



UCD Institute of Food and Health

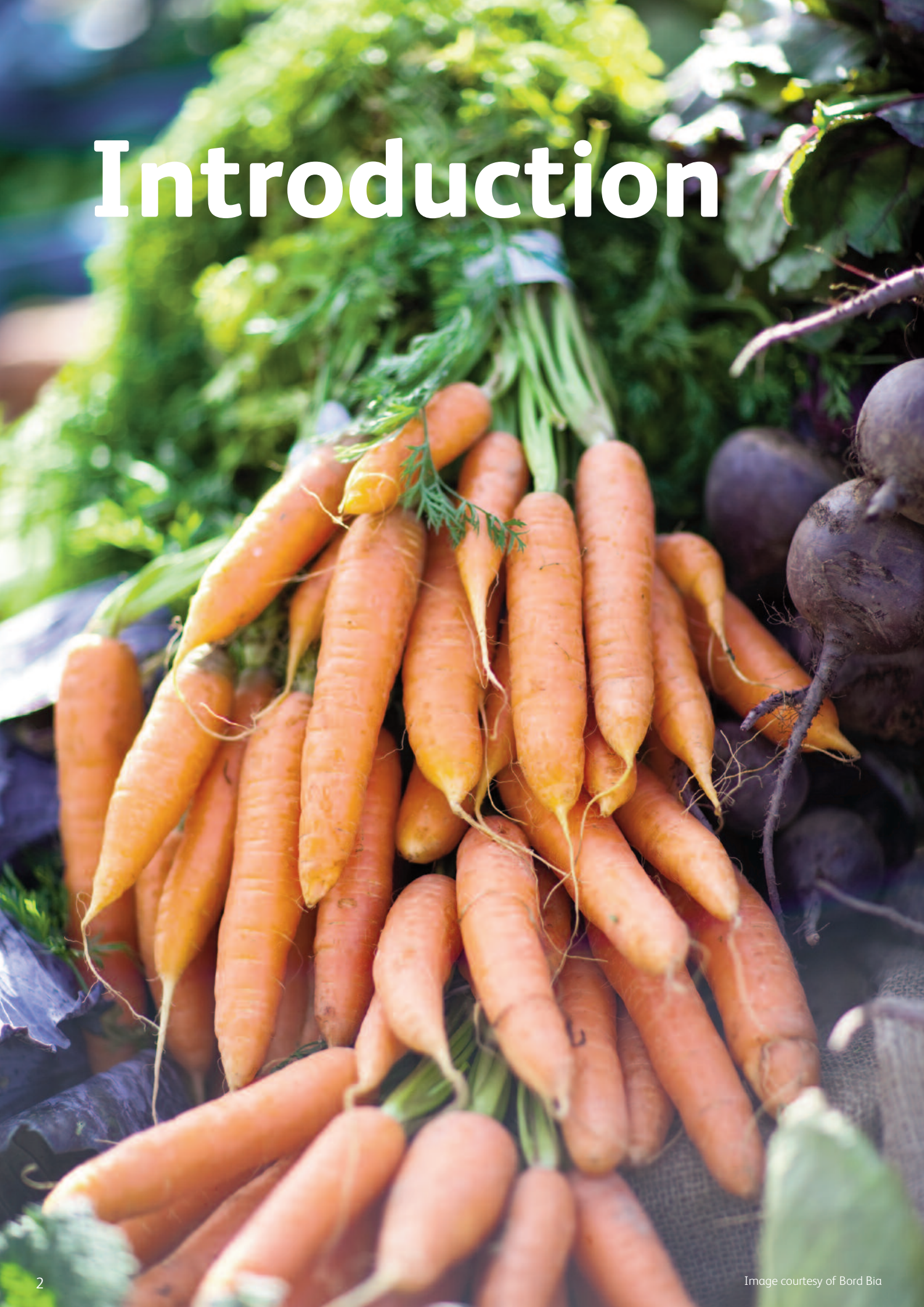
UCD Institute of Food and Health Research Roadmap

2014-2018



**Smart Science,
Good Food.**

Introduction





The UCD Institute of Food and Health brings together UCD staff with active research programmes in the area of Food and Health into one centre of excellence. It is a multi-disciplinary, campus wide initiative to develop Food and Health research with major projects spread across four research thematic areas: Food Quality and Processing; Food Safety; Personalised Nutrition and Health; and Food Chain Sustainability.

The Institute currently has 35 academic staff members, approximately 50 research staff and 130 graduate students funded through a significant research income¹. Since 2009 the Institute has won almost €50m from competitive grant awards (Appendix I). Of this funding approximately 25% has come through projects funded both directly and indirectly from industry involving partnerships with companies including: Nestlé, Cereal Partners, Coca-Cola, Abbott Nutrition, Glanbia, Kerry Group, Carbery, Dairygold, Dawn Meats, Kepak, Dawn Farm Foods, Largo Foods, Mead Johnson, Pzifer and Diageo. Allied to its funding success, the Institute performs well against standard academic metrics. A recent review of international status in the subject area of "Food and Health", places the Institute at 18th in the world and 5th in Europe on the volume of publications, and 7th globally on impact (at 1.65, well above the world average of 1)² (Appendix II).

A central tenet of the Institute's philosophy is the translation of its research for commercial, economic and societal impact. Utilising its scientific evidence as the basis for Food and Health policy is also a key objective.

Since its inception in 2008, the Institute has firmly established itself as a leading player on the national Food and Health research landscape. Now entering its second phase, the Institute and its members are fully committed to building on the platform of this initial success and achievement. This strategic plan identifies the means by which the Institute intends to advance this commitment in the coming years and establish itself as a global leader in Food and Health research.

Since its inception in 2008, the Institute has firmly established itself as a leading player on the national Food and Health research landscape.

¹ Based on 2008-2013 figures

² The tag Food Science and Technology was used, which includes all publications in the area of food and health. Analysis from Thomson Reuters InCites.

National and Global Context

Health and Agri-Food are central to the strategic research vision of UCD and the Institute is well-placed to lead the University's research strategy in these areas. From a national perspective the Agri-Food sector, as Ireland's largest and most important indigenous industry³, has ambitious growth plans under Food Harvest 2020⁴, which the Institute is well placed to support.

Research in the area of Food and Health is now a national priority as outlined in the National Research Prioritisation Report⁵. Two of the fourteen priority research areas highlighted in this report are directly pertinent to the activities of the Institute:

Priority H: Food for Health

Priority I: Sustainable Food Production and Processing

The Institute's research programme must also be considered in the wider European and global economic, policy and research context. Increased emphasis on the diversification of our funding base means that other channels must be explored, including European Union, US and industry sources.

The food sector is the largest industrial sector in Europe (12.9% of turnover). The proposed establishment of a Food Knowledge Innovation Community (KIC) in 2016 will provide the stimulus for increasing investment in food research in Europe. In addition to the KIC initiative, under the EU Horizon 2020 programme there are twelve focus areas, two of which are of particular relevance to Food and Health research:

- Personalising Health Care
 - Health Promotion
 - Healthy Ageing
- Sustainable Food Security
 - Sustainable Food Chain
 - Safe Foods
 - Healthy Diets

There are also opportunities within the cross cutting theme: *Innovation and Societal Challenges*, under the subtopics *Health Demographic Change and Wellbeing*, and *Food Security*.

Further factors such as Common Agriculture Policy (CAP) reform and the removal of milk quotas in 2015 will have a significant impact on the dairy industry and will influence future research agenda, both within Ireland and Europe.

The global food system will experience unprecedented challenges over the next four decades. Anticipated population growth, increased affluence and longer life expectancy, will further increase the demand for innovations in food and food production and increase pressure on health services. There will be global challenges to:

- develop new ingredients and innovative processes to manufacture affordable, nutritionally balanced foods to meet consumer needs in the changing demographic profile;
- provide safe foods that consumers can trust;
- produce foods sustainably in a world with finite resources;
- develop dietary intervention strategies to enhance health, wellness and longevity; and
- increase innovation in the food industry to ensure economic competitiveness.

The Institute, through its critical mass in the area of food and health is well positioned to address these global challenges by:

- providing new innovations for product and process development;
- developing cutting edge food safety diagnostics;
- developing know-how to ensure traceability and sustainability of the food supply chain, both locally and globally;
- further understanding the link between diet and disease, supporting national and international policy in food and health;
- training premier class scientists with honed skills for the food and health sector; and
- transferring our knowledge to government, policy makers, the general public, researchers and stakeholders along the food chain.

³ Department of Agriculture Food and the Marine: Food Research Ireland: Meeting the needs of Ireland's food sector to 2020 through research and innovation

⁴ <http://www.agriculture.gov.ie/media/migration/agri-foodindustry/foodharvest2020/2020FoodHarvestEng240810.pdf>

⁵ Department of Jobs, Enterprise and Innovation: Report of the Research Prioritisation Steering Group



The UCD
Institute of Food
and Health will
lead national
and international
science, policy
and innovation,
addressing
the complex
challenges facing
the human food
chain, now and
into the future.



Vision and Mission

Vision:

To be global leaders in Food and Health scientific discovery that will underpin innovation and provide the scientific evidence to support practice and policies for industry, government and society.

Mission:

To realise an internationally recognised multi-disciplinary consortium engaged in pioneering research in Food and Health delivering:

- scientific discovery to promote health and wellness in a sustainable manner;
- innovative outputs for industry to underpin economic development;
- an effective communications programme influencing national and international policy;
- a critical mass of highly skilled researchers and postgraduate students supported by world class infrastructure; and
- successful collaborations with leading international institutes.



Research Themes



Since its establishment the UCD Institute of Food and Health has positioned itself as an international leader in Food and Health research.

The research activities are collated into four key themes based on the scientific depth and strategic direction of the Institute:

- Food Quality and Processing
- Food Safety
- Personalised Nutrition and Health
- Food Chain Sustainability

The infrastructure capabilities, expertise and strengths of each of these research themes are outlined in table 1. By interacting across these research themes and by linking in with campus, national and international initiatives, UCD Institute of Food and Health researchers can ensure that their contributions are relevant to a broad spectrum of scientific, health, legal and social arenas.

UCD will achieve a seamless integration of research in Food Quality and Processing, Food Safety, Personalised Nutrition and Health, and Food Chain Sustainability. This will enable the Institute to respond to the global challenges along the human food chain and provide innovative solutions for the food industry while enhancing human health.

Table 1 Infrastructure Capabilities, Expertise and Strengths of the Research Themes

Research Theme	Expertise	Infrastructure
<p>Food Quality and Processing</p> <p>The focus of the theme is the development of technologies that will help to identify and incorporate bioactive ingredients into foods, as well as the use of process analytic tools and alternative processing technologies to enhance manufacturing efficiency and the quality of foods.</p>	<ul style="list-style-type: none"> • Food ingredient interaction. • Food preservation. • Novel food processing. • Food analysis and food structure. • Food product innovation. • Food formulation and the development of functional foods. 	<ul style="list-style-type: none"> • A bespoke suite of analytical equipment to assess the physical and chemical properties of food ingredients including HPLC, HPLC-MS, GC, GC-MS, NMR etc. • State-of-the-art facilities including a dedicated sensory suite with expert individuals and trained sensory panels. • Novel processing technologies for improving stability and shelf life. • Expertise in protecting and delivering bioactives, to enhance their functions and improve bioavailability and processing, including encapsulation.
<p>Food Safety</p> <p>The focus of the theme is the development of new technologies to ensure the safety of the food chain and the protection of public health through the application of conventional microbiology, molecular investigation of biological hazards, and the use of novel technologies to support pathogen reduction. Risk analysis is an important aspect of the research within this theme.</p>	<ul style="list-style-type: none"> • Development of reliable detection protocols for the neonatal pathogen <i>Cronobacter</i>. • Understanding the genetic basis for the emergence of multi-drug resistance (MDR) food-borne zoonotic bacteria. • Modelling of human exposure to food chemical intake. • Food safety risk analysis. 	<ul style="list-style-type: none"> • Molecular sub-typing expertise to track significant food-borne pathogens. • Genomic and proteomic tools to explore bacterial resistance mechanisms contributing to antimicrobial and food processing stresses. • A bioinformatics pipeline, to support basic DNA sequencing efforts, along with whole genome analysis (WGS). • WHO reference laboratory for <i>Cronobacter</i> is hosted within the Institute. • Unique searchable databases on food ingredients and packaging usage, coupled with advanced probabilistic software and expertise for the prediction of food chemical exposure risk.
<p>Personalised Nutrition and Health</p> <p>The focus of the theme is to understand the genetic and environmental interactions and how they influence health and dietary interventions.</p>	<ul style="list-style-type: none"> • An integrated systems biology approach to nutritional research using transcriptomic, proteomics, metabolomics and epigenetic platforms to understand the impact of nutrients on health. • A suite of tools and facilities to conduct human intervention trials. • Protocols and management systems for conducting national food and nutrition surveys in different age groups. 	<ul style="list-style-type: none"> • NMR platform (300,500 & 600 Hz), LC-MS, GC-MS, bioinformatics, cell culture and animal models. • Clinical investigations rooms, anthropometry and body composition (DEXA, BodPod, Impedance), physical fitness (VO₂ Max, muscle strength testing), biofluid collection, handling and analysis (biochemical, genomic, metabolomic, epigenomic). • Large national food consumption databases (incorporating adults, children and teens). Complex data analysis including meal pattern analysis, data mining and probabilistic modelling.
<p>Food Chain Sustainability</p> <p>The focus of the theme is to develop a holistic understanding of food chain sustainability, and harmonise relevant indicators for Irish food production and consumption that are applicable to all stakeholders as part of their ongoing drive to achieve a safe, sustainable and secure food supply.</p>	<ul style="list-style-type: none"> • Sustainable food production. • Enhancement of the nutritional composition in primary food production. • Novel oligosaccharides for gut health. • Process optimisation. • Sustainable energy and environmental engineering. 	<ul style="list-style-type: none"> • Key databases and software. • Facilities for nutrient and site specific emissions monitoring. • Novel feeding strategies to reduce methane and odour emissions from food animals. • UCD Lyons Research Farm. • Energy modelling laboratory suitable for developing Certified Energy Management Plan. • Waste management and the identification of valuable products in waste streams modern equipment and facilities to monitor wastewater and effluent quality. • Life cycle assessment and carbon footprinting.



Goals, Objectives and Actions 2014-2018

To realise our vision of becoming global leaders in Food and Health discovery, we have set, with the input and support of all the Principal Investigators within the Institute, five major goals by which we will measure and evaluate our activities over the next four years:

Goal 1:

To become an international leader in Food and Health research through successful competition for funding and the development of best-in-class personnel and facilities.

Goal 2:

To increase our relationships and collaborations with leading international research institutions.

Goal 3:

To develop educational and training programmes in Food and Health.

Goal 4:

To translate our research to impact positively on the economy, industry and society.

Goal 5:

To develop and communicate the Institute's brand to support and underpin the Institute in its work.

The timelines and activities required to achieve these goals are outlined in table 2.

Table 2 UCD Institute of Food and Health, Goals, Objectives and Time Lines 2014-2018

Goal 1: To become an international leader in Food and Health research through successful competition for funding and the development of best-in-class personnel and facilities.

Objectives	Timelines and Activities		
	Short-Term (2014-2015)	Mid-Term (2015-2016)	Long-Term (2016-2018)
<p>i. Integrate our research across the themes of the Institute.</p> <p>ii. Enhance collaborations with other UCD research institutes and centres.</p> <p>iii. Review our research focus on an ongoing basis.</p>	<ul style="list-style-type: none"> Further enhance the collaborations between research themes, by setting four meetings per year to "show and tell" activities and identify collaborative opportunities. Engage with colleagues across the University, particularly with respect to new funding opportunities. Review the membership of the Institute with a view to strengthening the research strands. Review the research themes and scan the horizon for future developments. 	<ul style="list-style-type: none"> Review midterm progress to assess the quality and success of meaningful collaborations between the research themes. Explore any hitherto unidentified opportunities for cross-sectional collaborations across the University. Define an integrated research programme with the Earth Institute, Connected Health and others. Review research focus and align as appropriate with national and international strategy/funding opportunities. 	<ul style="list-style-type: none"> Have established work routines for grant applications and research delivery with key institutional partners the Institute leading in the food chain domain. We will deliver a minimum of three collaborative projects. Have evaluated the success of inter-institutional theme-based collaborations and provided metrics to show the outruns. Embedded our research programmes across the Institute to underpin the national and international research agenda.
<p>i. Continue to seek funding from both exchequer and in particular non-exchequer sources, including industry.</p>	<ul style="list-style-type: none"> A new target of €1million (minimum) annual research income for each research theme has been established, from both national and non-exchequer funding. Prepare proposals for the national technology centres and the relevant Science Foundation Ireland (SFI) and Department of Agriculture, Food and the Marine (DAFM) calls, all of which will have a substantial industry contribution. Actively influence future research topics in Horizon 2020 (H2020) and prepare proposals for the 2014 call. Lead two proposals and partner in five. Continue involvement with the Knowledge Innovation Communities (KIC) (http://eit.europa.eu/kics/) via active participation in a number of committees to ensure we are in a strong position to apply when the call opens in 2016. Explore funding opportunities with both national and international industry partners with the support of Enterprise Ireland (EI) and Irish Development Authority (IDA). Identify potential philanthropic donors. 	<ul style="list-style-type: none"> Scope out SFI centre structures to identify niches in Food and Health. Seek to identify independent industry-related funding opportunities. Network and link to H2020 opportunities via established international collaborations. Seek funding with partner institutes in UCD to address key challenges in supply chain management, consumer behaviour and economics. Submit a minimum of three proposals under KICs strands. Prepare proposals to secure philanthropic funding. 	<ul style="list-style-type: none"> Have established a firm research-base (which will be aligned and inter-dependent on other parameters) to meet the challenges of providing a successful research capability, recognised for its relevance to the food industry and other stakeholders. Have secured 40% of total research income from non-exchequer funds. Be a participant in at least one KIC.

Goal 1 contd.

Objectives	Timelines and Activities		
	Short-Term (2014-2015)	Mid-Term (2015-2016)	Long-Term (2016-2018)
<p>i. Seek funding to make key academic appointments.</p> <p>ii. Provide mentoring for early stage researchers by creating a supportive environment for their activities.</p>	<ul style="list-style-type: none"> Continue to lobby for appointments in the core research areas, particularly food waste, packaging/chemical safety, consumer and sensory science, and food engineering focusing on powdered milk technology. Develop a proposal and attract funding for a Chair in Nutrition and Ageing. Attract and recruit senior post-doctoral staff and PhDs to ensure good critical mass. Mentor early stage researchers and support them in applications to programmes such as SFI and European Research Council (ERC). Advise on the publication of research to maximise output in high impact journals. 	<ul style="list-style-type: none"> Seek extension of existing contract appointments with the long term objective of creating permanent positions. Support appointments in key areas across the research themes of the Institute. Secure the means to appoint suitable technical staff, including data and IT management. Increase the impact of our scientific research. 	<ul style="list-style-type: none"> Created future-proof planning for the long-term sustainability of the Institute. Have increased the staff complement, both academic and technical, across the Institute. Developed a business plan and sought industry funding to support the establishment of a Chair in Food Chain Sustainability.
<p>i. Secure commitment to the long term enhancement of research facilities.</p>	<ul style="list-style-type: none"> Establish best practices in food processing facilities and draw up a detailed plan for new food processing infrastructure. Review infrastructure needs arising from the above plan and present solutions for deficits to senior management. Work in collaboration with the Office of the Vice-President for Development to seek philanthropic donations. Explore opportunities for funding under the National Research Prioritisation Exercise as well as from external sources. Establish a plan for the maintenance of existing equipment to ensure the Institute remains at the forefront of technology. 	<ul style="list-style-type: none"> Based on the outcomes achieved in the foregoing elements of Goal 1 assess the future sustainability of the research facilities. Upgrade facilities which are critical to support grant winning competitiveness within research programme proposals. Target funding for the replacement of existing equipment. Identify and establish pipelines to acquire necessary data from the State and industry. Identify the most appropriate data management and software strategy for Institute databases and modelling. 	<ul style="list-style-type: none"> Have secured new food processing facilities and supported the upgrading of other equipment and infrastructure, to fully underpin our ambitions as a centre of excellence across our research, personnel and facilities. Produced plans for future infra structural developments.

Goal 2: To increase our relationships and collaborations with leading international research institutions.

Objectives	Timelines and Activities		
	Short-Term (2014-2015)	Mid-Term (2015-2016)	Long-Term (2016-2018)
<p>i. Enhance existing relationships between international institutes and explore other partnerships.</p>	<ul style="list-style-type: none"> Use seed funding to develop collaborations with University of California Davis to initiate joint seminars, host Fulbright scholars and support other initiatives. Continue to host postgraduate students through China Scholarship Scheme and further develop links with China via the Science Foundation Ireland - China programme. Prioritise and select other universities and institutes for collaborations, such as the University of Wageningen and Institut National de la Recherche Agronomique (INRA). 	<ul style="list-style-type: none"> Continue to develop our collaborative links with new partners particularly those prioritised in phase 1. Have defined three key sustainability research objectives best addressed by Ireland – US; Ireland – China; and Ireland and Ireland/UK collaborations 	<ul style="list-style-type: none"> Have established firm and long-term linkages with the target institutions. Have significant interactions and ongoing projects and dialogue with other leading universities globally. Engaged in at least one H2020 research consortium related to each of the research themes

Goal 3: To develop educational and training programmes in Food and Health.

Objectives	Timelines and Activities		
	Short-Term (2014-2015)	Mid-Term (2015-2016)	Long-Term (2016-2018)
<p>i. Develop our students and empower them with the necessary skills for future employment while meeting the needs of employers.</p>	<ul style="list-style-type: none"> Further develop the e-learning platform to provide graduates with the necessary skill sets for employment within the Food and Health sector. Seek funding for the continuation of the Agri-Food Graduate Development Programme and within the programme explore opportunities for CPD accreditation. Develop programmes with the Business Schools. 	<ul style="list-style-type: none"> Develop thematic PhD programmes in Food and Health and Food Chain Sustainability. Develop a subscription based industry partner programme allowing access to seminar series and training across the research themes where appropriate. 	<ul style="list-style-type: none"> Have established an internationally recognised programme in Food and Health, and Food Chain Sustainability. Have developed CPD programmes with professional bodies in the area of Food and Health. Have identified programme opportunities for the future.

Goal 4: To translate our research to impact positively on the economy, industry and society.

Objectives	Timelines and Activities		
	Short-Term (2014-2015)	Mid-Term (2015-2016)	Long-Term (2016-2018)
<p>i. Train researchers to develop entrepreneurial skills and mindsets and translate research for economic and societal gain.</p> <p>ii. Develop systems for the provision of additional services for industry.</p> <p>iii. Develop a food innovation hub.</p>	<ul style="list-style-type: none"> Work closely with colleagues in NovaUCD, the Business Schools and EI to explore opportunities and develop a proposal for a Food Innovation Hub. Provide dedicated training sessions on innovation, IP protection, etc for the Institute's researchers. Apply for at least three EI innovation partnership grants. Establish metrics for innovation outputs. Develop a strategy to maximise impact of research on society. Explore the requirement for a Business Development Manager. Leverage internal support for industry engagement already available on the campus. 	<ul style="list-style-type: none"> Have at least one EI partnership grant across each research theme. Identify one or more SMEs to work with for a H2020 proposal related to each theme. Ensure all PhD students receive training in innovation and entrepreneurship. Develop implementation plan for a Food Innovation Hub. Organise placement of students in industry and reciprocal placements for industry staff. 	<ul style="list-style-type: none"> Have embedded an innovation and entrepreneurial culture across the Institute. Have transferred technologies to industry.

Goal 5: To develop and communicate the Institute brand to support and underpin the Institute in its work

Objectives	Timelines and Activities		
	Short-Term (2014-2015)	Mid-Term (2015-2016)	Long-Term (2016-2018)
<p>i. Develop a comprehensive communications programme aimed at profiling the Institute nationally and internationally to peers, consumers, policy makers, industry, and potential future students.</p>	<ul style="list-style-type: none"> Upgrade the Institute's website. Develop and deliver an appropriate social media communications strategy for relevant target audiences. Hold two policy seminars annually and prepare policy documents based on the discussions and outputs. Host visiting academics and international scholars. Host an outreach programme centred on activities for TY and senior cycle school children. Improve external communications to attract best international candidates for both academic and research positions. Improve the internal communications programme and arrange activities to enhance staff and student engagement within the Institute. Play an active role in preparing to host international conferences such as IUFoST, LCAFood and Food Micro in 2016. Review existing channels and technologies and identify best fit for communications messages. 	<ul style="list-style-type: none"> Engage with the public via lectures and other outreach activities such as evening lectures and medal lectures. Review the format of the policy seminars. Deliver keynote lectures to major international meetings, thereby raising the profile of the University and the Institute. Utilise latest communication channels and technologies to relay our outputs. 	<ul style="list-style-type: none"> Be an internationally recognised leader in the area of Food and Health Be the "go to" institution for the media for discussion and debate on Food and Health topics Have hosted three international conferences across the research themes. Have actively influenced policy making and national and international strategies in Food and Health.



Into the Future

The UCD Institute of Food and Health will lead national and international science, policy and innovation, addressing the complex challenges facing the human food chain, now and into the future.

UCD will achieve a seamless integration of research in Food Quality and Processing, Food Safety, Personalised Nutrition and Health, and Food Chain Sustainability. This will enable the Institute to respond to the global challenges along the human food chain and provide innovative solutions for the food industry while enhancing human health.

In the future, the UCD Institute of Food and Health will continue to be a valuable resource for fostering and leading innovations in the Food and Health industries both nationally and internationally.

Appendices

Appendix 1:

UCD Institute of Food and Health Annual Research Competitive Income 2009 - 2014 (€m)

Research Theme	Research Income 2009-2010	Research Income 2010-2011	Research Income 2011-2012	Research Income 2012-2013	Research Income 2013-2014	Overall Totals
Food Quality and Processing	0.13	1.37	1.85	15.35	5.61	24.31
Food Safety	1.49	0.66	0.31	1.97	1.21	5.64
Personalised Nutrition and Health	0.49	3.63	2.78	0.74	1.22	8.86
Food Chain Sustainability	0.74	1.27	2.03	3.61	1.51	9.16
Overall Totals	2.85	6.93	6.97	21.67	9.55	47.97

Appendix 2:

International comparison of research outputs of the UCD Institute of Food and Health in the subject areas of Food Science and Technology ⁶

University	Volume of Publications		Citations		Impact in Subject Area	
	Rank Global	Rank European	Rank Global	Rank European	Rank Global	Rank European
Wageningen University	3	1	2	1	15	9
University Estadual Campinas	5	2	13	4	83	32
University of California Davis	7	n/a	3	n/a	20	n/a
Ghent University	10	3	7	2	24	13
University of Copenhagen	13	4	14	5	59	24
University College Dublin	18	5	9	3	7	5

⁶ The tag Food Science and Technology was used, which includes all publications in the area of food and health. Analysis from Thomson Reuters InCites.



UCD Institute of Food and Health

University College Dublin,
Belfield, Dublin 4, Ireland

Tel: +353 (0) 1 716 2808

Fax: +353 (0) 1 716 1147

Email: foodandhealth@ucd.ie

Website: www.ucd.ie/foodandhealth