



## UK Plant Sciences Federation

### Translation Working Group implementation plan

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*This report was produced by an independent working group convened under the UK Plant Sciences Federation. All views, unless otherwise noted, are those expressed at the working group meetings, and are not necessarily those of the convening groups.*

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## **Scope**

In a [recent review](#) by the UKPSF, UK plant scientists identified knowledge exchange as the biggest weakness in the UK's research and funding strategy. Although plant science research has led to a broad range of intellectual properties, and despite considerable national activity in this area, there remains unlocked potential for translating basic scientific knowledge into useful applications. Additional routes and networks to facilitate translation, including public-private partnerships and other mechanisms will help to strengthen the scientific community further and accelerate the innovation journey.

The timeframes involved in producing plants or plant products for commercial use are too long for many investors, and new plant varieties must pass stringent field trials before they can be marketed in the UK. This, coupled with what is viewed by some as a restrictive European regulatory environment, represents a large and long-term financial investment with a high risk of failure.

Academics and industry representatives [reported](#) that they have been deterred by the heavy administrative load associated with Innovate UK funding schemes, as compared to the previous Defra LINK programme. They also expressed concerns that previous Innovate UK funding opportunities were limited to strategic calls, rather than open calls which allow applicants to submit proposals based on work the industrial partner considers to have good business potential.<sup>1</sup>

Key recommendations from UKPSF report:

- Effective translation of plant science research into applications is vital

It would appear that the UK plant sciences community would benefit from stronger representation in public-private partnerships. Plant science must be well-represented in knowledge exchange schemes generated through, for example, the UK Strategy for Agricultural Technologies. Mechanisms to support translation of research into practice must be simple, stable and readily accessible, to encourage the scale of uptake necessary to maximise opportunities for beneficial innovation.

Definition of translation:

The Working Group considered the following definition as a frame of reference for its scope:

*'The translation of basic plant science to real world applications, though new or improved practices, products or services.'*

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<sup>1</sup> Innovate UK has since introduced open calls through its Catalyst fund. This is designed to cater for relevant projects with a good business case, rather than the strategic calls through the Innovation Platforms.

## **Action 1: Mapping the technical and commercial capabilities for translation**

### **Summary of action**

Map the UK's plant science innovation system, including the key players and the technical and commercial capabilities for translation – e.g. the various plant transformation services operating as a commercial vehicle within the UK – with a view to publicising them more widely as a UK competence and/or identifying gaps where commercial development services or incentives may be needed.

### **Rationale**

Historically, applied research centres (e.g. experimental husbandry farms) provided a translational 'middle space' but many of the places that can do applied research have been lost and not (necessarily) replaced. Many of the organisations occupying this space now operate on fully a commercial basis and often are not eligible to apply for certain funding instruments.

There is a particularly large gap in applied research capability in areas where there is no obvious industrial partner or driver.

Data in *Arabidopsis* or another model system may be of translational value but if it has not been shown in a crop species it is less likely to gain interest from potential translational partners. Neither companies nor academics have the resources to do this work:

- The costs and infrastructure requirements for growing crops are too large for most universities.
- Breeders do not have resource to test a large number of ideas. Only some ideas that are tested will come to fruition so there is a large risk attached. Bridging that gap is very difficult.

It could be useful to have a technology facility that carries out pre-commercial and translational research as a commercial service. Services could include crop transformation, phenotyping and reproducing *Arabidopsis* data in crops. Some such services do already exist (Appendix 2) so it would be important not to duplicate or compete with existing services.

### **Mechanism**

The Working Group proposes mapping the existing technical and commercial capabilities for translating plant science in the UK. By highlighting where the current gaps are, this would demonstrate to Government where investment is needed and/or show industry (and potential international investors) where there is a potential UK opportunity. An added benefit would be to highlight to researchers where useful services already exist. This should help retain intellectual property (IP) in the UK, providing a development route to market.

The work might include:

- A community survey (or surveys) to establish which services are available, whether they work effectively, how well known they are among potential customers and which services/capabilities are missing.
- Engagement with organisations that have carried out related research e.g. the National Farmers' Union (NFU) and the National Horticultural Forum (Appendix 1) to draw on their data.
- Engagement with other groups that are developing their own sector strategies – including levy boards – to get a handle on their mechanisms for translating plant science

Projected outcomes:

- Information could feed into Action 2: the *Pathfinder* service to promote the use of existing services.
- UKPSF could hold a [SynBioBeta](#)-style showcase event for those who provide technical and commercial capabilities across the UK, with the aim of bringing them together with potential service users and investors, as well as increasing 'cross-fertilisation' within the sector. The event could be held as a satellite meeting to the UK PlantSci conference.
- UKPSF could recommend funding for services/centres to improve capability in areas where gaps are identified.

### **Responsibilities and timescale**

Immediate actions: The Working Group is forming a list of known services (Appendix 2).

Within six months: UKPSF to develop and carry out surveys, and engage with related initiatives.

## **Action 2: Pathfinder service**

### **Summary of action**

Scope the feasibility of a UKPSF-based 'pathfinder' service to help identify funding opportunities and broker interactions that are specific to plant sciences.

### **Rationale**

There is a general challenge of how to forge better links between academic researchers and industry. Facilitating the development of such links would have the benefit of both increasing the translation and therefore impact of academic research and helping industry meet its challenges in the development and delivery of new solutions. Furthermore, wider sharing of industry needs, which could be met through working together with academic researchers, is likely to stimulate further productive interactions.

Academics have very specific drivers in terms of ongoing revenues, so they need to be confident that something is worth pursuing in terms of translation. However, they do not necessarily understand where the best translational opportunities lie and what type of work will attract commercial interest.

Significantly fewer plant science start-ups have been founded in the UK as compared with medical biotechnology, for example, so it is crucial to identify the commercially viable areas from which SMEs could emerge.

Some company websites list research areas in which the company is interested, but there is no central hub that collates all of this in relation to plant science.

There is confusion about where funding is available for translation, who is eligible, and how to apply. Potential applicants do not generally have the time to search through this information if it is not presented clearly, so they are deterred from applying.

Some organisations are very aware of relevant funding opportunities and a minority make very good use of them (e.g. the Industrial Partnership Awards issued by BBSRC). Wider awareness of the funding opportunities could encourage better uptake.

Several organisations (including UKPSF) have web pages that list funding opportunities and links to source websites; however there is often no additional help or information about how to apply.

Ireland has a Government office that provides a service to help with funding applications and matchmaking collaborative partnerships. As a consequence Ireland has been very successful at gaining EU funding. A number of regions have Enterprise Networks that are funded by the European Commission to help disseminate awareness of new calls, support applications and facilitate brokerage; however the service is patchy across the UK. Innovate UK also employs the National Contact Points (NCP) who signpost and provide advice on EU funding; however there is not a bespoke NCP for plant sciences.

## Mechanism

An expert 'pathfinder' service could:

- Facilitate better information sharing between industry and academics and raise awareness about where opportunities lie for interactions.
- Help to broker collaborations by:
  - Informing industry about examples of work going on in academia, including areas of research to look out for in the long and shorter term.
  - Advising academics about the current interests and requirements from industry.
- Signpost relevant funding opportunities and recommend the most suitable funding calls to which people could apply.
- Provide advice about eligibility and application processes for funding.

This could be a paid service or a 'club' (potentially operated by UKPSF) to which organisations subscribe.

It is envisaged that the service would be unique among existing initiatives and resources in that it would:

- Be available to businesses as well as academics.
- Focus on translation of UK plant science research and increase the involvement of academic researchers in solving industry challenges.
- Be specific to plant science and therefore provide specialised expertise to proactively match relevant knowledge and skills.
- Centralise all of the resources/skills for translating plant science, avoiding duplication of effort and resources.
- Save institution costs.
- Help to bridge translational gaps where the research is too far from market for industry interest, by increasing visibility of places/organisations/centres in the UK that could generate this data.

By determining what industry wants and where the knowledge gaps are, UKPSF could also provide recommendations to funders on where funding would be well placed.

A first step towards setting up a pathfinder service would be to scope its feasibility i.e.:

- What is the appetite among the community of potential users?
- What are the gaps perceived by potential users?
- In what type of services/information would they be interested?
- How might *Pathfinder* sit alongside the services currently available so that it adds value?
- Would what be a suitable business model?
- Are there any foreseeable conflicts of interest?
- What are the risks?

Possible risks:

- University technology transfer offices (TTOs) and technology transfer companies could view *Pathfinder* as something that they already do, and they might be concerned that it would remove a source of income.
- Organisations with a good TTO might consider themselves as having a competitive advantage, and be less eager to see a centralised service.
- There may be confusion as to how the *Pathfinder* is different to existing offerings such as the Knowledge Transfer Network (KTN) etc.

To mitigate these risks it would be important for *Pathfinder* to work with the existing services to help build on them and add value. Messaging and engagement would also be key to avoiding conflicts of interest or perceived conflicts.

### **Responsibilities and timescale**

Immediate:

- The Working Group has begun to compile a list of organisations to survey (Appendix 3). It plans to condense this down to 10–15 organisations with which to begin discussions.
- The Working Group is currently developing a set of key messages and questions for scoping the feasibility of the service (Appendix 4).

Near-term:

- UKPSF to carry out face-to-face interviews with potential stakeholders.
- Depending on the outcomes of the survey, UKPSF could explore the possibilities of either setting up the service internally, or pitching the concept for another organisation to take on.

Next steps to developing the service internally would be:

One year: Develop a sustainable business model, establish funding to set up the service and recruit staff.

18 months: Develop a website, collate resources and create/disseminate marketing material.

Two years: Launch of *Pathfinder* service.

### **Action 3: Convening a plant science meets social sciences forum**

#### **Summary of action**

Convene a forum to bring together plant scientists, social scientists and farmers/growers to help understand the barriers and drivers to uptake of plant science innovations from a social sciences perspective.

#### **Rationale**

Plant scientists need to engage better with farmers and growers so their science can be effectively translated into practice. Reaching the large numbers of advisors/agronomists and ensuring that messages and approaches take account of end users could encourage the uptake of new technologies and practices.

Supporting change in farmers' behaviours and practices requires a good understanding of the levers and incentives that drive these behaviours, and the formulation of appropriate messaging and more effective dialogue based on this.

#### **Mechanism**

The Working Group proposes that UKPSF hosts an interdisciplinary workshop or conference to bring together plant science stakeholders (from academia, industry, policy and funders) with social scientists and farmers to collectively:

- Understand how farmers/growers find and assess new information, and what influences their decisions/behaviours.
- Establish a set of key messages.
- Derive the best mechanisms for engaging end users to optimise uptake of beneficial technologies/innovations, and increase constructive feedback to inform innovators about end user priorities.

The next step would be to demonstrate that these groups are working together well and to recommend an Economic and Social Research Council (ESRC) and/or Defra funding call in this area. These funders could be encouraged to pick up the outcomes of the workshop as a grant proposal.

#### **Responsibilities and timescale**

Initial six months: The Working Group has begun to engage with possible stakeholders and related initiatives (Appendix 5) to understand the history of activities in this area, establish how UKPSF can build on existing work and determine the level of interest from potential contributors.



One year: UKPSF to seek funding for a workshop.

Eighteen months: UKPSF to plan and host a workshop.

## Action 4: Event to forge multidisciplinary collaborations

### Summary of action

Scope out an appropriate format and the appetite for an event to help focus multidisciplinary ideas and establish collaborations around key challenges within plant sciences.

### Rationale

Scientific problem solving is becoming increasingly multidisciplinary. There is a need to bring together researchers from disparate fields who would not necessarily interact in the usual course of events, to help encourage them to address these problems collectively.

Researchers tend to sit in funding silos. There are eligibility issues for accessing funding and this causes researchers to congregate in groupings (e.g. around BBSRC, NERC or Levy board funding). Barriers between funding streams cause fragmentation of research across the board.

Researchers fall into patterns of working with particular collaborators. This is partly due to a failure in communicating the available opportunities, and lack of awareness.

### Mechanisms

The Working Group identified several structured ways to bring people together to work out how to address a problem from different perspectives:

1. **Sandpits:** A set of hand-picked partners get together for about two days to look at solving a common problem. Funding agencies often specify the initial problem/challenge and offer to provide a lump sum of money to support three or four project proposals if they offer solutions of sufficient quality.
2. **Science Foo (Sci Foo) Camp:** An interdisciplinary conference (run by Digital Science, Nature Publishing Group and Google) designed to encourage collaborations between scientists who would not typically work together. There is no predetermined agenda; instead attendees collaboratively produce an agenda on the first day, based on their shared professional interests and enthusiasms. Unlike a sandpit, there is no funding directly attached to the meeting. <http://www.digital-science.com/sciencefoo/>
3. **A speed dating style event.**
4. **An annual networking event attached to the UK PlantSci conference:** Establishing collaborations from a single event might be too much to expect, so an annual event could be more effective at building relationships.

Risks:

- Experiences of sandpits are mixed. They can be highly emotionally charged and some people can come away with substantial reward and/or satisfaction while others will have a very negative outcome.
- Researchers could be reluctant to give up their time to attend an event without funding attached. However, it might be possible to feed the outcomes into a funding call, through Innovate UK, for example.

In consideration of the above risks, the Working Group proposes carrying out informal conversations with people who have participated in various types of event designed to forge multidisciplinary collaborations, to find out about their experiences, establish the risks and benefits, and work out the most effective format. The UKPSF should also engage with funders to ascertain whether they might be willing to fund research proposals that emerge from such an event.

**Responsibilities and timescale**

Initial six months: UKPSF and Working Group members to have informal discussions with people who have been involved with different types of event.

Within first year: UKPSF to have discussions with funders.

Within two years: Organise and host event.

## Appendix 1: Mapping the technical and commercial capabilities for translation – Related initiatives and survey contacts

- The National Farmers' Union (NFU) has done some scoping work during the past year on scientific capability. This focussed mostly on institutes and was probably not comprehensive across all of plant sciences. Helen Ferrier supervised an intern who carried out the work, and would be the best contact.
- The National Horticultural Forum produced [A review of the provision of UK horticultural R&D](#) in 2008, which included a survey of UK facilities.
- Academics and institutes.
- Syngenta, Bayer and Unilever.
- SMEs.
- BBSRC.
- [Scotch Whisky Association](#).
- National Association of Brewers and Millers ([NABIM](#)).
- [Camden BRI](#).
- KTN: should have links with the relevant capabilities in engineering, ICT and sensor technologies.
- Scottish Government Rural & Environment Science & Analytical Services (RESAS).
- Levy boards e.g. Home Grown Cereals Authority (HGCA), HDC.

## Appendix 2: Mapping the technical and commercial capabilities for translation – Known services and contact persons

Organisation	The service	Web link	Contact person
<b>Diagnostic &amp; laboratory services</b>			
Fera	Plant Clinic	<a href="http://fera.co.uk/plantClinic/index.cfm">http://fera.co.uk/plantClinic/index.cfm</a>	Rick Mumford
Stockbridge Technology Centre (STC)	Plant Clinic	<a href="http://www.stockbridgetechnology.co.uk/">http://www.stockbridgetechnology.co.uk/</a>	Martin MacPherson
NIAB	Plant Disease Clinic & variety testing	<a href="http://www.niab.com/pages/id/4/Laboratory_Services">http://www.niab.com/pages/id/4/Laboratory_Services</a>	David Lee
Scotland's Rural College (SRUC)	Crop Clinic	<a href="http://www.sruc.ac.uk/">http://www.sruc.ac.uk/</a>	Fiona Burnett
University of East Anglia (UEA)	Fermentation Laboratory		
Mylnefield Research Services Ltd	Diagnostic services	<a href="http://www.mrsLtd.com/pathoger.asp">http://www.mrsLtd.com/pathoger.asp</a>	Jonathan Snape
Biorenewables Development Centre (BDC), York	Analytical services Pre-processing	<a href="http://www.biorenewables.org/service/analytical/">http://www.biorenewables.org/service/analytical/</a> <a href="http://www.biorenewables.org/service/pre-processing/">http://www.biorenewables.org/service/pre-processing/</a>	
<b>Crop storage</b>			
Sutton Bridge Crop Storage Research	Post-harvest applied research facility for agricultural storage	<a href="http://www.potato.org.uk/crop-storage/about-sutton-bridge-csr">http://www.potato.org.uk/crop-storage/about-sutton-bridge-csr</a>	Adrian Cunnington
John Innes Centre	Germplasm Resource Unit (GRU) National Capability facility for germplasm storage	<a href="https://www.jic.ac.uk/research/germplasm-resources-unit/">https://www.jic.ac.uk/research/germplasm-resources-unit/</a>	Mike Ambrose
<b>Crop trials &amp; pesticide efficacy</b>			
Stockbridge Technology Centre (STC)	Pesticide efficacy & variety trials	<a href="http://www.stockbridgetechnology.co.uk/">http://www.stockbridgetechnology.co.uk/</a>	Julian Davies
Food and Environment Research Agency (Fera)	Pesticide efficacy testing	<a href="http://fera.co.uk/agriTech/pestsDiseases/invertebrateNovelControl.cfm">http://fera.co.uk/agriTech/pestsDiseases/invertebrateNovelControl.cfm</a>	Rick Mumford
East Malling Research (EMR)	Crop protection trials	<a href="http://www.emr.ac.uk/commercial-services/crop-protection-trials/">http://www.emr.ac.uk/commercial-services/crop-protection-trials/</a>	Angela Berrie
NIAB	Contract trials	<a href="http://www.niab.com/pages/id/267/Contract_Trials">http://www.niab.com/pages/id/267/Contract_Trials</a> <a href="http://www.niab.com/pages/id/9/Trials_and_Evaluation">http://www.niab.com/pages/id/9/Trials_and_Evaluation</a>	Clare Leaman
Processors and Growers Research Organisation (PGRO)	Pea and bean trials	<a href="http://www.pgro.org/index.php/contract-services-overview">http://www.pgro.org/index.php/contract-services-overview</a>	Stephen Belcher
ADAS	<b>Environmental Impact Assessments</b>	<a href="http://www.adas.co.uk/Home/EnergyEnvironment/EnvironmentalImpactAssessmentEIA/tabid/362/Default.aspx">http://www.adas.co.uk/Home/EnergyEnvironment/EnvironmentalImpactAssessmentEIA/tabid/362/Default.aspx</a>	Robert Edwards
Rothamsted Research	Farm/field trials North Wyke Farm Platform	<a href="http://www.rothamsted.ac.uk/tools">http://www.rothamsted.ac.uk/tools</a>	
Mylnefield Research Services Ltd	Diagnostic services and crop trials	<a href="http://www.mrsLtd.com/">http://www.mrsLtd.com/</a> <a href="http://www.mrsLtd.com/pathoger.asp">http://www.mrsLtd.com/pathoger.asp</a>	Jonathan Snape
<b>Plant breeding services</b>			
East Malling Research	Soft fruit breeding	<a href="http://www.emr.ac.uk/commercial-services/plant-breeding/">http://www.emr.ac.uk/commercial-services/plant-breeding/</a>	Roger Carline
NIAB	Plant breeders rights services	<a href="http://www.niab.com/pages/id/20/Plant_Breeders_Rights">http://www.niab.com/pages/id/20/Plant_Breeders_Rights</a>	Jennifer Wyatt
	Seed Certification	<a href="http://www.niab.com/pages/id/21/Seed_Certification">http://www.niab.com/pages/id/21/Seed_Certification</a>	
Mylnefield Research Services Ltd	Plant breeding License varieties	<a href="http://www.mrsLtd.com/">http://www.mrsLtd.com/</a>	Nigel Kerby
<b>Agronomy and advisory services</b>			
SAC Agronomy	Agronomy	<a href="http://www.sruc.ac.uk/info/120311/agronomy_services">http://www.sruc.ac.uk/info/120311/agronomy_services</a>	
TAG Consulting	Agronomy	<a href="http://www.niab.com/pages/id/208/TAG_Consulting">http://www.niab.com/pages/id/208/TAG_Consulting</a>	
Agrii	Agronomy	<a href="http://www.agrii.co.uk/products-services/">http://www.agrii.co.uk/products-services/</a>	
Frontier	Agronomy	<a href="http://www.frontierag.co.uk/products-and-services.aspx">http://www.frontierag.co.uk/products-and-services.aspx</a>	
Hutchinsons	Agronomy	<a href="http://www.hlhLtd.co.uk/agronomy_services.html">http://www.hlhLtd.co.uk/agronomy_services.html</a>	
Agrovista	Agronomy	<a href="http://www.agrovista.co.uk/">http://www.agrovista.co.uk/</a>	

ProCam	Agronomy	<a href="http://www.procam.co.uk/">http://www.procam.co.uk/</a>	
CABI	Agronomy	<a href="http://www.cabi.org/projects/search">http://www.cabi.org/projects/search</a>	Phillip Swarbrick
Association of Independent Crop Consultants (AICC)	Agronomy	<a href="http://www.aicc.org.uk/members">http://www.aicc.org.uk/members</a>	
National Non-Food Crops Centre (NNFCC)	Bioeconomy consultancy services	<a href="http://www.nnfcc.co.uk/">http://www.nnfcc.co.uk/</a>	
Innovation for Agriculture – the English Agricultural Societies	Knowledge Exchange		<a href="mailto:info@innovationforagriculture.org.uk">info@innovationforagriculture.org.uk</a>
<b>Biotechnology &amp; breeding research services</b>			
NIAB	Wheat transformation	<a href="http://www.niab.com/transgenic">http://www.niab.com/transgenic</a>	Emma Wallington
Institute of Biological, Environmental and Rural Sciences (IBERS)	National Plant Phenomics Centre	<a href="http://www.plant-phenomics.ac.uk/en/">http://www.plant-phenomics.ac.uk/en/</a>	John Doonan
John Innes Centre	Tilling in Brassicas and wheat	<a href="http://revgenuk.jic.ac.uk/TILLING.htm">http://revgenuk.jic.ac.uk/TILLING.htm</a>	Fran Robson and Saleha Bakht
John Innes Centre	Wheat, barley and Brassica transformation	<a href="http://www.bract.org/transformation-services.html">http://www.bract.org/transformation-services.html</a>	Wendy Harwood
James Hutton Institute	Potato and barley transformation  Imaging technologies  Genome technology	<a href="http://www.hutton.ac.uk/research/facilities/functional-genomics">http://www.hutton.ac.uk/research/facilities/functional-genomics</a>  <a href="http://www.hutton.ac.uk/research/groups/cell-and-molecular-sciences/imtech">http://www.hutton.ac.uk/research/groups/cell-and-molecular-sciences/imtech</a>  <a href="http://www.hutton.ac.uk/research/facilities/genome-technology">http://www.hutton.ac.uk/research/facilities/genome-technology</a>	Jennifer Stephens  Alison Roberts  Pete Hedley
Biorenewables Development Centre (BDC), York	Fast-track breeding	<a href="http://www.biorenewables.org/service/fast-track-breeding/">http://www.biorenewables.org/service/fast-track-breeding/</a>	
Rothamsted Research	Bioimaging, Wheat transformation, Metabolomics, Analytical services	<a href="http://www.rothamsted.ac.uk/tools">http://www.rothamsted.ac.uk/tools</a>	
Centre for Plant Integrative Biology (CPIB), University of Nottingham	Imaging Phenomics		
iDna Genetics Ltd	Genotyping GMO detection Contract research Mutation detection	<a href="http://www.idnagenetics.com/">http://www.idnagenetics.com/</a>	<a href="mailto:mail@idnagenetics.com">mail@idnagenetics.com</a>
<b>Pharmaceutical services</b>			
John Innes Centre	Molfarma – Transient expression in plants	<a href="https://www.jic.ac.uk/scientists/george-lomonossoff/">https://www.jic.ac.uk/scientists/george-lomonossoff/</a>	George Lomonossoff
<b>Technology transfer companies</b>			
Mynefield Research Services Ltd		<a href="http://www.mrsLtd.com/">http://www.mrsLtd.com/</a>	Nigel Kerby
PBL	Management of patent applications & payment of costs; Funding for early stage technical developments; CASE / Follow-on Fund partner	<a href="http://www.pbltechnology.com/">http://www.pbltechnology.com/</a>	Jan Chojecki
Interface		<a href="http://www.interface-online.org.uk/">http://www.interface-online.org.uk/</a>	

### Appendix 3: Pathfinder service – Relevant initiatives/stakeholders and contact persons

- *The National Centre for Universities and Businesses (NCUB) Food Economy Taskforce*: The Taskforce has just completed a consultation on translation in the agri-food sector. It is due to release its findings by the end of 2014, of which one of its recommendations might be to set up a similar type of service to *Pathfinder*. There could be opportunities for UKPSF to work with NCUB to make the case for funding to take the project forward itself, or to pitch the idea for others to take on.
- Funding agencies: BBSRC, Innovate UK (Dean Cook), NERC, Defra, DfID.
- Levy boards: HDC (Steve Tones), Processors & Growers Research Organisation (PGRO), Home Grown Cereals Authority (HGCA) (Tim Isaac), Potato Council.
- KTN (Chris Warkup).
- University and institute TTOs: Cambridge Enterprise (Paul Thomas), Mylnefield Research Services (Nigel Kerby), University of St Andrews Research and Business Development (Kelly Maher), University of Dundee Research and Innovation Services (Diane Taylor), Sheffield Science Gateway/P3 (Jurriaan Ton & Duncan Cameron).
- Technology transfer companies: PBL (Jan Chojecki), [Interface](#).
- Academic and institute researchers.
- BBSRC Innovators of the Year and other scientists who have been successful in setting up public-private partnerships: could provide useful information about how they found the right partner.
- GARNet.
- Multinational companies: Syngenta, Bayer and Unilever are UKPSF members and would be a good starting point.
- SMEs and start-ups: Cathie Martin and Jonathan Jones from Norfolk Plant Sciences. Belinda Clarke can also provide some contacts for specific interactions.
- Big food retailers: Co-op, M&S, Sainsbury's, Morrisons, Tesco, Waitrose. (NB Sainsbury's has funded some Agri-tech projects and is about to do so again. Contacts: Judith Batchelar or Alec Kyrakides.)
- Big producers: e.g. Birdseye.
- Sector Skills Councils: LANTRA and Cogent.
- Agricultural Development and Advisory Service (ADAS).
- Scotch Whisky Association: Thomas Howard can put UKPSF in contact with James Broslin.
- Royal Agricultural Society of England (RASE).
- *Horticulture Innovation Partnership (HIP)*: Chaired by Mary Bosely at Syngenta.
- Organic Growers Alliance (Wendy Seel).
- RAGT Seeds/British Society of Plant Breeders (BSPB): Richard Summers, Head of Cereal Breeding and Research (RAGT Seeds) and Chairman of BSPB.

#### **Appendix 4: Pathfinder service – Possible survey questions for Pathfinder feasibility study**

- Do you think it is important to have easy access to information on opportunities to translate plant science research into application?
- If yes, why? (Expect them to say opportunities to access funding and to be able to demonstrate impact (for REF). May get something about duty to contribute to UK or global human or environmental wellbeing.)
- How well-informed would you say you and colleagues at your institution are about the potential funding opportunities for plant sciences, including academic research, academic-industry partnerships, translation, proof of concept, proof of market, early stage industrial feasibility studies etc?
- Where do you get most of your information about funding opportunities?
- How many can you name (expect them to say BBSRC and Innovate UK) and what are they (expect they know SMART, Agri-Tech Catalyst, SAF-IP competitions, EU (Horizon 2020) but also Industrial Partnership Awards (IPAs), stand-alone LINK etc.)?
- How well connected do you feel to the innovation needs of industrial users of innovations in plant sciences? (Extremely, very, fairly, not enough, hardly at all.)
- What possible mechanism could improve your awareness of these needs?
- Would you be prepared to pay for it? How much?
- How easily can you find new partnerships in industry or academia to help meet your needs or translate your research (as applicable).
- How would you go about finding the right partner?
- Do you see a need for an independent brokerage/signposting service to new partnerships and funding opportunities for translating plant science?
- If so, which types of service would you find useful?
- Who do you think should pay for them? Would you be prepared to pay? How much?



## **Appendix 5: Convening a plant science meets social sciences forum – Relevant initiatives, stakeholders and contact persons**

- Defra: employs good social scientists with experience in agricultural areas and economics. Gemma Harper, Defra's Chief Social Science Researcher was involved in a social sciences meets plant health workshop in 2013.
- The Agricultural Industries Confederation (AIC), Association of Independent Crop Consultants (AICC), HGCA and Landbridge hosted a workshop on 23<sup>rd</sup> September 2014, titled Building on a solid foundation: Improving knowledge exchange in arable farming.
- Centre for Rural Economy, University of Newcastle: does social science work around messaging to farmers. Jeremy Phillipson at the Rural Economy and Land Use Programme (Relu) has expressed an interest in participating in a UKPSF workshop on this topic.
- Innogen (Edinburgh): focusses on understanding the drivers of regulatory systems. Contact: Ann Bruce.
- The James Hutton Institute: covers a wider remit than many of the other research organisations, including social sciences. Contact: Deb Roberts.
- Stockholm Environment Institute (SEI) in York. Contact: Annemarieke deBruin.
- Julie Barnett, University of Bath.
- Michael Winter, University of Exeter.
- University of Reading, Economic and Social Sciences Research Division in the School of Agriculture, Policy and Development. Contact: Alison Bailey.
- The Scottish Government: has done some good work to identify the drivers of farmer behaviour.
- SRUC: has recently done some social science work in relation to farmers.
- NFU. Contact: Andrea Graham.
- Some agri-chemical companies (e.g. Bayer, BASF) have carried out good segmentation analyses of their customers and which forms of messaging each one responds to best (e.g. twitter, personal visits). However, they might be reluctant to share this information.

## **Appendix 6: Event to forge multidisciplinary collaborations – Relevant initiatives/stakeholders and contact persons**

- Personal contacts including UKPSF members who have experience of events designed to facilitate multidisciplinary collaborations.
- Association of Applied Biologists (AAB).
- Syngenta.
- KTN.
- Lancaster Environment Centre.

### Potential funders:

- Research Councils: e.g. BBSRC, EPSRC, NERC, ESRC.
- Innovate UK.
- KTN.
- Industry stakeholders: e.g. Syngenta, Bayer, Unilever.
- Retailers.
- Gatsby.
- Leverhulme.
- DfID.
- Big companies other than the usual suspects: e.g. BT, Google and Microsoft might be interested in areas of plant science such as big data, sensing and disease diagnostics. Getting these companies on board would be a unique selling point as well as potentially attracting new sources of investment in plant science.