waste). Either through curiosity-driven, fundamental enquiry into underlying biophysical and social processes, or by working in close proximity with the policy and business needs of government and industry, our research has strong influence within the land sector through the extensive channels to market we manage and the practical tone of delivery fostered at Cranfield.

**b. Approach to impact**

Cranfield's approach to impact is underpinned by the close engagement of industry, government and NGOs in the direction of research projects. This not only includes projects designed to engage industrial end-users, but EU Framework projects, research studentships and Masters' thesis research projects. The research and training environment within which academic staff, researchers and research students work is typified by strong industrial or other third-party involvement. This ranges from the provision of significant cash and in-kind funding through to close engagement by having regular project meetings with external bodies to help ensure focus and impact. Managers, front-line employees and policy makers are involved in all stages of the research, performing four roles: (i) contributors of research questions, ideas and intellectual content, (ii) first evaluators of project outputs, (iii) brokers of the research into field work and test sites, and (iv) advisors on dissemination and exploitation of the work in practice and policy. The combination of research in natural sciences with social sciences enhances our ability as an evidence provider to policy. Seven highly effective 'pathways to impact' have evolved, of which five are well-established within UOA 6.

**Strategic research alliances with industry and government.** Formal strategic alliances with a range of major organisations have been formed by Cranfield. These include Defra, Environment Agency, Teagasc, Unilever, Waitrose, The Brazilian Agricultural Research Corporation (Embrapa) and the 'Noel Kempff Mercado' Museum of Natural History (Bolivia). Examples of impact through strategic alliances include

- Digital soil map and operational spatial database of soil properties for the whole of the Republic of Ireland, saving €50 million and 20 years work compared with conventional survey methods.
- Intimate working with policy advisors and technical advisors to Government (national and the European Commission) on definition of European soil protection zones.
- Development of the Geospatial Centre for Biodiversity, a web portal which collects, processes and disseminates spatially explicit information and scientifically robust biodiversity knowledge to promote the sustainable management of Bolivia's biodiversity as natural capital. It has been adopted by four national parks as a management tool.

**Industry and government engaged research degrees.** Of 80 research students related to the UOA on 31<sup>st</sup> October 2013, 58 had an industrial, non-research department of government or NGO as one of the funders. Of these 18 received partial research council or charitable trust funding through CASE and other awards. Companies and other organisations that sponsored PhD and EngD students include Defra, Forestry Commission, Environment Agency, Unilever, Anglian Water and Teagasc (seven PhDs through the Walsh Fellowship). Cranfield is a partner in the BBSRC Agri-Food Advanced Training Partnership (ATP), working with four other universities and nine non-academic organisations to deliver skills and training to businesses in the agri-food sector (<http://www.agrifoodatp.ac.uk/>). The ATP currently sponsors six PhD students. Cranfield has established its own Doctoral Training Centres to stimulate impact through interaction with industry. These DTCs map onto the University's strategic themes including environment (<http://www.cranfield.ac.uk/research/doctoral-research/doctoral-training-centre/>), which includes agriculture. This close engagement provides immediate benefits through the projects undertaken and longer-term impact through doctoral graduates equipped to understand the needs of users.

**Knowledge Transfer Grants.** Impact is achieved through undertaking research with a wide range of external partners through grants with industrial leverage that embed knowledge transfer. The funders principally include European Union (EU) Framework consortia grants, Defra LINK and the Technology Strategy Board (TSB), including Knowledge Transfer Partnerships (KTPs). Recent examples include

- The Soil-for-Life KTP (2010-13) between Cranfield and ProduceWorld was graded 'outstanding' by independent assessors for the TSB. It was estimated by the company to have a minimum impact of £0.25 million increase in annual profit within three years. The company said that it had (i) facilitated a much greater understanding of the interactions between soil characteristics and crop performance; (ii) provided a new information system which facilitates the integration and analysis of large, disparate, datasets; (iii) provided a fantastic platform for engaging with customers, growers and scientific communities.
- Defra HortLINK HL0196 (current) with nine industry partners integrates soil moisture sensing, wireless communication and variable application technologies, to improve crop quality, save water and minimise environmental impacts.

**Knowledge Transfer via Trade and Other Bodies.** In order to influence policy in key subject areas, Cranfield is a member of industry-led networks and organisations that influence industrial, government and international policy. Examples include

- The Water for Food Group convened by the NFU and including other agriculture and countryside groups. "The Water for Food group is all about learning the lessons of the last drought and planning for the next one" – Paul Hammett, NFU.
- The FAO Global Soil Partnership, which promotes the sustainable management of soil resources to produce crops for food and other products.

- LEAF (Linking Environment and Farming), promoting sustainable food and farming, including membership of the Technical Advisory Committee for the LEAF Marque standard.

**Continuing Professional Development (CPD).** Cranfield differentiates its educational offering by integrating teaching with leading-edge research and innovation activities applied to industrial practice through sponsored research projects, staff exchanges and collaborations. Through the BBSRC Agri-Food Advanced Training Partnership, Cranfield contributes to delivering skills and training to businesses in the agri-food sector. Examples of ‘transferable skills’ courses in the ATP and other CPD courses that have used the results of research to inform industry, regulators and policy makers that have been delivered since 2008 include Evaluating Sustainability, Land Engineering and Water Management, Landscape Ecology, Soil Erosion Control for Catchment Management, and Sustainability and Fresh Produce Supply Chains. ([www.cranfield.ac.uk/study/professional-development/cranfield/](http://www.cranfield.ac.uk/study/professional-development/cranfield/))

### c. Strategy and plans

The UOA makes use of the University’s overall knowledge transfer strategy to increase the impact of its research. The pathways to impact identified above will be enhanced as outlined below.

The newly-formed **Food@Cranfield Research Network**, which brings together academics from UOA 6 and the School of Management with senior representatives from companies throughout the agriculture and food sector will be expanded to include a wider cross-section of the sector. It will address the scientific, managerial and logistics aspects of the complete food supply chain.

The Environmental Science and Technology Department has recently employed a **Knowledge Exchange Manager** to ensure effective two-way communication with public and private sector clients. She works closely with a network of organisations, including Defra and related agencies, the FSA, Scottish and Welsh governments and NERC, to understand, co-ordinate and communicate their requirements and the results of the unit’s research. She assists project leaders in preparing proposals to meet clients’ requirements and in developing KE strategies. Academic institutes host staff with specific outreach responsibilities to maintain sectoral engagement.

**Knowledge Exploitation Partnership:** While the overarching principle for knowledge exploitation will continue to be research users embedded in project management to ensure direct technology transfer, assessment of IP through our knowledge exploitation partner will be enhanced. Raising awareness has already begun through sessions within departments and coaching with staff from Isis Innovation (the knowledge transfer arm of Oxford University). Isis provides advice about exploitation of IP that includes evaluating the commercial potential of an individual’s ideas, protection of IP and the best strategy for exploitation.

### d. Relationship to case studies

All the case studies illustrate our approach of integrating scientific excellence in our specialist areas with close involvement with industry and government to combine innovation with relevance.

The impact of the work on reducing waste from fresh produce arose from an industrially sponsored PhD that was followed by a LINK project founded on close integration with industrial partners to deliver direct benefits to the industry and environment.

The applications of digital soil information methods arose from several strategic alliances. A formal agreement with Teagasc led to the soil map and spatial database for Ireland, membership of the European Soil Bureau Network to the European Soil Atlas, and a long heritage of work in Africa to the African Soil Atlas. Other impacts from this research depended on working closely with clients including the Defence Estates and local authorities.

Strategic relationships with Defra and the Environment Agency were central to the impacts arising from the work on life cycle assessment and water resource management. In each case Cranfield is seen as a centre of excellence in the science and a trusted supplier of evidence that understands the client’s requirements, resulting in commissioned and competitively won projects. The recognition of the scientific rigour and independence of the LCA work has resulted in contracts from organisations as diverse as the Crop Protection Association and WWF, while the results of work on water resource management have directly influenced farm practice.