Ipsos MORI
Social Research Institute

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Public Dialogue to inform Science Strategy

Report prepared for the John Innes Centre

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Contents

Executive Summary

1 Introduction

1.1 Background

This is a report of findings from a public dialogue carried out by Ipsos MORI and commissioned by the John Innes Centre (JIC) and the Biotechnology and Biological Sciences Research Council (BBSRC) with co-funding from Sciencewise[1] in December 2014.

1.2 Objectives

The primary objectives were:

- To inform the development of the John Innes Centre's proposed Science Strategy for 2017-22.
- To provide members of the public with an opportunity to engage in determining the social, economic and environmental challenges which the JIC Science Strategy 2017-2022 should aim to address.
- To inform the development of a new governance framework and initiatives to support and encourage public dialogue in JIC in future.

To this end an online and face-to-face dialogue process was developed which was conducted in line with Sciencewise guiding principles.

1.3 Project design

The dialogue comprised three main elements.

1. A day-and-a-half-long **face-to-face dialogue workshop** in Norwich (17 participants) and one in Birmingham (15 participants) in March and April 2015. Both these workshops were reconvened so that participants came to sessions on Friday night then returned on Saturday for a day-long session.
2. An **online community** of 446 participants was recruited and ran from May – July 2015.
3. A **desk research** of previously-conducted dialogue studies which had a relationship with JIC science, or were concerned with issues with some synergies to JIC research.

The broad question of the dialogue, to which participants were introduced, was: “How should JIC meet the challenges of the future when it comes to food and medicine?”

In developing the dialogue approach and stimulus Ipsos MORI consulted the leads of the Independent Strategic Programmes (ISPs) at JIC by interview, conducted the desk research on the learnings from previous dialogues and surveys, and ran a Researcher Day comprising three group discussions at the John Innes Centre where researchers contributed their thoughts as to the issues they wanted to raise with the public.

[1] Sciencewise is funded by the Department for Business, Innovation and Skills (BIS). Sciencewise aims to improve policy making involving science and emerging technology across Government by increasing the effectiveness with which public dialogue is used, and encouraging its wider use where appropriate. www.sciencewise-erc.org.uk

An independent advisory group was convened, managed by Ipsos MORI, to comment on and contribute to discussion of materials and approaches used within the dialogue, and to provide a sounding board for the final report, representing a breadth of sectors and interests.

2 Views of global challenges in food and medicine

2.1 What are the biggest challenges facing the world?

Participants saw the greatest global health challenges as antibiotic resistance and readiness for global epidemics such as Ebola.

In terms of food, they wanted to ensure that there is enough food for everyone, especially in the developing world, and in the face of climate change. They see the challenges here as agricultural (ensure that yields are high and climate change does not lead to losses); but also as political (ensure fair distribution) and cultural (ensure demand-side and commercial interests are managed).

When it comes to addressing the issues, a few participants would prioritise UK taxpayers' money going towards issues which affect people in the UK, such as educating people on healthy diets, increasing the nourishment levels of food, or reducing food waste.

2.2 How can science help?

Participants' understanding of bioscience was very limited at the start of the project, but they were broadly happy to offer general strategic advice to JIC based on their understanding of the challenges facing the world and how they thought basic bioscience could best help.

They assumed scientists would be working on the global challenges as mentioned above and considered that bioscientists had a public duty to work on the biggest global challenges.

There is a perception that all the problems facing the world are amenable to both scientific and non-scientific solutions. Medical challenges, perhaps, are seen as more immediately amenable to scientific approaches, whereas the food system was seen as very complex and needing effort from a number of directions, political and social as well as technical.

While participants want JIC to focus on those issues they see as more amenable to science, they also want the John Innes Centre to demonstrate that it is taking account of the context in which its work operates. In particular, participants wanted JIC to consider the ramifications and consequences of bioscience innovation on the broadest levels – cultural, political and ethical as well as scientific.

Implications for JIC: Participants expect that JIC scientists will have expert knowledge on the biggest global challenges and will be working on the biggest challenges themselves. They also want to see JIC demonstrating that it sets its science in the context of the social and cultural challenges facing the world as well as the technical ones.

3 Principles: the public priorities for JIC decision making

3.1 Using case studies to derive principles

In the face-to-face dialogue we showed eight case studies from across the strategic programmes run by JIC. In analysis, we extracted principles which had emerged from these face-to-face discussions and

asked participants in the subsequent online dialogues to comment upon them. Across the whole study, there were six areas on which the public would like to see JIC focus when taking strategic decisions, see overleaf.

3.2 The six principles

	Strategic priorities (found in Principles, Chapter 3)	…and implications for JIC (found in Conclusions chapter 6)
1	Preserve the right to do basic, curiosity-driven research which may not necessarily lead to immediate tangible benefits.	Continue to do basic research, and try to explain potential application where possible. Consider the possible costs and benefits to society of such applications and communicate long-term benefits to the public.
2	Prioritise research with the greatest scope to tackle the most serious, high impact, wide-ranging problems of the world, in order to create research of best value to society and the best use of taxpayer-funded grants.	When carrying out research, consider what kinds of application will have impact on the highest number of people or which diseases are most severe in their effects. Conduct research into new and improved ways of growing crops and thereby directly impact the lives of billions of people worldwide. Be involved with multi-faceted research projects which address global problems in multiple ways.
3	Demonstrate that JIC has investigated who stands to gain from any benefits of the research, and the context of the research.	Participants wanted JIC to demonstrate that it has made research choices which are transparent and fair, and that it has counterbalanced any vested interest. They feel this is necessary so that JIC can be accountable to the public and accountable for consequences that might come from its research decisions. Conduct due diligence in considering vested interests and go through the process of considering end beneficiaries throughout each piece of work.
4	Use public money to address areas of research commercial interests won't (for example if there is a low probability that research will lead to the development of a commercially available product).	Consider how projects benefit society in different ways; for example considering the interests of small scale farmers as well as multinational businesses, helping farming in the UK and finding cures for critical illnesses affecting UK citizens; consider prioritising research which is outside the commercial sphere.
5	Maintain flexibility by recruiting the 'best and brightest' to ensure diverse, creative, high quality research.	Keep using broad recruitment criteria and pick researchers who are bright and interested and give them freedom to research areas that excite them. Incentivise good researchers to stay on at JIC and make it worth their while to remain at the institute rather than moving elsewhere, diminishing the JIC's expertise

		and the quality of its work.
6	Plan in some flexibility by retaining some resources for 'the unforeseen'.	Plan now to tackle the unknown global challenges of the future – for example, keep some financial resources in reserve and encourage researchers to be adaptable to new projects.

3.3 Views of genetic modification

The dialogue did not focus upon arguments around the benefits and risks of genetic modification of crops in general. However where GM techniques were used participants were given background information and a brief discussion was held within the face-to-face dialogue. Participants online also mentioned GM spontaneously.

Participants in person and online were not strongly opposed to the idea of genetic modification but there was uncertainty and questioning. The biggest question was, "if scientists are confident about these techniques, why are there still social and political debates around the use of GM?"

They wanted to see John Innes Centre scientists engage with the more complex social reality of people's beliefs and uncertainties, and think about the implications of GM products in the world more widely. This might involve, for example, convening discussions between scientists and non-scientists.

4 Response to specific case studies

The public was introduced to various examples of JIC's science, in order to spark debate and see principles in action. Eight case studies were used to illustrate different ways of conducting fundamental research and different areas in which JIC works. These came from across the four Institute Strategic Programmes.

At the analysis stage, two dimensions of this valuation emerged as important:: *potential impact* and *likelihood to improve our understanding of the world*

Potential impact: Participants tended to think about research in terms of its application, wherever they could. So, the case studies which seemed to convey an immediate or past application were valued highly in this dimension. Participants tended to discuss the level of *certainty* of the impact, but also their perception of how *valuable* that impact would be in the world. Therefore projects looking at areas of research likely to benefit many vulnerable people, such as Rust Resistant Wheat, were placed higher on this dimension than Purple Tomatoes.

Improving our understanding of the world: This was a more subtle area of value. When first reading the case study, participants often focused on the practical detail of the project, rather than the conceptual science. Hence, the projects they found easiest to understand were often seen as most intriguing. They liked Vaccines from Leaves as the principle was easy to grasp, while the Anti-Cancer Drug from Yeast case study described a more complex process which some participants found hard to follow. The Leaf Shape project was seen as elegantly simple, and one of the most fundamental areas of curiosity-driven science so potentially the most intriguing.

5 Public Engagement

5.1 What is public engagement?

Public engagement has various facets; three important areas are communication, consultation and participation. This chapter describes the ways in which the John Innes Centre could conduct engagement in different areas, and learning on the channels which can best be used.

5.2 Communication

Whilst some were aware of the John Innes Centre (particularly in Norwich), most participants were not generally familiar with JIC's research, remit, or the world of basic bioscience in general. However, given the opportunity, they were interested in finding out about the work JIC does and how this can be leveraged to meet global challenges.

Participants lacked detailed knowledge of how scientific research is decided upon, funded and carried out. Ultimately, participants supported basic bioscience and its publicly funded status. However, most took some time to understand its value and always tended to link it to its downstream impacts when trying to assess its benefits.

In general, all participants expressed a great deal of trust in scientists and their views. They also valued the perceived independence of scientists (although they lack trust in private companies which do science). The John Innes Centre scientists were seen as good role models for the Institute; talking with them helped participants understand the value of basic bioscience. They felt that the questioning spirit of fundamental science was embodied by the scientists themselves. Scientists engaging with public communication was felt to be a good thing and to lead to greater potential for public engagement.

Participants were particularly interested in hearing about research related to health, through a variety of channels but particularly online. They also saw a role for the JIC in communicating the importance of healthy lifestyles, for example, by highlighting the science underpinning it.

5.3 Consultation

The public are interested in JIC's work; they like having the opportunity to learn about JIC's research, and feel there is a role for the public in advising on further communications. They believe public dialogues such as this can help to create informed public and that such groups would be well placed to advise in this way. However the public don't think they personally have the necessary knowledge to be able to advise on research strategy. Such decisions are best left to the experts, they say; however they do want to know that JIC is taking a wide range of different experts' advice; for example convening ethical panels to discuss wide ranging implications of their work.

5.4 Participation

We received positive feedback from many of the members of the public who took part in our online community. In particular, community members enjoyed the opportunity to engage directly as part of 'Ask a scientist'. A key learning here is that participants enjoyed observing the way scientists think and talk, and did not need high level or technical answers to the majority of their questions. Some community members would be happy to continue with the engagement and act as a sounding board in future.

6 Conclusions and next steps

6.1 Which social, economic and environmental challenges do the public want JIC to address?

- The multi-faceted challenges facing the world such as climate change, management of epidemics, antibiotic resistance, solutions to deal with emerging oil and water shortage.

- JIC scientists are best placed to address this through the technical innovations which can be produced downstream, based upon the knowledge produced by fundamental bioscience.

- However the public also want JIC to take around of political, cultural and societal contexts when considering what research to do.

6.2 Which public priorities should influence JIC's science strategy?

- The first two principles (do curiosity driven research / address global problems) are to some extent mutually contradictory; this reflects the fact that the public know there is a fine judgement to be made and trust the scientists to make that judgement.

- However they also wanted reassurance that JIC was taking advice from different stakeholders and including a range of expert voices in decision making (principle 3).

6.3 How can this dialogue inform the development of a governance framework for public engagement in future?

The dialogue process was in part devised to test whether this mechanism was the best way to engage the public. The findings suggest:

- The public are particularly engaged by meeting scientists and spending a significant length of time in discussion; the dialogue approach in itself is engaging.

- Materials used managed to balance broad scope with detail. They can act as a useful benchmark for materials development in future.

- The scope of the dialogue was fairly broad; while overarching principles for strategy have been identified, the public may feel able to give more specific direction on a narrower topic, such as one workstream or the work of one ISP.

- Online, there is a real public interest in having scientists available to enter into discussion regularly, or over a set time frame, and able to reach larger numbers of people.

- There is also interest in regular contact online and scope for the community, or something like it, to be run again in future.

JIC should design its public engagement strategy to include different levels and types of engagement, for example:

- Communication: scope to provide information which enables members of the public to inform themselves; this may lead to greater confidence from the public to join other engagement activities

- Consultation: appetite to engage on strategy, if not on the detail of research decisions. JIC could also demonstrate how it is engaging with other experts, to reassure the public. Online and face-to-face could both work well as consultation channels.

- Participation: appetite for real two-way discussions with scientists, hearing how scientists think about problem-solving. There is potential for further dialogue on some more specific questions from an ethical dimension, such as the best ways to address global hunger, or the role and value of nutraceutical foods.

1 Introduction

This chapter sets out the objectives and project design and gives guidance on how to read this report.

1.1 Background

The John Innes Centre has four Institute Strategic Programmes (ISPs) into which research is organised. Halfway through the cycle of programmes, the Institute is now looking to the next research cycle and those areas that the public would like scientists to consider as part of that planning. The Institute is also considering how best to engage the public in discussions on strategy going forward. Both JIC and its main funding body, BBSRC, have made a commitment to engage the public and other stakeholders in upstream dialogue on strategy, so that a wide range of voices can be heard and different priorities taken into account. JIC and BBSRC, with co-funding from Sciencewise[2], therefore commissioned Ipsos MORI in December 2014 to carry out a public dialogue.

The dialogue process was designed in accordance with Sciencewise guiding principles on dialogue development.

As this report will demonstrate, the exercise showed that talking to the public is useful, to give guidance on what to take into account when making decisions about what to research on how best to communicate and engage with the public about the work that is being done. The process has left a legacy in terms of engaging internal scientists and stakeholders in public engagement processes including online and further face-to-face approaches.

1.2 Objectives

The **primary objectives** of the process were:

1. To inform the development of the John Innes Centre's proposed Science Strategy for 2017-22
2. To provide members of the public with an opportunity to engage in determining the social, economic and environmental challenges which the JIC Science Strategy 2017-2022 should be aiming to address.
3. To inform the development of a new governance framework and initiatives to support and encourage public dialogue in the JIC in future.

Secondary objectives were:

a) To engage in meaningful conversations with public groups about the research proposed by JIC in the next funding cycle

b) To engage a range of views and values

c) To provide advice which is relevant to JIC

d) To provide JIC with an engagement mechanism and a means of reflecting on public opinion in submission to the next funding cycle and beyond.

e) To embed and encourage a culture of public engagement at JIC

[2] Sciencewise is funded by the Department for Business, Innovation and Skills (BIS). Sciencewise aims to improve policy making involving science and emerging technology across Government by increasing the effectiveness with which public dialogue is used, and encouraging its wider use where appropriate. www.sciencewise-erc.org.uk

f) To demonstrate JIC's commitment to open and transparent strategic planning

g) To explore models for further use of public dialogue in JIC's strategic planning activities

1.3 Project design

The dialogue comprised three main elements.

1. A day-and-a-half-long **face-to-face dialogue workshop** in Norwich (17 participants) and one in Birmingham (15 participants) in March and April 2015. Both these workshops were reconvened so that participants came to sessions on Friday night then returned on Saturday for a day-long session.
2. An **online community** of 446 participants was recruited and ran from May – July 2015.
3. A **desk research** of previously-conducted dialogue studies which had a relationship with JIC science, or were concerned with issues with some synergies to JIC research

1.3.1 Desk research and engaging internal stakeholders

In advance of the fieldwork, Ipsos MORI carried out telephone interviews with ISP leads and other key stakeholders at JIC to fully understand their aims for the dialogue and to help provide early ideas for the structure and materials for the dialogue events.

Three group sessions were held with JIC researchers; the Researcher Days; to enable the wider JIC research community to feed into the dialogue.

Desk research was carried out to provide background as to what public dialogues have already shown when covering similar topics, as well as broader contextual data about public attitudes including quantitative work. Some sources for this research were suggested by JIC/ BBSRC, others based on Ipsos MORI's experience in carrying out science dialogue, others generated through search terms agreed with JIC. The desk research summarised the learnings from these sources, and the implications for the proposed areas of discussion.

The desk research is included in APPENDIX A.

1.3.2 Framing the dialogue materials and engaging external stakeholders

Ipsos MORI then created a draft dialogue plan and stimulus materials based on these scoping exercises. The stimulus materials comprised an introduction to the John Innes Centre and its work; a presentation outlining the key challenges facing the world in food and medicine; and case studies showcasing the work of the JIC and its four ISPs. The case studies included a brief summary of the research project, alongside the key implications. These case studies were used as a tool to draw out principles that are important to the public.

An advisory group was recruited to feed into the development of materials, particularly the nature of the information provided, and to provide a sounding board for the final report. In contrast to other dialogues, the group was managed by Ipsos MORI as the delivery contractor rather than by the end client.

The group was recruited to provide a breadth of interests, including members from academia, environmental NGOs, the NHS and industry. A face-to-face advisory group meeting was held after the first drafting of materials, and members were sent materials in advice. This session enabled advisory group members to comment on the materials and suggest and provide rationale for changes. Two members of the group were unable to attend in person on the day and therefore discussed their views on the materials by telephone with the project director.

The advisory group members were:

Name	Organisation
Barbara Gallani	Food and Drink Federation
David Gibbons	Royal Society for the Protection of Birds
Jason Chilvers	University of East Anglia
Tom MacMillan	Soil Association
Shawn McGuire	University of East Anglia
Jo Bowman	Limagrain
Ali Harrison	East Cheshire NHS Trust
Helen Ferrier*	National Farmers Union
Darryl Cox*	Bumblebee Conservation Trust

Feedback from the advisory group provided several contrasting perspectives on key issues for the research and played a valuable part in the design of study materials, which were refined and finalised by Ipsos MORI in collaboration with the JIC, BBSRC and Sciencewise.

1.3.3 Face-to-face dialogue

Two face-to-face dialogue events were held, one at the John Innes Centre in Norwich on 26/ 27 March 2015 and one in Birmingham on 10/11 April 2015. At both events, participants attended for 3 ½ hours on the Friday evening then all day (6 hours) on the Saturday. 17 participants attended in Norwich and 15 in Birmingham.

Face-to-face dialogue participants were recruited on the street by Ipsos MORI recruiters. Recruiters used a screener which ensured a variety of demographic groups were represented, and that those with a close connection to the subject matter or the JIC were excluded, as well as those declaring strong views for or against the subject matter.

A qualitative, deliberative approach was considered the best way to allow participants to explore this topic, from both a personal and a citizen perspective. Qualitative methods allow participants the freedom to express the issues that are salient to them and develop their views in the light of discussion and debate. A reconvened approach allowed participants enough time to digest the complex information that they received on the first evening, and reflect on the topic outside of the dialogue environment.

JIC scientists attended each of the events. They described their work and answered participants' questions.

The dialogue events were guided by a flexible discussion guide. This summarised the activities for the moderators and included key questions and probes to pose to participants. This ensured similar information relevant to the research objectives was elicited at both workshops whilst allowing fluidity so that lines of enquiry could be pursued as they developed. The activities undertaken are summarised in 1.4 below.

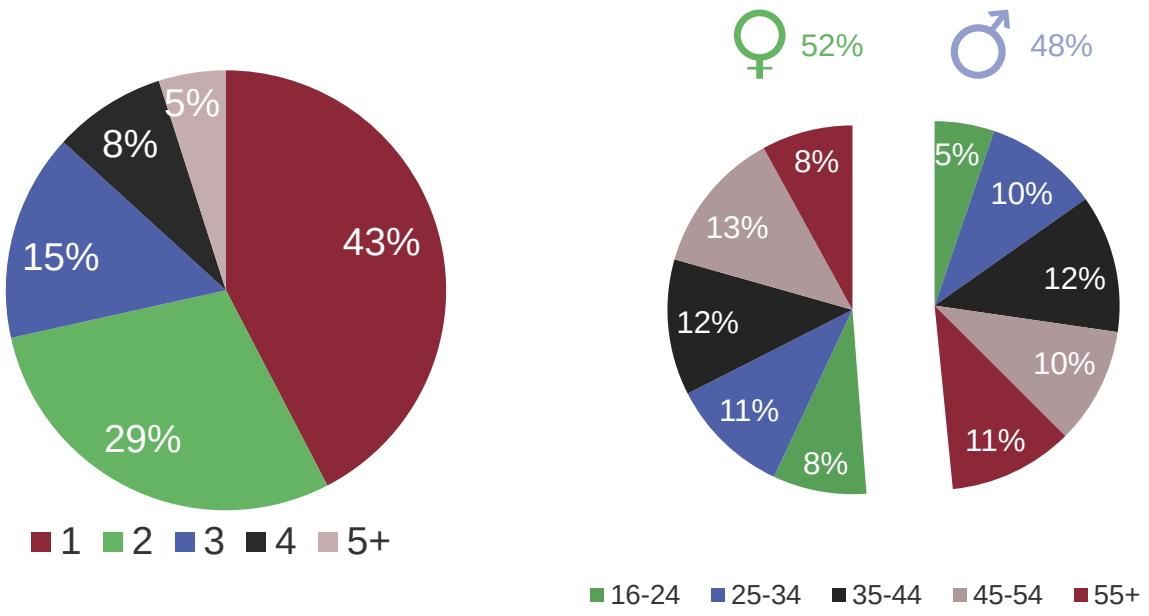
1.3.4 Online fieldwork

The online community was primarily recruited through the Ipsos MORI online panel. Panelists were sent an invitation to complete a short online survey asking if they were interested in joining the community. Those who wanted to take part were asked some demographic questions before they signed up. Using the

online panel enabled us to set quotas on demographic variables such as age and gender therefore the community was representative on those variables with respect to the panel – as an online panel it was naturally not entirely representative of the population in terms of age given that elderly people are much more likely to be offline.

As a proxy for socio-economic group, we asked prospective members to provide their education level, however no quotas were set on this. In the event, those educated to degree level and above were disproportionately represented, and the community included comparatively fewer with no formal qualifications. This is in line with our experience of other communities, and might also be due to the subject matter; the community was described as being an opportunity to discuss views about science.

Figure 1.1 Community membership. The chart on the left shows the % of members who took part in different numbers of activities; the chart on the right shows the breakdown by age and gender.



Online community members took part in activities created by the Ipsos MORI team.

The online community allowed the research team to engage with the same group of 446 people over a period of 7 weeks, and also to target activities at particular groups, for example online focus groups were carried out with people who had expressed particular views in an earlier survey.

1.4 Summary of activities

The tables on the following two pages summarise the activities carried out in the whole dialogue, with participants in both the face-to-face workshops and the online community. The activities were all designed with the objectives in mind and to illustrate any differences in views between public and internal or external stakeholders.

SUMMARY OF FACE-TO-FACE ACTIVITIES	Information provision	Global challenges	Responses to JIC's work	Eliciting Principles	Ethics and governance
Participants choose from a selection of images and use it to help discuss how they feel when they think about science.		■			
Participants shared spontaneous views of what they think are the most important global challenges in food and health. Facilitators ran through of global challenges, and the discussion focused on which are the most important and the role of bioscience.		■			
Participants decided which issue they thought was the most important, then placed it on a scale to reflect the extent to which they think it can be solved by science.		■			
A JIC staff member gave a presentation on how they are funded and how it decides which research projects to pursue.	■				
The scientists present discussed their work and took questions from participants			■	■	
The groups discussed 8 case study examples of JIC's work in turn, including the perceived benefits and risks. They discussed how well they understood the area of work; what immediately appealed and felt intriguing and relevant; where they had further questions; and were asked to compare the case studies as a way of eliciting their perceptions of basic research and the lay perspectives by which they assessed and valued it.			■	■	
Participants were presented with a series of possible recruitment priorities and asked to rank them, discussing their reasoning.				■	■
Participants were shown examples of provocative perspectives, generated by Ipsos MORI, about the role and remit of basic bioscience in global challenges. They discussed how far JIC's work could/should take into account these views.					■
Participants were asked to develop principles for how JIC should decide research to do in the future, based on the previous exercises and discussions.				■	■

SUMMARY OF ONLINE ACTIVITIES	Information provision	Concerns and Global challenges	Responses to JIC's work	Principles	Ethics and governance
Members were first asked for their spontaneous reactions to what they think are the main challenges facing the world in food and health. They were then presented with a succession of screens asking which of a pair of principles should be more important for JIC to consider, and give their reasons. They then completed a short survey and put the principles in order.	■	■	■	■	
Members completed an attitudinal survey covering a variety of topics including: which areas of science they find most interesting and important to society, what challenges can be tackled by science, basic research and public money funding it, who the JIC should listen to in deciding to do research, how the public should be involved in their work, preferred communications channels, and demographic information.		■		■	■
Members were free to pose questions for JIC scientists, who then answered them each week. Members could ask follow up questions of the scientists, and also discuss the issues amongst themselves.	■	■	■	■	■
Online discussion groups were carried out to discuss i) how science can meet the challenges facing the world, ii) ethical questions about science iii) how science can improve human health.			■	■	■

1.5 Reading this report

Each chapter contains a summary of the key points upfront, which forms the executive summary at the start of the report.

The following notes may be helpful in interpreting qualitative data.

Qualitative research approaches (including public dialogue workshops) are used to shed light on why people hold particular views, rather than how many people hold those views. It is used to explore the contours of people's views, the diversity of views, the factors which shape or underlie them and the ideas and situations in which views can change.

The results are intended to be illustrative rather than statistically reliable. Given the qualitative nature of the data collected from the dialogue, this report aims to provide detailed and exploratory findings that give insight into the perceptions, thoughts and feelings of people, rather than statistical evidence from a representative sample.

It is not always possible in qualitative research to provide a precise or useful indication of the prevalence of a certain view, due to the relatively small number of participants generally involved (as compared with the larger respondent bases involved with quantitative studies). So, the views of proportions of the qualitative group should not be extrapolated to the population at large. Sometimes, ideas can be mentioned a number of times in a discussion, and yet hide the true drivers of thoughts or behaviours; or a minority view can, in analysis, turn out to express an important emergent view or trend. The value of qualitative work is to identify the issues which bear future investigation.

Therefore we use different analysis techniques to identify how important an idea is. This report states the strength of feeling about a particular point rather than the number of people who have expressed that thought. Having said this, is it sometimes useful to note which ideas were discussed most by participants, so we also favour phrases such as "a few" or "a limited number" to reflect views which were mentioned infrequently and "many" or "most" when views are more frequently expressed. Where views apply only to a subset of participants, e.g. participants in Norwich, we have highlighted this in the text, as this may indicate differences by rurality, for example. Any proportions used in our reporting (e.g. a 'couple' or 'handful' of participants), should always be considered indicative, rather than exact.

Verbatim comments have been included in this report to illustrate and highlight key points, i.e. those views either shared by a large number of participants or reflecting the strong views of a smaller subset. Where verbatim quotes are used, they have been anonymised and attributed by location, e.g. Norwich, or for the online community, reflecting the activity in which people took part, e.g. discussion group.

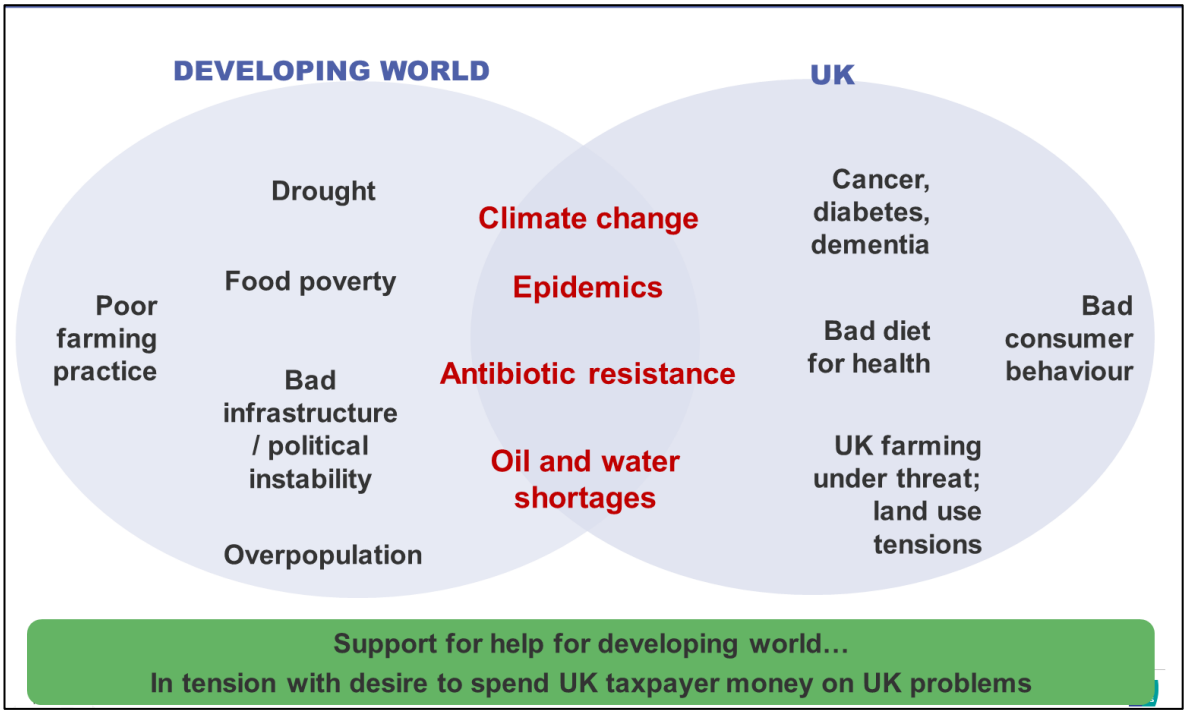
2 Views of global challenges in food and medicine

This chapter provides an overview of participants' starting point for discussions about JIC's research work. It explores what participants see as the major challenges facing the world today and what role they believe science has in addressing these.

2.1 What are the biggest challenges facing the world?

Participants were asked to discuss this question and give their spontaneous views. The key global problems that the public identified can be grouped into three categories: those affecting the developing world, those affecting the UK and those that impact both the UK and developing world.

Figure 2.1 – Problems facing the world



Participants wanted to ensure that there is enough food for everyone, especially in the developing world, and in the face of climate change. They described the challenges here as *agricultural* (ensure that yields are high and climate change does not lead to losses); but also mentioned a lot of issues that they saw as *political* (ensure fair distribution) and *cultural* (ensure demand-side and commercial interests are managed).

Overall, participants felt that the greatest global health challenges were antibiotic resistance and readiness for global epidemics such as Ebola.

Participants' spontaneous views of global challenges were very similar to those presented later by the facilitators. However, despite recognising the challenges, the groups were still surprised when presented with the scale of some of the problems. Some participants were shocked when they saw stark facts and figures, for example the extent of food poverty or the resources involved in agriculture, and as a result sensitivity to these issues grew.

'Seven kilograms of grain for one kilogram of beef – it's phenomenal, isn't it?'

Birmingham

Much public support was initially given to helping the developing world and addressing global challenges like food poverty, overpopulation and what they saw as poor farming practice.

'Keeping a growing population fed with a dwindling resource and limited available space'

Online community

'We need to be able to find ways of growing food and in new areas where the soil hasn't been plundered'

Birmingham

But this support could be in direct tension with the public's priority to direct UK taxpayer money towards UK issues such as poor diet, irresponsible consumer waste habits, supporting the UK farming industry and looking to solve the problems of critical illnesses such as cancer and dementia.

'We can't take the focus off the UK, people are unhealthy. There are people who are homeless, starving, obese, if we can't get it right here how can we get it right elsewhere?'

Norwich

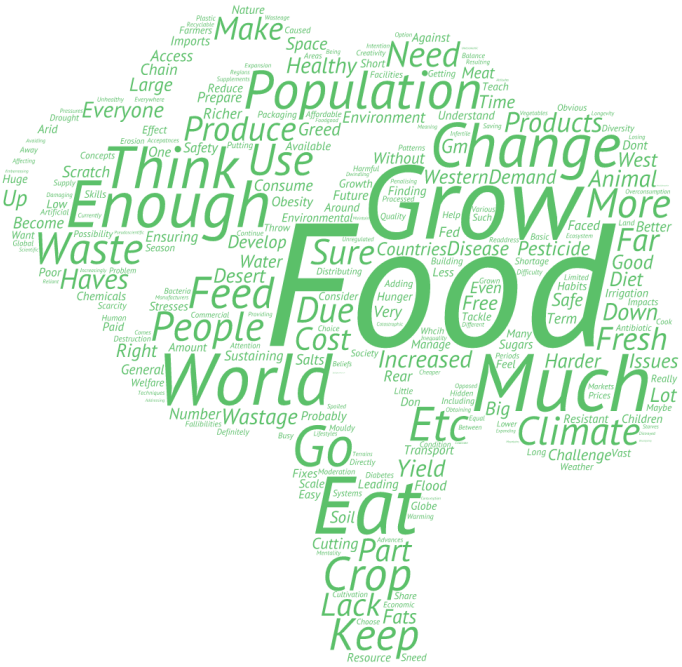
In the online community, the most commonly mentioned challenges were related to diet (both as a challenge in food and medicine), obesity, antibiotic resistance and feeding a growing population. The table below summarises how often different challenges were mentioned.

	Mentions
Diet	30
Antibiotic resistance	22
Obesity	22
Feeding a growing population	20
Waste	14
Aging population	12
Resource and land use	9
Climate change	8
Cancer	7
Inequality	6
Dementia/ Alzheimer's/ Mental health	6

As with the face-to-face participants, the online community members tended to see diet and obesity as issues facing the UK (or potentially the western world) while antibiotic resistance and feeding a growing population might affect everyone.

Below are images created using the language used in the online community. They show the type of words the public used when discussing global challenges, and the words which spark most discussion (the larger the word appears, the more often it was mentioned).

Figure 2.2 – Word cloud showing online community suggestions for the major global food challenges



Challenges around food were seen as very significant; though the types of challenges were not necessarily always defined as bioscientists would define them. For example, the word *enough* was very important and often used to suggest that there is already enough food, but that it is not fairly distributed; participants focused on the elements of the challenge relating to politics and society rather than thinking about the technical challenges of food growth and storage. Similarly, participants tended to talk about *population* in terms of the growing population as a challenge facing the world, and the difficulties in persuading people to have fewer children.

Figure 2.3 – Word cloud showing online community suggestions for the major global health challenges

When it came to health challenges and medicine, the focus was on beating diseases, diet and obesity, and on encouraging people to lead healthier lives; suggested by the use of health, people, access, service – all terms which suggest the focus is (potentially) on the individual to make positive changes. Population change and growth was another concern.

2.2 How can science help?

Participants were broadly happy to offer general strategic advice to JIC based on their understanding of the challenges facing the world and how they thought basic bioscience could help. It is worth noting, however, that their understanding of bioscience was very limited, especially at the start of the sessions before they had spoken with scientists. We discuss this further in Chapter 5 where we explore the learning from the dialogue on how best to engage the public in future dialogue.

There was a general impression among participants that science provides technical solutions to many of the challenges in food and medicine that currently face the world. Many of the questions participants had for scientists online, and the initial discussions in the face-to-face workshops about the problems of the world, highlighted this belief; they assumed scientists to be working on solutions to big global problems.

> ***'What diseases (both plant and human) is the centre currently developing new treatments for? And what progress has been made?'***
>
> Online Ask a scientist

In the online community, members asked if scientists had discovered new medicines derived from plants and how far off we are from finding cures to common diseases like colds. They were eager to hear what progress has been made. This suggests that not only is the public interested in the work of organisations like JIC but that they also set high standards for basic bioscience, considering scientists to have a public duty to work on publicly useful areas.

Across the dialogue, participants felt the priority issues for science were the same as the big global challenges which affected both UK citizens and the rest of the world. When asked where they would like to see JIC focusing its research efforts, members of the public across the dialogue tended to stress the major global challenges that they saw as having obvious links to science: antibiotic resistance, readiness for pandemic outbreaks, higher yields and alternative energy sources. These issues were often raised spontaneously and seen as natural areas for JIC to prioritise.

> ***'We're becoming immune to antibiotics, do you work on developing new antibiotics?'***
>
> Norwich

Participants found it easy to consider how scientific research could help solve medical problems. Medical issues that they envisaged scientists focusing their efforts on included finding a cure for cancer, developing new vaccines and reducing antibiotic resistance. These all clearly fit the public's perception of the types of challenges scientists in general address. Participants did not have much awareness, at the start of the dialogue, of the range of issues on which specifically curiosity-driven research could have a bearing.

Tackling the global hunger crisis and improving the way we farm and manufacture food worldwide seemed to participants to be contingent on other factors beyond science. They cited consumer habits, farming systems in the developing world, overpopulation, the food industry, third world governments – all of which could affect how well the problem could be solved. As such, they felt that sometimes investing time and resources in scientific research was lower priority than investing in other ways to tackle these problems.

These kinds of big global challenges were seen as being broader than the remit of science to tackle. Many participants pointed out that these issues are complex. They saw multiple groups and individuals as responsible; and felt there may not be a single player responsible for finding the solution. They expected those in positions of power, such as politicians (and, they believed, scientists), to have an appreciation of this wider perspective too, working together to find solutions. Levers to pull might include ecology or social and cultural issues.

Participants wanted JIC to demonstrate that it actively takes account of the context in which its work operates and that it considers scientific issues alongside others, in order to best tackle problems.

> ***'In the future we're going to get bigger, we can't stick to the same farming methods, (JIC should) look into research to see what's suitable, go to (other) climates and distribute (crops) around the world....it has to keep up with the times.'***
>
> Online principles

3 Principles: public priorities for JIC decision-making

This chapter looks at what the public think JIC should take into consideration when making decisions about what and how to conduct future research projects. It presents six key considerations, 'principles' for good decision-making, which emerged from both online and offline elements of the dialogue.

3.1 Using case studies to derive principles

During workshops, participants were presented with a variety of case studies to exemplify the type of research that JIC carries out. The case studies came from the four Institute Strategic Programmes[3].

Scientists from JIC were present to explain different elements of the case studies and the materials were developed with close reference to the JIC teams working on these projects. Thus, different sub-groups had a wealth of information about the case study, and also different details were explained, as the conversation in each group naturally varied. However it is important to note that the case studies were still relatively brief introductions to some very complex areas of research.

Participants were tasked to consider the case studies based on their appeal and to explain their rationale. They described this process of consideration for JIC in terms of key trade-offs which they weighed against each other: for example: Would a project have local or global impact? Was it likely to bear results quickly or over many years? Would it save the lives of many or just a few? In the dialogue, we heard them use the case studies as examples to debate these more abstract points.

As part of this process of deliberation, workshop participants were asked to compare the case studies against each other, based on their immediate responses and the general conversation.

The focus here was on the criteria by which they compared. The purpose of the exercise was to gain insight into the criteria the public used to understand the work that JIC does and to help the groups arrive at principles which could be drawn out. The exercise was not designed to 'rank' science projects. Instead, this task pushed participants to articulate and debate what types of research they valued, surfaced the issues seen as most important, and helped us uncover how participants prioritised strategic decisions, in lay language. The outcomes from this comparison are to be found in Chapter 4, below, which shows how the discussions of the case studies gave rise to the principles.

The principles are the result of iterative analysis. After the face-to-face dialogues, we analysed the principles as we saw them and then designed an online trade-off exercise was designed based on emerging findings from the workshops. Community members, therefore, were challenged to comment on the principles explicitly, this was possible because we ran the online element after the face-to-face dialogue workshops. The online 'Ask a scientist' task was also very useful for demonstrating people's priorities for JIC and the kinds of considerations they expect JIC staff and researchers to take into account.

[3] The four ISPs are: Growth and Development underpinning yield (GRO); Biotic interactions for crop productivity (BIO); Understanding and exploiting plant and microbial metabolism (MET); Wheat Improvement Strategic Programme (WISP)

3.2 The six principles

The next chapter, Chapter 4, sets out the learning from each case study on strategic decision-making and what the response to each one, in detail, tells us about public engagement with JIC science. In the remainder of this chapter, however, we focus on the principles themselves.

3.2.1 Preserve the right to do basic, curiosity-driven research which may not necessarily lead to immediate tangible benefits.

Participants saw the value of basic research and pure scientific discovery, although people had diverse ways of interpreting what this value meant, and these ways changed during the day.

For example, when participants saw one case study of JIC's research regarding leaf shapes, many participants were happy with this research and valued the fact that it was curiosity-led. They felt the joy of discovery can be sufficient justification for carrying out research. However, in some cases, at least initially, participants did not identify societal or monetary value.

> ***'It may be more practical to go with products that can be brought to the market quickly and reinvest the financial benefit with additional research.'***
>
> Online principles

Over time they developed an understanding that this type of research may lead to more tangible benefits to society in the long term, and therefore came to feel that this research might provide good value to the UK taxpayer. Some participants were comfortable not to know what products would ultimately derive from basic research and when, whereas others were keen to see applications to be explicitly considered at an early stage.

> ***'Things could be discovered that can then be researched more thoroughly'***
>
> Online principles

Overall, there was a tacit understanding that application would happen somewhere along the line and that the best way to create new breakthroughs was to allow curiosity-driven research to happen. Participants were interested to learn that critical scientific discoveries of the past had originated in such research.

> ***'The greatest discoveries of our time came from people's curiosity and wanting to satisfy it'***
>
> Online community

> ***"It's a case of if you don't dig you aren't going to find it. There is a reason that things are here, and that's why we have scientists."***
>
> Birmingham

3.2.2 Prioritise research with the greatest scope to tackle the most serious, high impact, wide-ranging problems of the world, in order to create research of best value to society and the best use of taxpayer-funded grants.

Participants wanted to see JIC working on big, headline issues; they had high ambitions for the impact of JIC's work and strong appetite to see the organisation tackle the challenges of today. They valued research that looks for solutions to the food crisis in Africa, a cure for cancer, a way to stop the "next Ebola". They wanted JIC to think about both the number of people their work is likely to reach and the severity of the issues they are tackling when considering how valuable their research is to society.

An obvious display of high impact is saving lives and many participants therefore placed high value on JIC projects that they clearly see address some of the world's biggest killers: food poverty in the developing world, global epidemics, critical disease. Case studies that focus on improving the health of populations worldwide – Antibiotics from *Streptomyces*, Producing vaccines more quickly using plants rather than traditional means, and Anti-cancer drugs from yeast – thus tended to win public favour because they showed JIC investing resource in high impact areas.

> ***'Solve world poverty' / 'Save lives! (Antibiotics)'***
>
> Norwich

With this thinking, some participants saw all projects which tackle a global problem (rather than one local to the UK,) as automatically more valuable, given the likelihood that they will affect a larger population.

> ***'Research to address crop production worldwide is more important as this affects more people than people in the UK.'***
>
> Online Principles Task

It can be harder for the public to imagine the scale of impact for many basic, upstream research projects because of their undefined nature and the extended lengths of time they are likely to take. Participants therefore found it harder to see immediate application in the case study of the leaf shape and hence some thought that the public benefit of the work was less clear. Similarly, some felt that the purple tomatoes case study had a definite outcome and represented good science, but that in their view, thought other project examples presented had more appeal in tackling more immediate world problems.

Once participants became more familiar with the concept of upstream research and its opportunities for unexpected discovery and scientific breakthrough, potentially changing the lives of billions of people worldwide, they started to appreciate its value.

3.2.3 Demonstrate that JIC has investigated who stands to gain from any benefits of the research, and the context of the research.

A key concern from the advisory group when discussing the structure of the dialogue was that JIC should not restrict the framing of the problems of the world simply to those problems suited to technical scientific solutions.

One stakeholder contended that all research, even curiosity-driven work, had an assumed end use. Therefore there should be scope in the dialogue for participants to question whether JIC was taking enough account of diverse voices and interests in deciding on what research to do; and to judge whether JIC's strategic decisions would in themselves steer the conversation about global problems and might lead to unintended consequences for society as a whole.

> ***'What is JIC's ongoing accountability to people who might do something as a result of their work? In (basic bioscience), there is an expected end use and an emerging intention. If a bunch of scientists come up with an idea (to solve global problems) and the tools they already have fit it nicely, how can they ensure that they are not making assumptions which will cause certain interests to benefit? How might the institute's decisions affect the world longer term?'***
>
> Stakeholder workshop / follow up interviews

Some participants, especially in one of the online groups and in the principles exercises, also had a sense that strategic decision making should not just be about which basic science project to pursue, but that JIC needed to think about how its work influenced, and was influenced by, the wider world.

> ***'Science influences the market and the market influences science'***
>
> Online group

> ***'Often improving crops means taking it away from the people and commercialising the process, and destroying fragile ecosystems on which we depend.'***
>
> Online principles

In order to find the research which has the most value to society, long-term and down-stream outcomes should be considered. Participants in the face-to-face dialogue felt that if, for example, JIC focuses on the technical solutions to yield problems this might lead to unforeseen cultural or economic consequences across the world. Therefore they wanted JIC to be accountable for consequences coming from decisions made upstream.

> ***'How can they decide when they all start without knowing what will result? Think about who is likely to benefit.'***
>
> Norwich

Transparency was important, as was demonstrating that the John Innes Centre is not swayed by vested interests.

> ***'Being more open and not limiting themselves to the cognoscenti'***
>
> Online community

Some wanted JIC to demonstrate a kind of due diligence, that it had convened conversations about the different consequences of doing research. Participants did acknowledge that JIC's remit is scientific but wanted to see the Institute demonstrate that it was taking account of a wide range of different interests in conceptualising its task in the world.

Only a minority wanted JIC to place itself under this level of scrutiny, but most participants at least wanted JIC to consider the many different groups that might stand to gain or lose from research, and make a judgement call about which projects benefited people (see scale of impact, above).

Part of the requirement to consider end beneficiaries involves considering alternative forms of public spending, like international humanitarian aid, and whether UK taxpayers' money is better off spent on that or on scientific research that will ultimately reduce the developing world's reliance on aid. By considering the wider context like this, JIC can reassure the public that they have fully factored in the question of who stands to benefit and the interests of citizens at home and abroad.

3.2.4 Use public money to address areas of research that commercial interests won't.

JIC is publicly-funded and this was an important consideration for participants. Especially at a time when some forms of government spending are being cut, the public are keen to see their money spent wisely. Therefore whilst there was general support from participants for public money to go to scientific research, there were caveats.

In some ways, JIC's public funding was seen as an advantage. The public are frequently sceptical of the motives of private companies and possible vested interest driving research strategies. Some saw that

without the same profit motivation JIC, as a publicly-funded body, would be able to run research that would not receive the same investment from the private sector.

For example, basic research may take many years to yield commercial benefits, if it does at all, and therefore is unlikely to be funded by the private sector. However it is seen as important that as a country we undertake such investigations. So participants felt there was a clear mandate for JIC to act.

> ***'I think there are enough people doing research to bring products to market so I really appreciate curiosity driven research.'***
>
> Online principles

A small number of participants saw research involving *Streptomyces* as a good example of this. They know that the pharmaceutical industry undertakes research into new drugs. However these participants believed industry would not fund this particular type of research given the uncertainty and timescales, therefore this would be a good use of public money. Similarly, researching new vaccines for rare diseases might not be sufficiently lucrative to attract private investment but are important to fund with public money. JIC's status as a leading institution in the field therefore means they would be well placed to carry out this type of research.

Other research may be undertaken by food manufacturers if it were not publicly funded, therefore commercial money rather than public money might be a better source of research funding.

When thinking about public money, some participants felt that UK taxpayer's money should be directed towards the UK:

> ***'I think helping farmers in the UK is more important considering the funding for JIC comes from the government and ultimately the UK public'***
>
> ***Online principles***

However in most cases participants thought that UK public money should be used to tackle global as well as national problems. Participants pointed out that wasteful and high-consumption behaviours of people in the developed world had in fact created and contributed to problems which faced the rest of the world. Others felt that institutes like JIC had a responsibility to share learning globally when tackling issues that are relevant worldwide, and that this would lead to quicker resolution of problems.

> ***'(It's about) world communications, we're doing our little piece, they're doing theirs, but what if we could do it all together and share it, we might be able to progress more.'***
>
> Norwich

3.2.5 Maintain flexibility in resourcing by recruiting the 'best and brightest' to ensure diverse, creative, high quality research.

Creativity, world-class expertise and capacity to react to unforeseen challenges were seen as vital to the performance of a good bioscience institute.

A JIC representative explained to participants how recruitment at the centre works and how scientists write applications for funding projects. This gave the group useful insight into how the Institute is structured.

Participants valued the open-minded and flexible approach that JIC takes to recruitment, employing passionate and intelligent researchers and allowing them freedom to work in areas of their choice. They saw value in JIC creating a challenging, high calibre environment that motivates its staff and gets the best results out of them.

> ***'I like the idea of how you recruit. If you are thinking outside the box and just recruiting generally bright people it is good.'***
>
> Birmingham

The public's expectation is that this will enrich the organisation by feeding a vibrant and exciting research environment, ideal for fresh discovery.

> ***'Building expertise in new fields, just like this scientist, who was telling us what she was doing, it's new and she's bringing her expertise…'***
>
> Birmingham

Retaining good researchers and using effective ways to encourage staff to stay with JIC was viewed by participants as important for safeguarding the quality of the organisation and its work. Linked to this was a desire among some to make sure taxpayers' money is used well, investing in UK researchers in the hope that they will remain working in the UK rather than be poached to work abroad, which was felt unfair (although understandable from the perspective of the individual involved).

3.2.6 Plan in some flexibility by retaining resources for 'the unforeseen'.

There was a further belief that JIC needs to create an environment that protects a certain amount of investment and resource so that its researchers can react to unforeseen challenges. Creative researchers need to be able to address changing global priorities and there may be new issues on the horizon the scale or nature of which we cannot predict.

> ***'At the moment JIC is more early stage than immediate. If, for example, Oxfam were funding research, they would look at what the crisis of the time is, like Sudan.'***
>
> Norwich

Given the valuable role participants saw science research having in tackling the most pertinent issues of the day, they saw it as important that an organisation like JIC is agile enough to adapt to the current affairs of the future.

> ***'I don't think they can look too far into the future now, because the world is changing.'***
>
> Birmingham

3.3 Attitudes to GM food

While the dialogue did not seek to run a detailed deliberation around the perceived risks and benefits of genetically modified food, it is the case that the John Innes Centre uses GM techniques in a laboratory context and there was a need to understand public views and perceptions of this.

Where GM techniques were used in the case studies, participants were given background information and a brief discussion was held within the face-to-face dialogue at the moment where GM issues were

discussed most by participants (facilitators were free to introduce the materials where relevant)[4]. However, before GM was mentioned by facilitators or scientists, there were questions both online and face-to-face. There was little strongly-held opposition to the concept of genetic modification, but a lot of uncertainty and questioning.

> ***'I find this very difficult, especially since I have a non-scientific unease about genetic modification at all.'***
>
> Online principles

The key questions about GM were not about the technology itself as used at the John Innes Centre. Participants, for the most part, accepted information about its usage at JIC in the lab and were not concerned about potential risks.

The key underlying question for participants however, was "Why are other people still concerned about GM, if scientists are telling us it is OK?" These participants wanted to understand more about the social and political debates surrounding GM, not just about the scientific challenge of whether plants could be grown which increase yields, resist insects or blights, and so forth.

Some of their concerns related to underlying conceptions of the world, for example the paradigm of 'naturalness' (see desk research in appendix A). Participants felt that if knock-on effects on ecologies are not entirely understood, then the precautionary principle should be observed. Stories from the media often contribute.

It is fair to say that this partly stems from a misunderstanding of the principles of agriculture and plant breeding in general. However most in the face-to-face dialogue did feel that there were risks, benefits and a social context around GM, and they wanted to discuss this. In particular, they wanted to know about the implications of moving GM from the lab to the market context, in terms of how products might be used nationally and globally. Some online wanted to know how society could trade off the benefits of using GM to solve local and global problems against uncertainties around its use.

> ***'I think helping farmers in the UK is more important considering the funding for JIC comes from the government and ultimately the UK public though I'm not sure how comfortable I feel about GM crops. If we can fix problems in the UK first then we can focus on worldwide issues.'***
>
> Online principles

> ***'They are trying to introduce legislation TTIP - a trade partnership with America where GM food will be pushed again but Europe is standing firm at the moment'***
>
> Online chat

Overall, participants felt John Innes Centre scientists should engage with this debate; crucially, they should not simply inform the public that all is well and GM crops are scientifically without risk; but should engage with the more complex social reality of people's beliefs and uncertainties. This will relate to the way GM products might be used in the world as well as the ways the techniques are used in the lab. This might involve, for example, convening discussions between scientists and non-scientists. The engagement may

[4] Information was drawn from an information pack prepared by the Royal Society in 2014 as part of research to investigate the public's key questions around GM. The results of that research are a report answering public questions, publication of which is forthcoming.

in itself lead to allaying people's fears as they will be able to have a discussion without feeling that their concerns are being swept aside.

> ***'The GM resonated with me, although we might think GM is good, I think people are still worried about GM, you won't change public opinion on that at the moment. I think lots more things should be done GM wise, only because I've been educated about it today, to get that out in to the public more needs to be done.'***
>
> Birmingham

4 Responses to JIC's projects

This chapter looks in detail at responses to the examples of JIC's work which participants were asked to consider.

4.1 Different definitions of 'value'

As discussed in Chapter 3.1. participants were presented with eight examples of JIC projects and asked to comment on: how interested they were in the area of work; the questions they would ask to help them understand it better; the monetary and societal value they perceived it could have; and the principle underlying the research – how did they think JIC should take forward research like this in future? The face-to-face dialogue participants spent a lot of time considering these case studies, while the online community members were offered summaries and trade-offs between the different principles, as illustrated by case studies, in order to establish which principles they felt were important.

At the analysis stage, two dimensions of this valuation emerged as important. These dimensions were perceptions of the *potential impact* and the *likelihood to improve our understanding of the world*

Potential impact: Participants tended to think about research in terms of its application, wherever they could. So, the case studies which seemed to convey an immediate or past application were valued highly in this dimension. Participants tended to discuss the level of *certainty* of the impact, but also their perception of how *valuable* that impact would be in the world. Therefore projects looking at areas of research likely to benefit many vulnerable people, such as Rust Resistant Wheat, were placed higher on this dimension than Purple Tomatoes.

Improving our understanding of the world: This was a more subtle area of value. When first reading the case study, participants often focused on the practical detail of the project, rather than the conceptual science. Hence, the projects they found easiest to understand were often seen as most intriguing. They liked Vaccines from Leaves as the principle was easy to grasp, while the Anti-Cancer Drug from Yeast case study described a more complex process which some participants found hard to follow. The Leaf Shape project was seen as elegantly simple and one of the most fundamental areas of curiosity-driven science so potentially the most intriguing.

4.2 Case studies in detail

The following pages provide an overview of the public's responses to the eight case studies, including the perceived value and concerns that the public associate with each, and the implications that their responses have for JIC.

OVERVIEW	PERCEIVED VALUE	LEARNING FOR PUBLIC ENGAGEMENT
ANTI-BIOTICS FROM STREPTOMYCES Interesting example of applied science that captures people's interest in pure science. Perceived as having a significant impact on a large number of people	• Clearly addresses a familiar and global public health issue; there are worries of increased immunity to antibiotics and over-prescription by the medical profession, the public are attentive and keen to support research in this area. • Seen as a fair endeavour as it has obvious benefits for everyone – UK and global citizens, rich and poor – no-one is exempt from the need for antibiotics. • JIC are well-placed to research this because clearly understood as within the remit of biomedical research. As a public health issue it should be addressed by a publicly-funded body without commercial interests . • Little sense of what other public body would research this if not JIC, and concerns around private drug companies involvement, strengthen the belief that JIC is best-placed. **Principles**: Effective in terms of scale of impact, benefitting everyone fairly, and using public money to address non-commercial interests. It is also of value as pure scientific discovery, preserving fundamental research. *"Any research into antibiotic development is a must, for too long the medical profession has been prescribing as though they were sweets and some ailments are now immune to their effect."* Online principles *"Perhaps they focus on things that [aren't] seen as commercially viable, this is important for them to do this work as industry might look at something and say well we're not going to work in this area."* Birmingham	*"This looks like what the public can understand, everybody has taken antibiotic tablets."* Birmingham • An easy "success story" that people can understand which supports the case for more curiosity-driven science. • The scale of the project is easy to understand: the microbes in the soil leading to new antibiotics can easily be conceptualised and communicated. • There is some perception that research in this area would involve high investments of time and money and participants would like to understand more about it before being equipped to make a judgement about its value for money.

OVERVIEW	PERCEIVED VALUE	LEARNING FOR PUBLIC ENGAGEMENT
PRODUCING VACCINES MORE QUICKLY Captures interest due to a 'wow' factor, and seen as important as due to its potential for large scale impact	• Similar to Antibiotics (above), addresses a familiar global health issue, with potential to impact a large number of people across the developed and developing world. • Additionally, shows UK leading ground-breaking research which has benefits for UK plc and eventually taxpayers; it is seen as a worthwhile way of spending public money. • Impressive "wow" factor to the research – it captures the public's interest and sense of amazement at science's capacity to discover new things and improve lives; • Addresses a very topical issue with high traction among the public given large amounts of media coverage of global epidemics like Ebola and Swine Flu. **Principles:** important in terms of scale of impact, and can show value of pure scientific strategy. It can also demonstrate the value of considering end beneficiaries. *"The work on vaccines would be invaluable in all parts of the world."* Online principles *"When you have something like Ebola which was a major threat you need to produce things quickly."* Birmingham	• The concept of creating vaccines can be harder for some to grasp than other types of research; technical details may need to be spelled out in future engagement. • Some people have worries about vaccinations in general and this can overshadow any potential value of research on vaccines, so this question may need to be addressed even if it is a lay debate rather than a scientific one. • Consider public communications strategy for potentially contentious issues (like vaccines) and provide extra reassure about the need for this type of medical research and public benefits. *"I have children and I don't give them vaccines, there might be no purpose in it*." Birmingham
RUST-RESISTANT WHEAT Has the potential for a very large scale impact as it tackles global food poverty	• Similar to Antibiotics and Vaccines, also seen as having potential for high impact with many and diverse beneficiaries (consumers, farmers, food industry across developed and developing world). • Tackles one of the key challenges facing the world – global food poverty – a problem many are keen to see being addressed and want to hear a positive message about solutions for. • Given the potential scale of impact, it is also seen as an admirable mission for UK researchers to take on, raising their profile and creating a sense of respect for scientists. **Principles:** also effective in terms of scale of impact.	• Other factors play an important part in solving this problem and for some this can mask the benefits of scientists being involved. For example, they doubt what the point of an amazing scientific breakthrough would be in this area if ultimately the power to make sure that new rust-resistant wheat is grown lies with farmers and government outside of JIC's control. Therefore there may be a need to engage with the wider social and cultural questions around farming. • Perception that GM is involved causes resistance among some, often due limited understanding of how GM works and a full grasp of its potential benefits and drawbacks - could be a need for JIC to explain what

OVERVIEW	PERCEIVED VALUE	LEARNING FOR PUBLIC ENGAGEMENT
		the debate around GM consists of. *"What's the point if corrupt third world governments don't ensure farmers have access to this new grain of wheat?"* Norwich *"People shouldn't be making money out of others who can't feed themselves." Norwich*
NITROGEN-FIXING CEREALS Seen as quite complex and time consuming but with potential to solve major challenges	• Similar to Rust-resistant wheat, the project gains public favour for tackling global hunger, one of the key challenges of the world that worries many members of the public. • Seen to have additional environmental benefits - reducing pollution caused by fertilisers. • Similar to advances in rust-resistant wheat, the potential for knock-on benefits to the UK economy are recognised as helping farmers in the developing world can lead to reduction in spending on international aid; • Financial backing of external US charitable funding lends an additional stamp of approval as the funder is seen as a trusted, established institution. • However there were questions around the amount of time that the research will take and level of investment needed, therefore limiting the perceived level of benefit for UK citizens. • There were also some doubts about the legitimacy and need for GM solutions – are there existing options could be used instead that might be easier/cheaper? **Principles:** important in terms of the end beneficiaries and how JIC's work fits into a wider context of using public money carefully. *"Nitrogen fixing is important because it will reduce the huge pollution problems with fertilisers being washed into our water systems."* Online principles *"But it will help us indirectly if we can help Africa then they can help themselves. That means comic relief and charitable funding can go further*". Norwich	• Leverage public interest in environmental issues and stress the potential benefits for the environment when communicating projects where this is relevant (even if it is not the primary focus of the research). • Think about partnerships and who else JIC is involved with as this can affect public trust and confidence in the work. • Set out this example alongside non-GM solutions. *"Experimental plants? Do they produce hazardous waste too? Why work on something else when you've got the legumes already?"* Norwich

OVERVIEW	PERCEIVED VALUE	LEARNING FOR PUBLIC ENGAGEMENT
RECIPE FOR THE RIGHT LEAF SHAPE Took some time for participants to see the value in this type of fundamental research, but following discussion did capture interest.	• High potential to capture public interest and trigger a sense of wonder both in the natural world and the possibilities of scientific discovery; • Supports the concept that scientific research is adding to a body of knowledge and wider understanding of the world which is valuable for its own sake. • Perceived value of this type of project tends to increase as the public learn about the context of past scientific discoveries and the unpredictable nature of many breakthroughs, for example Penicillin being discovered 'unexpectedly'. • Very obviously falls under scientific remit of seeking to understand the world, unlike other projects where there are other groups who could potentially play a role either in carrying out research or providing other solutions to global issues. **Principles:** clearly demonstrates valuing pure scientific discovery, and for many it is using public money carefully. *"Maybe we are looking at it all wrong, maybe they (JIC/scientific community) should just study the leaf and someone else should look at the stuff to fight the problems (of the world)."* Norwich	• Initially can be a hard concept to grasp, as some members of the public do not see the link between looking at the structure of a leaf and wider application – there may be a need to communicate the role that pure science has in breakthroughs in medicine and food; do not underestimate the importance of this for influencing the sense of public value. *"What's the point of doing research without immediate application?"* Online principles *"If you were watching the telly and you heard about this leaf we might not understand how important this might be, but after it being explained to us we do now."* Birmingham
ANTI-CANCER DRUGS FROM YEAST Quite complex and so hard to grasp for some, but has great potential to save many lives.	• Potential for very high impact both in terms of saving lives and saving many lives; • The project is seen as inherently exciting and surprising in its scope – using yeast to upscale cancer drug production is not something members of the public would expect and as a result it gains credibility and an increased sense of value; if scientists do not work on this kind of thing we might miss important medical discoveries; • Clearly benefits UK citizens and addresses an issue close to many people's hearts – members of the UK public have often had personal experience with friends and family living with cancer and there is an understanding that this sense of familiarity with the problem will only increase. • The public are invested in the cause and this outweighs other concerns relating to length of time needed and costs.	• The complexity of the process involved in the research can make it hard for some to grasp initially and can elicit a knee-jerk reaction or sense of confusion that obscures a perception of value therefore time should be taken to explain it • Capitalise on excitement factor of science doing surprising things that the public would not expect;

OVERVIEW	PERCEIVED VALUE	LEARNING FOR PUBLIC ENGAGEMENT
	Principles: important in terms of the end beneficiaries. *"The anti-cancer drugs will not happen overnight but let's continue with it and hopefully at the end of the day we will manage it."* Birmingham *"I think when you talk about cancer risks, most people would say yes this is important."* Norwich	
RESISTANCE TO POTATO LATE BLIGHT Seen as having a benefit to farmers, but could be picked up by the private sector rather than just public funded studies.	• Potential benefit to farming communities in UK and worldwide recognised by those with some familiarity or personal experience of the effects of blight and the severity of the issue. • However some participants thought that chip manufacturers should carry responsibility – either for investing in research or for making changes to their production practices and using alternative varieties of potato. • And some with more knowledge foresee problems in encouraging the use of GM as strict EU laws govern this and therefore money spent on this research may ultimately not lead to the desired outcome. **Principles:** has the potential to have a large impact and seen as an opportunity for the private sector to fund. *"I don't want my taxes to be spent on fighting potato blight when I like the ones that exist already."* Birmingham *"The companies that buy potatoes want the potatoes which aren't resistant."* Norwich *"This takes the Frankenstein vegetable to a positive thing for me. This is something people need to know that it's a positive outcome."* Norwich	• Most of the UK public have very limited awareness of potato blight and so do not see this as a priority area for consumers– the link between the research and its potential impact to tackle food poverty and save lives is very opaque and hard to grasp. There may be a need to educate about the problem that is potato blight.
PURPLE TOMATOES The idea of purple tomatoes captures	• Captures some public interest for being a novel idea – "purple tomatoes!?!"; • Parents see the appeal for children who might prefer to eat tomatoes rather than blueberries; • Perceived as valuable for UK consumers because tomatoes are cheaper	. • Similar to the Potato blight example, the perception that individuals carry responsibility for what they eat can cloud a sense of wider public benefit from research that addresses a consumer issue of this

OVERVIEW	PERCEIVED VALUE	LEARNING FOR PUBLIC ENGAGEMENT
public interest. Some liked that it is cheaper than alternatives naturally containing anthocyanins whereas others thought the alternatives were sufficient.	than blueberries and therefore this offers a fairer deal; • This type of research can put JIC in a position to make the argument for individuals taking greater responsibility over what they eat. • However while they understand that it is valuable to be able to put anthocyanins into a cheaper food product, participants noted that there were alternatives already available. *"How many children would eat pasta sauce rather than blueberries?"* Norwich **Principles:** within the context of wider conversations about the JIC science examples, participants saw this as impacting fewer individuals due to the regulatory process of commercialising a GM product and the availability of other food-stuffs containing anthocyanins.	kind. This idea of responsibility could be fertile territory for future public engagement. • As the breeding and development of plants for food is not well understood, there is a knee-jerk reaction that this research is tampering with a 'normal' tomato. Again, there could be scope for public engagement more generally about the continually-evolving process of plant development.

5 Public Engagement

Public engagement is a multifaceted concept and there are various different (contested) definitions. This chapter first unpacks the idea of 'public engagement'. We then describe how the learning from the public dialogue suggests how the different types of engagement could be best achieved.

5.1 What is public engagement?

Science communication practitioners use various frameworks to explain different types of public engagement with science. Rowe & Frewer's[5] model identifies public engagement in terms of different kinds of communication, consultation and participation and details a number of mechanisms within each and factors affecting the efficacy of processes. The Public Engagement Triangle[6] describes transmission, receiving and collaboration as the three broad types of public engagement. Pieczka & Escobar[7] also assert that there are three facets to engaging society with science, public understanding of science, public engagement, and public dialogue. In whatever way we describe the various types of engagement it is important to note that one is not 'better' than another. Instead, different types of engagement serve different purposes. They are likely to create different outputs and have different impacts.

The sections below describe in more detail how this dialogue sheds light on the potential for different types of public engagement. We describe how the John Innes Centre can communicate its work to the public; consult with them and find out their views efficiently on relevant strategic issues; and also enable their ongoing participation in decision-making.

5.2 Communication

5.2.1 Information is needed as a start point for engagement

Familiarity with JIC was limited. While participants in Norwich were relatively more aware of the organisation's existence compared with those in Birmingham and the online community, the Institute was often confused with neighbouring science park buildings and many participants were unclear about its purpose.

> ***'Is the food institute the same as the JIC?'***
>
> Norwich

In both Norwich and Birmingham workshops, participants mentioned John Innes compost and made an educated guess that JIC might have something to do with horticultural or agricultural research.

This lack of knowledge of JIC sat in a context of a more general lack of knowledge about basic bioscience, plant science and indeed any research. For many participants, scientific research spells unfamiliar territory and they had little understanding of who carries it out, how it is funded and how decisions about what to research are made.

[21] Rowe G and Frewer LJ. (2005). "A Typology of Public Engagement Mechanisms." Science, Technology & Human Values; 30(2): 251-290
[22] *Colbourne*, L. (2010) Science for All Conversational Tool (*BIS*)
[23] Pieczka, Magda and Escobar, Oliver (2012) Dialogue and science: Innovation in policy-making and the discourse of public engagement in the UK. Science and Public Policy, 40 (1). pp. 113-126

'How do you know you're not researching something that has already been researched?'

Norwich

Participants' understanding of basic, fundamental research was also very varied. Levels of education naturally varied, and this was perhaps more notable online where writing style varied between participants quite a lot, some drawing out quite complex points, with others making briefer responses. In the face-to-face dialogues too, there were differing levels of education and contact with science.

Some participants became interested in the concept that early-stage research is necessary to allow room for chance discoveries and were intrigued by the idea that breakthroughs in scientific research can derive from serendipity. Others found it initially hard to justify spending time and resource on what they saw as unfocused and aimless work. Some found it hard to see how scientists could justify the use of public money by fundamental research if the remit is very broad. In the extreme, some members of the public see it as a primarily self-interested pursuit, without clear public benefit.

'You have to define aims and targets, what is the ultimate goal?'

Birmingham

For these participants, the value of science tended to remain in what they could imagine the downstream benefits might be. The majority simply assumed that research would always work towards a translational outcome.

'I think it's very exciting that there is a known cancer fighting substance and if we can find a way to produce it and make it cost effective then we should.'

Online principles

Yet, when the public discuss their own interest in science and what kind of value they see it as having, they often express wonderment at the natural world and an instinctive curiosity for how life around them works.

'I love to pick up a leaf and see all the veins. It's marvellous.'

Birmingham

'Chemical reactions, they interest me because I don't understand how they work!'

Birmingham

Across the board there was clear enthusiasm and appreciation for the premise of scientific curiosity and the need for discovery. Communicating the importance of basic research and the need to ring-fence funding for curiosity-led studies could draw on this sense of wonder and remind people that science helps us address fundamental questions about the world.

Participants knew little about how science research is funded – what sorts of organisations are involved and how basic research is translated to wider applications. For some, lack of knowledge in this area lead to a concern that there may be hidden vested interests that they do not know about; some question the credibility of findings from of any research sponsored by industry.

'It's sometimes sponsored by an interested party? So it's coming to the result they want? If companies who produce drugs fund the research this could affect the results. Do JIC have a vested interested? Are they funded by KFC?'

Norwich

But at the same time, participants saw a role for industry in helping to tackle the problems of the world, such as global food shortages and waste. Their response to science research in this area was complex; they liked the reassurance that publicly-funded scientists (such as those at JIC) would have neutrality and independence, but on the other hand they wanted to see other players being involved. This was because they could see that problems in the world involve a number of different stakeholders and actors and might need collaborative solutions.

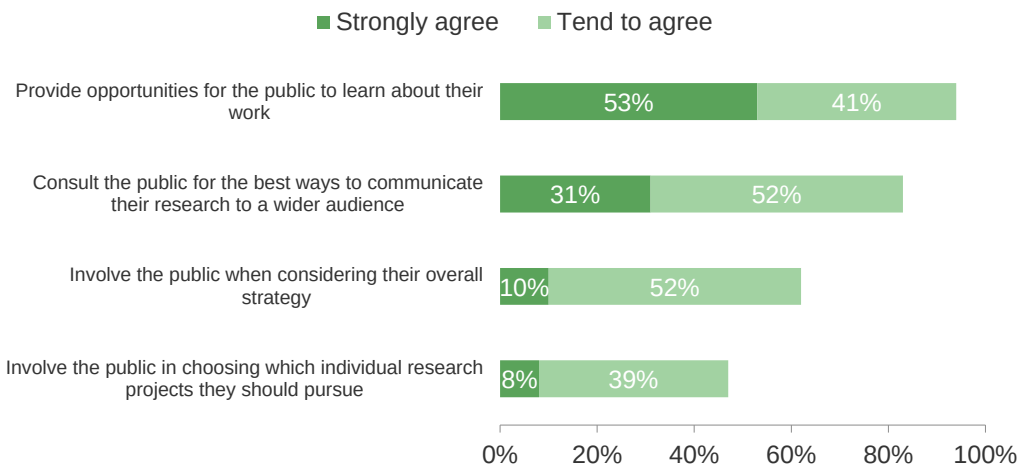
> ***'I think the food industry. They have a responsibility, they can't wait for (others)...McDonald's, they say 'we do this and have this and we are funding research into alternatives, producing more efficiently, (but are they?)'***
>
> Norwich

> ***'Sometimes big companies are more powerful than countries. A big global research foundation has more power.'***
>
> Norwich

Overall, the more participants spent time considering the issues, and talking with scientists, the more able they felt to hold opinions about basic bioscience and to engage with the more complex issues of John Innes Centre's strategy.

The graph below shows that online community members, who had less time to engage, and no face-to-face contact with scientists, were likely to strongly agree that JIC should provide opportunities for the public to learn about their work (53%). However, they were more ambiguous about the value of consulting the public on the detail of communication strategies (31%) and on the specifics of research projects (8%) or overall strategy to pursue. (10%)

Figure 5.1 – Answers from the online community about public involvement. "The JIC should..."



This suggests that the JIC could usefully bring the public to the table, such that they can be informed of JIC's work and have a voice in overall strategy and communications; and if there is a need to engage the public with the detail, JIC may need to explain and reassure to participants in future as to what they can add and why their voices are important.

'I think we need shared responsibility. It's not just JIC or the government, it's the public too.'

Norwich

5.2.2 Trust in scientists leads to trust in the science

Participants responded well to hearing from JIC representatives about the Institute's work and individual research projects. At the face-to-face dialogue events, there was a noticeable increase in enthusiasm for basic, curiosity-led research once people had listened to JIC scientists elaborate on the work they were doing, and on their motivations for carrying out basic research.

'Some of the biggest breakthroughs have been made by accident.'

Birmingham

'It's like she (the scientist) said, she was telling us what she's doing, it's new, and she's bringing her expertise to it'

Birmingham

This suggests the powerful role that JIC's scientific community could play within public engagement in future.

Interestingly, participants were keen to hear the views of scientists on a wide range of issues, not just the obviously scientific. This was clearest among members of the online community who took part in an exercise called 'Ask A Scientist' which allowed them to put questions of their choice to a JIC scientist. Many of their questions demonstrated the very high, and sometimes unrealistic, expectations that the public have of scientists, as well as the regard in which they hold scientists.

'I just visited the Kennedy space centre in Florida and the emphasis is on sending men to Mars. What difficulties need to be overcome to make this success as I believe this may be a step too far.'

Online Ask A Scientist

'I'm very curious about life after death. There are few good trusted mediums out there that allegedly can contact the dead…my question is: How far are we from getting proof that there really is life after death.'

Online Ask A Scientist

Public expectations initially seemed high. But it appeared that once the scientists actually engaged with individuals, the members of the public were satisfied with all levels of engagement, from the brief to the more in-depth. The online community frequently presented JIC scientists with questions outside of JIC's specific expertise, as the questions above demonstrate.

However, the participants really did not mind that the JIC scientist might not be the authority on the issues. We suggest there are two reasons for this.

First, relative to the understanding of participants, it seemed that just by virtue of being a scientist the JIC team were a set of authorities worth listening to.

Second, it was notable that the public did not require categorical answers to their questions. They were happy to hear that the situation was complex, and even happy to hear that scientists did not know the answers. It appears that simply hearing the questions considered in the light of a 'scientific mentality' was satisfying, and helped people 'think like a scientist' about the problems of the world. This demonstrates that

for the public, the appeal of discussion with scientists might be just as much about hearing about the way scientists think and react, as it is about collating new substantive information on a topic.

> ***'I don't think you could get bored in science'***
>
> Birmingham

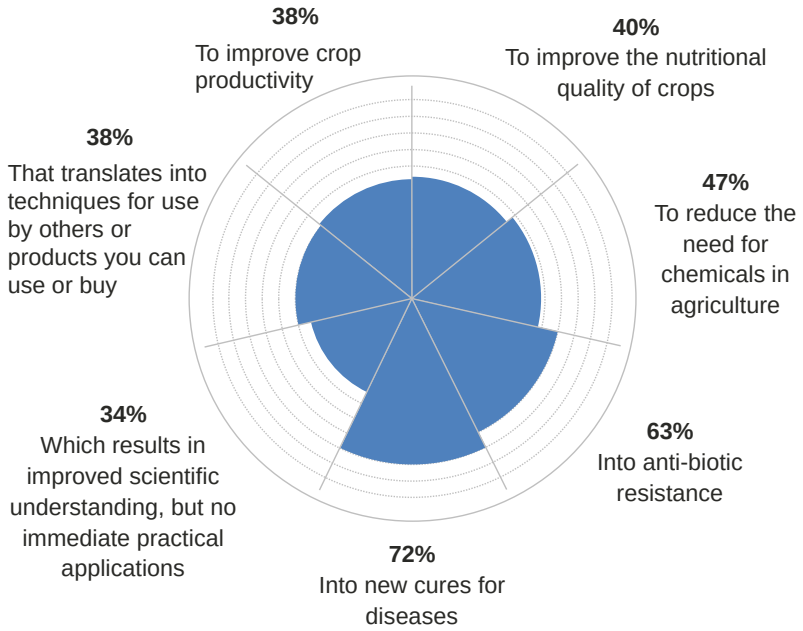
For scientists, (whose experience of public questioning may be a more rigorous peer-review) this may allow for a more low-stress way of dealing with the public, reducing the need for very cautious answers, lengthy preparation or over-complicated, precise responses. Indeed, where scientists did go into detail, participants sometimes found the comments hard to follow. There are learnings for communications here.

> ***'Scientific research is incredibly hard to understand and even more difficult to report. I graduated in chemistry nearly 40 years ago. I have done nothing scientific since I left. I now struggle with many scientific reports. It would be helpful if JIC could express its work in simple language.'***
>
> Online Ask A Scientist

5.2.3 What are they interested in?

Whilst there is general public appetite to be informed about JIC's work, some areas are of more interest than others. Online community members said they were more interested in finding out about health related research, such as into cures for new diseases or anti-biotic resistance, than plant or crop centred projects. This tallies with other research such as the Wellcome Trust Monitor and Public Attitudes to Science – in these studies, large, representative, robust quantitative surveys have shown that the public see health research as particularly important.

Figure 5.2 – Which, if any, of the following areas of the John Innes Centre's work would you want to find out more about?



5.2.4 Which channels?

Online community members said they would most want to find out about JIC's work through the JIC website (67%). However, it is important to bear in mind that online community members were by definition informed to some extent of the JIC's work through their engagement on the community. Therefore they could be considered more likely to be aware of the JIC website than the public at large – other members of the public may be interested in this work if they came across it through other media, but may not check the JIC website if overall public awareness of the Centre is low.

Sizeable minorities of community members said they would want to find out about the JIC's work through other media which could have a greater reach among the general public. These included the mainstream media such as TV (34%) and online newspapers/ news websites (31%), but also social media such as Facebook (28%). There may therefore be scope for the JIC to engage with the public through this and other online channels.

Some participants also highlighted the importance of education to increase scientific awareness among young people. They also thought awareness could be raised by linking basic research to the products in food and medicine that ultimately derive from it. The status quo is that the JIC does not play a role in bringing products to market, however if the JIC was to publicise its role in the earlier stages then the public would be more aware of the Centre and the importance of basic research.

'In supermarkets it should say this broccoli was brought to you by John Innes!'

Online group discussion

5.2.5 Communicate the importance of healthy lifestyles

As well as communicating the research they have done, some participants would also like to see JIC communicate the importance of healthy lifestyles.

Many participants in both the online and face-to-face research were pessimistic about lifestyles in the UK, believing that unhealthy lifestyles are a widespread problem, leading to major impacts such as obesity. They tended to view this as a problem affecting wider society as well as themselves.

However, they saw these sorts of challenges as demand-side issues. Therefore the role of JIC wasn't seen to be in solving these problems through research, but through highlighting the basic science underpinning healthy living, so that people change their own behaviours.

'Most of us could do a lot to maximise our health if we took the trouble to do so.'

Online principles

'At the end of the day it's an individual's choice, everyone keeps hearing about obesity etc., you can't expect the scientists to fix absolutely everyone's problems.'

Birmingham

Similarly, some participants were aware of food waste as a problem and believed that we should focus on our behaviour as a society, i.e. encouraging us to create less waste, rather than, for example, using technical solutions to reduce the impact of waste or increasing shelf life time for products. JIC could therefore similarly communicate the scientific foundation of why it is important to minimise waste.

5.3 Consultation

Participants both online and face-to-face had some reticence when asked to consider JIC's specific projects. They saw decisions about science strategy as lying outside of their comfort zone and preferred to put faith in scientists to make good decisions on the public's behalf. Participants in Birmingham were particularly concerned that they were not equipped to engage with decision-making.

> ***'Leave it to the experts, the public don't know what they are talking about.'***
>
> Birmingham

This reticence was perhaps also because participants found the work of JIC, as presented to them, as very complex and sometimes confusing. However, when they engaged with the case studies we showed them, the majority became interested and even inspired.

Hesitancy can be an attitude commonly found in public dialogues: on the one hand people say they want to be informed and consulted about strategic decisions which affect the public, while on the other they want the reassurance that experts will take the burden of decision-making and use their position of expertise to make decisions on their behalf. The desk research (see appendix A) highlights various examples of this phenomenon. In other words, people do not necessarily trust themselves to make the best decision in the public's interest, when they see a need for complex and technical knowledge.

> ***'The public don't really understand research strategy so they might resist something good.'***
>
> Birmingham

However, participants did feel that JIC should take account of wide expertise and that the public voice should be within this; but they caveated their strategic advice by saying that other experts' views might need to carry more weight.

> ***'Sometimes we could provide higher level input about what we consider priorities but it would be difficult to decide upon individual projects. For example, councillors aren't trained planners etc. but they rely on the advice of people who are, and can question them.'***
>
> Online chat

This links to an important underlying principle that participants applied to their thinking about any work JIC should carry out; they want JIC to ensure that it acts responsibly by recruiting and retaining researchers who will make good decisions and weigh up competing priorities. If the public can trust that JIC is doing this, this will act as a layer of self-scrutiny.

However, they definitely do want to feel confident that decision-makers within JIC have what they need to make them on their behalf – such as the right researchers and the right set of priorities. A minority of participants (in Norwich and online) also suggested that there should be a system in place to ensure that happens, such as an external ethics committee of experts.

Across the research, participants were aware of the difficult nature of JIC decision-making – what projects it should conduct, how it ensures a good research environment – and the fact there must inevitably be competing priorities involved.

In addition, the public seem comfortable being consulted by JIC on the best ways of communicating their research to a wider audience. Whilst JIC are viewed as scientific experts, the public can see themselves as well-placed to make recommendations in the area of public communications, possibly because they know first-hand what tone and style works for engaging the lay person.

Thus while participants seem to show greater appetite for communication than consultation with regards to science strategy, consultation is important in terms of public engagement and basic principles.

5.4 Participation

This research, and the online community in particular, demonstrated that some members of the public value opportunities for participation, engaging in dialogue with scientists. The 'Ask a Scientist' activity demonstrated the value of scientists being truly accessible. The public do not get many opportunities to have such direct engagement with scientists and to ask them questions and this opportunity on the community was enjoyed by those who took part.

> ***I really enjoyed being part of the community. I learnt a lot and it was great reading other peoples' comments and the replies from the scientists.***
>
> Community member feedback

Community members tended to ask very general questions and when the answers were too technical and precise they could not always understand and sometimes became demotivated. This has implications for which scientists engage in dialogue with the public and about what. Scientists do not need to be confined to only engaging on matters within their personal field of research.

> ***'I do expect those that direct research to have knowledge outside their specific field because the consequences can be far reaching and important'***
>
> Community member feedback

What the public really valued was seeing the scientific mind 'at play'; understanding how a scientist addressed a problem seemed to be fascinating and was valued.

The online question sessions highlighted the fact that in order to help the public feel that they can contribute to a debate, it is important to use terminology that is likely to be understood by the majority, and to explain things as simply as possible, even when discussing relatively complex scientific concepts. This activity demonstrated that people responded better to simpler language.

> ***'I logged on a few times and found the discussions were just too high level for me, I didn't think I could add anything.'***
>
> Community member feedback

The online community also provided lessons for the best ways to frame questions back to the public. As noted above, some are confident enough to engage in two-way dialogue with scientists, and relished the opportunity to do so, enjoying the unexpected freedom of being allowed to ask a scientist anything they liked.

For the majority, though, simply asking for questions did not provide enough direction. Some left the engagement process because they were daunted by the idea of asking freely. Hence, in participatory engagement JIC could consider creating discrete questions on which they are asking for public input, to help the public to formulate their views and know in which area their views are sought.

'I participated in the initial survey, however the subsequent email invitations seemed to be for me to ask questions. I felt…I only had a basic understanding.

Community member feedback

Overall an online engagement was felt to have potential to engage the public. In exercises and discussion groups the community members pointed out that the longer-term, more discursive approach that a forum permits might work well for engaging the public in more complex strategic questions.

'I think it is a useful two way process of raising awareness.'

Community member feedback

6 Conclusions and next steps for John Innes Centre

This section summarises the learnings from the dialogue when it comes to the key objectives of the process, and the implications for JIC.

6.1 Which social, economic and environmental challenges do the public want JIC to address?

As discussed in chapter 2, the public are keen for the JIC scientists to focus their attention on the multi-faceted challenges facing the world, such as climate change, management of epidemics, antibiotic resistance, and solutions to deal with emerging oil and water shortages.

Participants expect JIC scientists to be already working on research which ties directly in with these areas. While they see the political and cultural dimensions of these problems as just as important as the technical challenges for bioscience, they want JIC to establish its vision for research based on the technical solutions the scientists feel they can best offer. They feel the value JIC scientists add is through the technical innovations which can be produced downstream, based upon the knowledge produced by fundamental bioscience at JIC.

However they also want to see JIC demonstrating that it takes account of the political, cultural and societal contexts in which it operates. This is principle 3 in their list of key principles.

They would like JIC to be discussing its science in the light of the social and cultural implications of the outcomes of its research. For example, looking at distribution of food as well as increasing yields; at the economics of farming as well as at developing new strains or new resilience within plants.

This is in part a question of governance. Centre management could discuss how best to ensure that these ideas are included in decision making. Which different stakeholders in global problems should be

included? Which mechanisms of discussion will work best? How can the public be included also, so that it is clear that this work has been done? What is the best balance between carrying out this wider investigation of the context for bioscience, and putting resources more directly into delivery of projects? How can JIC transparently demonstrate that it is including this process of looking wider?

Participants also felt that scientists were important, powerful people, with a voice to be heard in the public realm, on a number of issues. This suggests that JIC could convene discussion on the wider contexts affecting bioscience and that this would be appreciated.

6.2 Which public priorities should influence JIC's science strategy?

The first two principles that the public want JIC to adhere to are, to some extent, mutually contradictory; they are to do ***curiosity-driven research*** and yet also to ***address the problems of the world***. Participants could not resolve this contradiction, and this is partly because they recognise that the John Innes Centre, in common with all those who do basic bioscience, must exercise a fine judgement.

Participants did not necessarily feel that the lay public were the best suited to assist in this judgement; they (especially the online participants) did not want to take responsibility for which specific research direction or project should be chosen. Rather they wanted reassurance that JIC was taking advice from different stakeholders, as discussed in the section above.

Specifically, the principles can be applied as follows:

1. ***Preserve the right to do basic research:*** Continue to do basic research and try to explain potential application where possible. Consider the possible costs and benefits to society of such applications and communicate long-term benefits to the public as this may increase support for basic research, but don't be afraid to say that the benefits are unknown, or may not be immediate.

2. ***Prioritise addressing the most serious, high impact, wide ranging problems:*** When carrying out research into medical areas, consider what kinds of application will have impact on the highest number of people or which diseases are most severe in their effects; conduct research into new and improved ways of growing crops and thereby directly impact the lives of billions of people worldwide. Be involved with multi-faceted research projects which address global problems in multiple ways and are therefore more likely to impact a large number of people's lives.

3. ***Demonstrate that JIC has investigated who benefits from research:*** When carrying out basic research without clearly conceived beneficiaries or predicted outcomes, think about which projects are most likely to have the widest application and impact the highest number of people. Conduct due diligence in considering vested interests and go through the process of considering end beneficiaries throughout each piece of work

4. ***Use public money to research areas commercial interests won't:*** Prioritise areas that would not attract private sector investment. Consider how projects benefit society in different ways; for example considering the interests of small scale farmers as well as multinational businesses, helping farming in the UK and finding cures for critical illnesses affecting UK citizens; consider prioritising research which is outside the commercial sphere.

5. ***Maintain flexibility by recruiting the 'best and brightest' to ensure diverse, creative, high quality research:*** Keep using broad recruitment criteria to pick researchers who are the brightest without restricting the research areas they may investigate. Incentivise good researchers to stay on at JIC retaining the centre's expertise and the quality of its work.

6. ***Plan in some flexibility by retaining resources for 'the unforeseen':*** Plan now to tackle the unknown global challenges of the future – for example, keep some financial resources in reserve and encourage researchers to be adaptable to new projects.

6.3 How can this dialogue inform the development of a governance framework for public engagement in future?

The dialogue process was in part devised to test whether this mechanism was the best way to engage the public. The findings suggest:

- The public are particularly engaged by meeting scientists and spending a significant length of time in discussion; the dialogue approach in itself is engaging.
- While it is hard in project development to balance the complexity of the issues with the need to communicate clearly and succinctly to the public, the materials used eventually did manage to achieve this balance. They can act as a useful benchmark for materials development in future.
- The scope of the dialogue was fairly broad; while overarching principles for strategy have been identified, the public may feel able to give more specific direction on a narrower topic, such as one workstream or the work of one ISP.
- Online, there is a real public interest in having scientists available to enter into discussion regularly, or over a set time frame, and able to reach larger numbers of people.
- There is also interest in regular contact online and scope for the community, or something like it, to be run again in future, possibly using more internal JIC resource to manage and moderate.

To make the most of this dialogue and follow through on its impacts, JIC will need to follow up internally on how scientists and others involved in the dialogue have been affected; it would be useful to share views internally on the learnings from those directly involved and get more precise ideas as to which approaches can be used in future.

JIC should design its public engagement strategy to include different levels and types of engagement, for example:

- Communication: scope to provide information which enables members of the public to inform themselves; this may lead to greater confidence from the public to join other engagement activities
- Consultation: appetite to engage on strategy, if not on the detail of research decisions. JIC could also demonstrate how it is engaging with other experts, to reassure the public. Online and face-to-face could both work well as consultation channels.
- Participation: appetite for real two-way discussions with scientists, hearing how scientists think about problem-solving. Potentially, co-creating solutions to global problems, as long as the public's responsibility and remit is clearly defined. There is potential for further dialogue on some more specific areas within JIC's work, for example within each ISP or looking at specific questions from an ethical dimension, such as the best ways to address global hunger, or the role and value of nutraceutical foods.

7 Appendices

Appendix A: Desk research

Methodology

This paper describes the findings from desk research undertaken to inform the development of discussion guides and exercises for public dialogue which will shortly be conducted by the John Innes Centre, to inform their science strategy for 2017-22.

The desk research process was designed to:-

- establish **overarching learnings** from previous dialogues on science and technology issues, so that the current dialogue overall can start from what is known and moves the debate on;
- understand **public views and concerns about areas of research relevant for JIC** which can help us design specific probes and exercises during the dialogue; and
- provide a resource for **JIC stakeholders** to reference the key debates in public dialogue around science and innovation, in a quick, easy to digest way.

This short review brings the dialogue providers and JIC stakeholders to a shared understanding of current thinking, and ensures that our dialogue project builds on the substantial body of work conducted in the sector over recent years.

We sampled documents and identified a series of relevant themes within them pragmatically; based on our previous knowledge. This is not an academic review of all the relevant literature. An initial list of sources was compiled via suggestions from Ipsos MORI and added to in conjunction with JIC, BBSRC and Sciencewise. Further sources were then 'snowballed' throughout the research using an iterative approach, including sources which became available during the process (for example notes from an LSE seminar, a Science & Technology Committee report on GMOs and associated blogs). We have also drawn in themes and relevant comments from the JIC study's scoping phase which includes a Researcher Day with JIC staff, an initial meeting of the study's Advisory Group, and an initial brief scoping of social media.

This short paper is structured by relevant theme and its implications for the current study. The themes are

- Public responses in dialogue to emergent science and technology - moving on from what we know
- Food security;
- Sustainable agriculture;
- GM foods;
- Antibiotic resistance.

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3	Global Food Security Programme – Exploring public views	Global Food Security Programme/ TNS	2012	http://www.foodsecurity.ac.uk/assets/pdfs/gfs-exploring-public-views.pdf
4	Public views on strategic priorities for Basic Bioscience Underpinning Health	BBSRC/ Ipsos MORI	2012	http://www.bbsrc.ac.uk/web/FILES/Reviews/1211-bbuh-public-dialogue-report.pdf
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Findings

Science and Technology dialogues; what characterises public views and expert views?

In addition to specific reports on particular dialogues, this review has looked at studies which seek to draw out common learnings from dialogues over recent years. These include the 2013 review of learnings from Research Council dialogues, and the 2011 report on Science, Governance and Public Engagement, both conducted with at least co-funding from Sciencewise. Evidence from a few years earlier is found in the Public Perceptions of Agricultural Biotechnologies study, which reports on a significant qualitative project across Europe in 2001. The authors ran international focus groups on public responses to GMOs and contrasted this with interviews and desk research on the views of stakeholders and policymakers, to come up with an assessment of the differences in views in the GM debate.

In addition, very recently, Melanie Smallman (ex-Dialogue and Engagement Specialist for Sciencewise) has been researching for a PhD at the London School of Economics. At a LSE seminar in February 2015 she outlined her emerging findings; she has looked at Sciencewise dialogue reports over a ten-year period and uncovered some distinctly different public, expert and policymaker discourses around the framing of science and technology issues in dialogue. (She has called these different discourses "socio-technical imaginaries"). This research is not yet published, but we have been given permission to include notes from the seminar in this analysis.

The basic public response themes in dialogue are detailed below, along with suggestions for how the JIC dialogue could investigate these viewpoints and uncover further learning, rather than asking the public to rehearse the same positions.

Before describing the responses, we should point out that the studies we looked at all mention the way in which the framing of dialogue questions conditions response. Participants are usually asked to assess drivers and barriers which would persuade them to, or prevent them from, supporting some kind of scientific research or application. This framing tends to lead to dialogue reports which give *conditional support for new technologies* and go on to *detail the conditions which would need to be met*. This means that public responses to science dialogue are often broader responses to the issue of *governance* of new technologies (2); the public set their opinions of science in the context of their opinions of wider issues of how to safeguard public goods and minimise future risks. The public also bring to bear their lived experience of working with regulatory bodies, governments and business to colour their assumptions about how such governance would work in practice (8).

1) The public want to know about the purpose of research in order to give or withhold support

The public always ask about the purpose of research – who benefits, whose agenda does it serve, and what societal needs does it address? in order to have a view on its value. Hence, dialogue reports tend to call for innovation processes to be informed by social values, not only by what is possible scientifically. (1). The public desire to see research focused on clearly articulated societal needs. (2). Research presented with less obvious practical implications tends to be seen as less of a priority. (3).

For future dialogue, then, it would make sense to include information on the purposes of research. This presents a challenge however. Some dialogues ask views on basic or blue skies research (this current dialogue, and, for example, the BBSRC dialogue on basic bioscience underlying health). Dialogues can

be challenged for linking basic research to beneficial social outcomes too directly as this biases public views ("This will definitely cure cancer / decrease global warming - now do you support it?"). On the other hand, it is impossible to give the public a sense of the meaning of research if it is not placed within any wider narrative of scientific discovery.

In this dialogue we suggest we explore some of the uncertainties around doing 'blue sky' research and ask the public how they feel scientists should justify and consider different approaches to scientific discovery. Suggestions from our JIC Researcher Day included describing applications of research in terms of long term and short term, rather than describing research as either basic or applied, and this terminology should be explored.

Also, in the Advisory Group's initial meeting for this project, one member gave the view that even basic scientific research hypotheses contain "an implied future"; that there are social goods implied in the construction of even basic research proposals. We suggest that the JIC dialogue should pick up on any social or ethical issues mentioned by participants and ask what relevance they feel these should have to the scientists when deciding on the areas of research they should focus on.

For example; should JIC scientists simply concern themselves with what the science does, or with the potential uses of the science? If it is important that they consider different impacts of their work on the world, at what stage in the process should they do this? How do they demonstrate they have done this? How satisfied are the public with different levels of uncertainty about what effect the science might have in the world?

A key question that the public wanted scientists to consider previously was "How do you know you are right [when approaching a new way of doing something, or taking a new technology to the next stage]?" (1) We can ask the public: should JIC scientists ask themselves this question? What forms of evidence should the JIC scientists draw upon to make their assessment?

2) Capitalism is inevitable, useful, but needs to be checked

The public assumes that business will be involved in scientific processes. They assume business serves its own interests, and that the profit motive is inevitably in tension with public good (5). Therefore there is usually a call in dialogue for the role of business in driving new science and technology to be scrutinised, and if necessary, counterbalanced with regulation.

While business participation in research is broadly welcomed, society as a whole, not business, should set public research agendas (RCUK dialogue review) and there is a fear that by 'getting into bed with business' innovations are being taken in directions less beneficial for society (1). In food and biotech government is too close to the interests of industry so can't be trusted to act in the public interest (6). There is also concern that food technology patents could create monopolies and leave people dependent on the West. (1). This issue was considered worthy of a deeper dialogue. (3)

In this dialogue, the public will likely want to discuss tech transfer of new agricultural and medical solutions and how commercial interests can be balanced with scientific and social ones. We will need to explore how far the public feel it is the responsibility of scientists to consider these issues, and for the work JIC does, how far commercial and scientific issues are felt to be in tension.

It will be helpful to clarify what is up for discussion; for example, JIC could build into its strategy an overall greater or lesser focus on working with business; is this decision within the remit of the public dialogue to discuss?

Participants in dialogue also tend to ask for cautious and "incremental" solutions to societal challenges (2); they are less likely than experts and policymakers to consider the benefits of science to the economy and do not tend to bring up issues such as the value of being first to market with innovation (9). We may need examples of how science can create wealth, but will need to take care that we are not presenting as axiomatic that research always creates wealth, or that its purpose is primarily economic.

In some dialogues, also, there is a theme that participants are concerned by the pace of scientific development. (5) They worry about the implications of this for ethical and regulatory oversight, and the possibility of development diverging from what was considered in advance. (6).

3) Governance is needed, but might well go wrong

There is often a call for regulation to go along with science, as the public believe anticipatory regulation of emerging technologies should be considered simultaneously with research and innovation. (2). The Science Governance review also claims that the public lack trust in government to act in the public interest (see comments on the role of business, above).

An additional subtle point from dialogue reviews is that the public may not trust regulation to work as intended. The public draw on their lived experience and "empirical lay knowledge" to assert that governance mechanisms are often likely to fail, due to human error, mismanagement or corruption (8). In addition, the regulatory failures around issues such as BSE are not seen as unusual outliers, but commonly expected behaviour from institutions which regulate. (8) This means that public participants will not automatically accept assurances from experts quantifying and minimising risks, and will want the precautionary principle to operate where possible.

The PABE report asserts that the public are happy with a modicum of uncertainty around future outcomes, but that trust is eroded when governments and others simply deny the uncertainty is there. Given the recent strong claims from government that the risks of GM are minimal (10), it will be useful for this dialogue to explore what kind of governance is needed around research and who should be responsible. What kinds of risks can be lived with, whose views on risks are believed, who should judge – and what is JIC's role?

We will have to ask about public views of likely outcomes from new research, and how they feel these outcomes might play out in complex social and political contexts where decisions are not always made based on the best scientific evidence.

4) Fairness and equity of outcomes is important

There is a desire to see equitable distribution of potential benefits and potential risks. (2). The public are concerned that benefits of research will be distributed both in the UK and globally. The current dialogue can use case studies to explore the potential for research to meet needs both in the UK and elsewhere.

5) Nature is at odds with scientific development

In general, the public value 'naturalness' and are sceptical of the value of high-tech solutions to complex social and environmental problems (2). For example, synthetic biology is regarded as scary due to

concerns about the release of synthetic materials into the environment, and some believe artificial entities have less intrinsic value than natural ones (1). This topic was seen as disruptive and highlighted as worthy of further investigation. (3)

A continual reference to a world of natural things which are in some way compromised by new science is a feature of most science and technology dialogues, and can be said to be a key public discourse. The public see the natural world as a complex unpredictable system, with rules of its own (9), and which is changed at our peril. A similar axiom is that most new technologies inevitably have some unknown consequences (9) and so even when scientists assert risks in science to be minimal (10) the public find this hard to accept and support precautionary principles. In the geoengineering dialogue it was necessary to explain to the public that the status quo for agriculture today does not, in fact, represent a 'natural' world which has not been affected by human agency, and this may be relevant also for the JIC dialogue. It seems from previous dialogue that participants always need some time to explore this view in order to consider new technologies in detail.

Advice for JIC:

Most of the reports also stress that it's not just what happens at the dialogue which is important – it is how the learning is taken on by the dialogue owners. Being present at the dialogue and engaging first hand tends to create the most significant shifts in attitude among clients.

Discussions of individual behaviour and responsibility are important. For example, topics which shape individual rights, the right of government to intervene in personal choices, consumer behaviour and how to promote behaviour change have all been suggested. (3). Other dialogues have helped find out more about underlying values in terms of individual vs collective responsibility. (11).

In this case, a need to understand what's fairer on a global scale, given there are uncertainties about the potential results of different agricultural or medical practices.

There is some research which suggests that it is important to the public for dialogue to come as early as possible in the process. Dialogues should start with a problem to address rather than presupposing solutions like food tech or pitting one food tech/system against another (3, 10) but also needs to not simply present technical solutions as the only ones.

Where dialogues are concerned with innovation the public want to be involved throughout the pipeline of innovation, from the lab to consumer products (1). In addition quantitative surveys have found that the Government should act in accordance with public concerns about science and technology, however the same survey found 45% agree that 'politicians should put scientific evidence above public opinion when making decisions'. (7)

There also needs to be a structure for feeding back to the public (11).

Process questions

A quick fire look at a lot of different issues can be beneficial. It provides spontaneous views on a range of topics which can help engage participants with the dialogue process (11) – therefore case studies can be beneficial.

Being practical and concrete: Dialogue participants may struggle where topics are abstract. Issues should therefore be framed so they are relevant, but not oversimplified (11). There needs to be focus on the purposes of research (3) and on value for money (2)

The rest of this report looks at potential responses to specific issues and suggests how we might use this as a jumping off point in the JIC dialogue.

Food security

Feeding a larger and wealthier population is a salient issue for the public regarding their future involvement in the policy making for emergent science and technologies (11). There is thought to be a tendency for too much focus to be placed on the supply side of this solution though and previous public dialogues have found the public deeming solutions from the demand side of things, such as behaviour change, to be vital too. There is a feeling that innovation alone will not solve the problem (3).

Some of the public were concerned about how increasing competition for land use with things such as biofuels would impact on food security (1). This reflects the general public's concerns with being out of touch with quickly developing technology across a broad range of areas and an acknowledgement that choices will need to be made between areas for development along the line. The public have often expressed a desire to be involved in the directing process from a very early stage and to see choices of technological development being informed by 'social values' rather than simply what is possible and profitable with new technologies.

The FSA's strategy report established safeguarding the future of food as a priority for the Government. In particular, consumers were concerned that food production and the food chain should not become so complex that it becomes impossible to access natural, local food without a price premium. It was also thought that the British farming industry should be protected as a consideration of future developments, and raised concerns as to the environmental impact of food production. (12)

Very little is known in the public domain about food technology. (12) The public acknowledge that there are likely both benefits and risks within the domain and concluded that thorough testing was vital. It was not specified what the public deemed as 'thorough', however. In-keeping with a theme across this paper, there was explicit concern about moving away from the concept of 'natural' food production processes.

Implications for the dialogue:

- Situate technological food solutions in the context of others (e.g. demand side)
- Discuss different ways to value environmental goods (the land use debate)
- Explore the perceptions of 'naturalness' and point out the ways that technologies have shaped landscape and agriculture for many centuries.

Sustainable agriculture

The public expressed concern about a reactive approach to problem solving not addressing underlying issues and causes. In particular this was discussed in the context of bioremediation, though this attitude could have resonance in other areas for discussion. (12)

There was a disparity between discussions on domestic and global issues, with the public finding domestic issues easier to discuss. A theme through this research has been that discussion topics need to be relevant; participants in dialogues have struggled to engage with more abstract topics or issues conceptually further away from their lives. Thought should be given in development of this public dialogue that common frames of reference and anchoring points are necessary to engage the public. Global issues were easier to discuss as consequences of local choices. (3) However, some issues do need to be seen on a global scale to be appreciated and so stimulus material which puts the global perspective should also be included.

GM food

GM food is thought to be an area clouded by partisan debate, resulting in a lack of trust in information from the public. As an issue that is highly politicised, GM dialogue needs to be treated carefully (13): people are often already coming at a discussion with strongly held opinions. However there is also evidence that suggests that members of the public whose views are ambivalent are also important to include. (8)

The issues about dialogue as a whole are particularly relevant to the issues around GM.

As such, GM dialogue is a dialogue about uncertainty. Policy makers and government need to be the 'other half' of dialogue into GM. Due to the sensitive nature of conversations, the purpose of the discussion should be clear and the tone open and honest – what commitments have already been made? What decisions will the dialogue inform?

Scientists also feel frustrated about public opinion holding back work (13). One scientist summarised this view – "We don't know what they are going to do with us".

> *When GM was the big news issue, it was characterised as being a debate about risk: 'is this food safe?' However, one of the headline findings of the report is that food safety is in fact a bit of a sideshow. More important are the huge technical and social uncertainties about the implications of the technology for the environment, for societies and economies. Those aren't resolvable by science, they are often poorly defined and are contested. But it's those issues we should be focusing on.*
>
> Jack Stilgoe

Smallman's discourse analyses demonstrate that for the public, social and ethical issues are always seen as an integral part of the question of whether and how technologies should be progressed. For policymakers and experts, however, these issues are often seen as questions of public perception, a separate 'problem' to be overcome. Calculating the social purposes or outcomes from science is seen as different from assessing the risks or benefits of doing the science. (5) The PABE report goes further, warning that scientists and experts tend to believe that any differences of opinion between experts and the public (about GM) arise from the public being misguided, ill-informed and not including the 'right' evidence in their assessment of risks and benefits. The report suggests that controversies between

public fears and scientific reassurances can be beneficial, as they can help to construct a 'societal technological assessment' which can even surface issues with the development path of the technology which might not have previously been apparent. (8) This dialogue, therefore, should ask the public how public fears and concerns can be taken on board, even if the scientific community arrives at a scientific consensus that GM products are no riskier than alternatives.

A new parliamentary report suggests a move to a trait based regulatory system for crops as is the case in Canada, rather than the current process based system. This is something we can explore in this dialogue (if there is time) to understand public views of these two systems. (10)

Antibiotic resistance

There were few examples of antibiotic resistance being used as a dialogue topic and therefore limited evidence to work with. Research suggests that it is not immediately obvious to the public why this topic is important. (14) Implications for the dialogue are that we should help the public to understand its importance.

Pace of advancement

The public do not necessarily support scientific funding for health. Some say that they already know how to live healthily therefore improving health does not necessarily require further scientific advancement, seeing it as an economic and social issue, for example as cost is a big driver of what people eat. BBSRC funding should reflect this. (4)

Summary: prompts for discussion

- Include facts about public views of GM in background presentation (from PAS; on advice of advisory group to use social science evidence alongside other evidence)
- Give information on purpose of specific research activities but in context of pros and cons
- Describe applications of research in terms of long and short term benefits rather than basic vs applied, while also acknowledging the uncertainty of longer term research to bring social benefits
- Should JIC scientists simply concern themselves with what the science does, or with the potential uses of the science? If it is important that they consider different impacts of their work on the world, at what stage in the process should they do this? How do they demonstrate they have done this? How satisfied are the public with different levels of uncertainty about what effect the science might have in the world? How do JIC scientists know they are right about their assessment?

How far is it the responsibility of scientists to consider the role of business in science? How much should JIC consider the pace of change? This should be explored via case studies.

Appendix B: Stimulus materials

Case studies of JIC's work

Nitrogen fixing

All plants need nitrogen to grow. That's why most crops are treated with fertilisers containing nitrogen.

Legumes such as peas and beans can "fix" nitrogen by interacting with certain bacteria.

This helps them grow without fertiliser.

JIC is trying to discover how to make wheat which "fix" nitrogen.

Issues to consider

- In Africa nitrogen is the main problem for crops. Farmers can't afford fertilisers and their yields are low and variable.
- Nitrogen fertilisers damage the environment. Developing nitrogen fixing crops is intended to improve yields without this damage
- Some say rotating the crop with a legume crop is a better way to improve the soil; others say poor soil in Africa might make both N-fixing crops and legumes less useful.
- Some argue that the results of developing new crops are unpredictable. Altering wheat and maize this way might leave them susceptible to other pests and diseases, or it might not increase yields; but we just don't know yet.
- Research is in early stages. Large investment of money and time needed to create nitrogen fixing maize and wheat crops. Is this the best use of money and research attention?

Resistance to potato late blight

Blight is a major problem for potato farmers and caused the Irish potato famine in the 1800s.

It's caused by a fungus. Farmers spray a potato crop with fungicide 10-20 times per year to control it.

Scientists have introduced genes from a South American wild relative of potato into commercial potato varieties. This will help our crops recognise and resist blight.

In a three year trial the modified potatoes were compared with non-GM potatoes – all the GM plants remained resistant for the full 3 years, but the other plants were all infected.

- The new varieties will reduce the need for fungicides. This should save money, reduce chemical use and reduce greenhouse gas emissions caused by making the fungicides.
- The GM blight resistance genes will not be introduced into all varieties. The blight may evolve to overcome these resistance genes, and then farmers would need to start spraying again. Would it be better to invest in a wider range of potato varieties through conventional breeding?
- Current blight-resistant varieties are not the ones chosen by big potato users (e.g. chip manufacturers).
- Blight resistance genes that work in potato also work in tomato which is also susceptible to blight

Higher yield wheat that resists rust

Rust is a disease that affects wheat. It can mean up to 70% of a crop is lost, or even 100% if the rust occurs early in the growing season.

JIC researchers are studying the rust genome to understand how infection happens, and how the disease has evolved over time.

They hope to identify which genes help wheat resist rust. With this knowledge they will be able to breed new varieties of rust-resistant wheat.

Issues to consider

- Over 800 million people worldwide are undernourished, including 20% of the African population. Improving wheat yields will help the world's poorest have enough to eat.
- Resistant wheat will reduce the need to use fungicides which could help the environment.
- Creates more price stability- currently growers in the developing world can't afford fungicides so harvests are unreliable, and prices are affected
- If the rust-resistant wheat is developed, the seeds could cost more and this might affect growers in the developing world.
- It will also mean large companies control more of the seed market globally and can charge a premium for rust resistance whether or not it is needed.
- It may also lead to farmers abandoning a wider variety of crops which could create problems for biodiversity, possibly leading to new even more deadly varieties of rust.

Purple tomatoes

Researchers have introduced a gene from a snapdragon plant into tomatoes using GM. This gene makes the tomato make much more purple pigment called **anthocyanin**. Similar compounds are found naturally in blueberries and cranberries.

Early studies show several possible health benefits, such as slowing cancers in mice. The researchers hope the tomatoes will have benefits for humans.

Other issues to consider

- Tomatoes are popular, versatile and cheap, but some people argue that we should simply eat more blueberries, blackberries, Heritage purple tomatoes already exist with anthocyanin in skins (though the new tomatoes contain more of it)
- A Canadian company has produced juice from the tomatoes (the EU restricts the development of GM products) – this has been allowed without further toxicity tests due to differing regulations in Canada.
- It is possible to produce antrocyanin-rich purple tomatoes without genetic modification, but they have less than the new tomato (which has as much as blueberries do & could be cheaper than blueberries)
- There are already lifestyle choices which can lower the risk of cancer and some argue that 'cancer beating' products might distract our attention away from these.

Finding the 'recipe' for a leaf shape

Researchers are modelling leaf shapes to help understand how they are formed. They make a simulation of the cells dividing and expanding as they grow. They try to understand how the activities of millions of leaf cells add up to make the shape of a leaf.

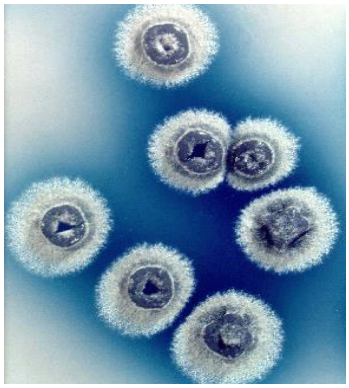
They have found that plants have an inbuilt system to sense direction. This is a pattern of molecules which helps the leaf 'understand' which is the base and which is the tip of the leaf.

This pattern forms early in growing leaves and guides the activities of cells to make the right shape.

Other issues to consider

- Research like this helps us trial how we can use computer and mathematical models to help us understand really complex biological processes. But it doesn't give us a quick result (e.g. a new crop, product or result which can make money for the UK or taxpayer). Therefore, should we be investing in this when there are other problems in the world which are more pressing?

Making antibiotics from Streptomyces



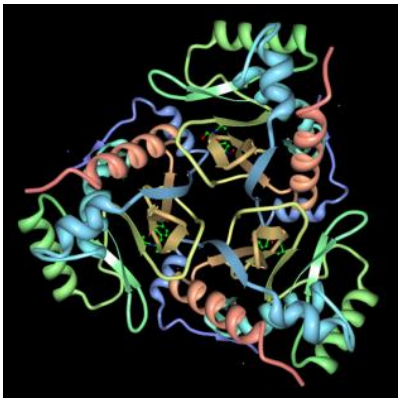
Streptomyces are bacteria that are found in the soil. They make antibiotics to compete with other bacteria in the soil, and we make over half of our antibiotics from these bacteria.

Antibiotics were first developed from Streptomyces in the 1940s. Streptomycin, isolated in 1943, was the first antibiotic that could be used to cure tuberculosis (TB).

JIC is studying new strains of Streptomyces to understand how they produce antibiotics and other valuable products. This will help produce new types of antibiotics and other products.

Other issues to consider

- The initial discovery was 'curiosity-driven' science which had a big impact – should we be focusing on similar research today?
- There is a high investment required to turn this research into new antibiotics and pharma companies may prefer to get a higher return from heart disease or cancer drugs. Who should fund this type of research?
- We need to reduce antibiotic use in farming and human medicine alongside trying to create new antibiotics. Where should we focus our attention?



Producing vaccines more quickly

Researchers have invented a new way of producing ten million doses of a vaccine within 90 days.

This uses plants as growth incubators for the vaccines (rather than eggs, which are often used, and which take 9 months to create the same quantity).

This is useful as some vaccines need to be produced quickly, for example in response to epidemics.

The system has been licensed to commercial partners, and one is already using the system for to develop vaccines commercially for swine flu.

Other issues to consider

- Some argue that using plants is more ethical than animal products to develop vaccines (though all medicines are still required to be tested in animals at a later stage of development)
- Some want the benefits of UK research to stay in the UK – is it more important to retain licences in UK or get vaccines made more quickly?
- These new vaccine processes might make vaccines cheaper for developing countries
- New ways of developing medicines would still need to be tested as ‘new medicines’ – which would be costly.

Anti-cancer drugs from yeast

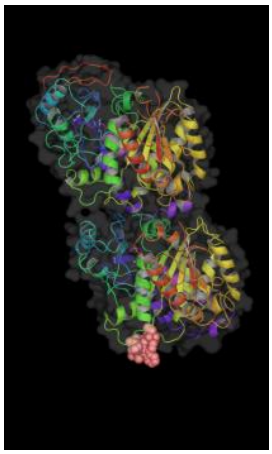
The Madagascar periwinkle produces **Vinblastine** naturally which is used to treat a variety of cancers. However the compound is produced in very small quantities so extracting it from the plants takes a lot of time and money.

JIC researchers have produced a compound called **Strictosidine** in yeast. This is a halfway point to compounds like **Vinblastine.**

Normally yeasts struggle to produce large amounts of these compounds. The researchers have solved this problem by adding in genes from other organisms so the yeast produces 8 times as much.

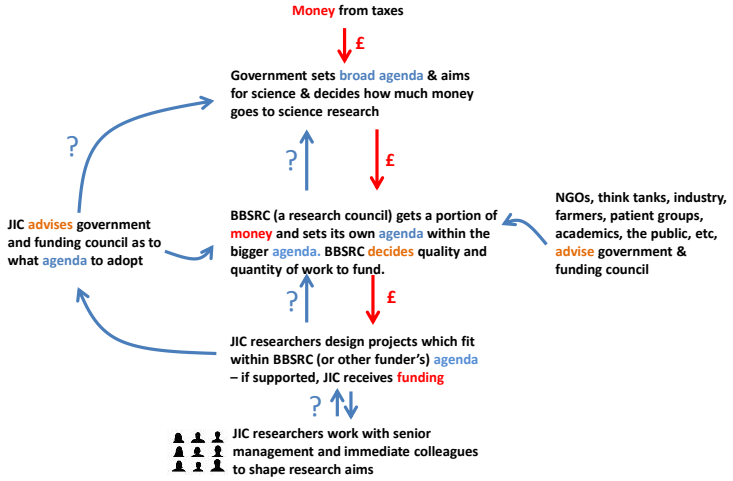
Other issues to consider

- This includes genetic modification of organisms. Are the public happy to use medicine which comes from GM processes? Many medicines already do, for example insulin.
- Drugs are costly. The yeast work offers the opportunity to lower cost, and to test new and potentially better versions of drugs.



Science funding handout

How does science get funded?



Uncertainties presentation

Feeding the World - choices and challenges

- Global population 2050: 9 billion (up 35%).
- Now I billion overweight people and 1 billion malnourished.
- We use 40% of the earth's land for agriculture, and food demand is going up, along with demand for housing, cotton, biofuels…
- We have to preserve clean air, water, soil, biodiversity…

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Balancing high yields with preserving biodiversity

Different farming systems across the world; sizes, technologies, soil and climate, types of food produced,

Political and economic issues and regulation play a part

Some forms of farming create high yields, but also degrade farmland in the long term

Choices and challenges

How to produce high yields of crops to feed the hungry?

How to make sure that we keep land productive for the future?

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How to protect crops against pests and diseases?

Pesticides and herbicides control weeds, insects and diseases, and fertilisers increase yields.
Chemicals today are generally safer than those in previous generations and are often used as a part of **integrated pest management**.

Without any pesticides, our crop yields will go down (leading to lack of jobs in UK). But - we need to make sure chemicals are safe for humans, birds, bees and the environment in the long term.

- **Monoculture and intensive** farming create high yields but need chemicals
- **Precision** farming uses technology to help use chemicals as carefully as possible.
- **Organic farming** includes diversity of crops, restricting pesticides (but currently only provides 1% of UK food)

Choices and challenges: How do we reduce chemical usage while still feeding everyone?

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Can we change our diets?

There is a growing demand for products such as meat and dairy which take a lot of resources to make. It takes 7kg grain to produce 1kg beef

Diet is connected to our culture. For example, the rising middle class in China are keen to eat more pork, while in the UK the trend is (just) moving away from meat

The world relies on 3 crops, maize, wheat and rice, for half its food, and diets are becoming similar across the world

Choices and challenges:

Will diets become more 'Western' (high protein and sugar) or will other trends take shape?

Should we develop new alternatives to meat? (insect or algae protein?)

How do we balance our desire for meat with its effects on the environment?

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How to adapt to and prevent climate change?

Climate change affects farming

Less rainfall and higher temperatures in the US corn belt

Drought in sub-Saharan Africa, floods in the UK…

Temperature changes alter seasons and flowering time of crops

Farming affects climate change

Agriculture accounts greenhouse gas emissions, for example it is the greatest producer of methane

Meat and dairy produce the most

Fertiliser manufacture is also a major cause of emissions

Choices and challenges

How to farm in a world where climate is changing

How to reduce our emissions from agriculture

How to make sure we protect the poorest from the worst effects

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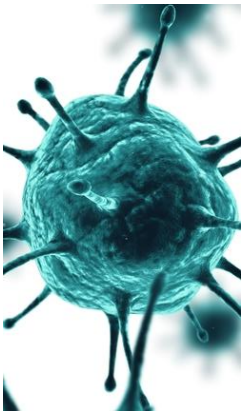
Antibiotic resistance



Half of all antibiotics in the UK are given to farm animals, about 315 tonnes per year

Bacteria can become resistant to these antibiotics

Also some pass through the animals and enter water and soil in an active form

This can contribute to resistance in human infections like salmonella, E.coli

Choices and challenges:

How can we protect humans and animals from disease and balance this with the kinds of diet we want to eat?

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How to deal with loss and waste?

The world's reliance on maize, wheat and rice for half its food means that if prices or harvests change, there are big consequences.

15% of China's rice harvest is lost due to poor storage, transport and inefficient processes

A quarter of food brought in Western countries is thrown away

5.3 million tonnes of still-edible food is thrown away each year in the UK, partly due to confusing 'sell-by' or 'use-by' date labels

Choices and challenges:

How should we tackle the problems of disease and crops being lost before and during harvest?

How should we tackle the problem of waste – by consumer behaviours or through technologies, or both?

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- We use 40% of the earth's land for agriculture, and food demand is going up, along with demand for housing, cotton, biofuels…
- We have to preserve clean air, water, soil, biodiversity…

Increase the amount of food?

Deal with loss and waste?

Change the way we distribute food?

Deal with disease in animals and plants?

Change the way we farm?

Adapt to and reduce climate change?

Change diets?

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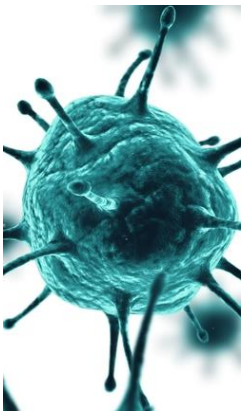

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Welcome presentation

Welcome!

The John Innes Centre

- JIC is an independent, international centre of excellence in plant science and microbiology
- Funded by
  - UK Biotechnology and Biological Sciences Research Council
  - others eg. Bill and Melinda Gates Foundation
  - European Research Councils
- As a charity, JIC must carry out research in areas that contribute to human health, food security and industrial biotechnology.
- The Centre is deciding now which projects to plan for 2017- 22…

John Innes Centre
Unlocking Nature's Diversity

BBSRC
bioscience for the future

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And we need your help to inform the 2017-22 Strategy

"How should the John Innes Centre's research meet the challenges we face in the future when it comes to food and medicine?"

- What should the John Innes Centre be trying to achieve in the world?
- What values and principles should JIC draw on when designing research projects?

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About the dialogue

- In Norwich and in Birmingham …and an online group, later on
- We prepare a report which you can see and comment on
- The dialogue is evaluated

Who's here?

- Facilitators and note takers from Ipsos MORI, Scientists from JIC, Evaluation team, You!

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How the event will look

- **Learn about** what JIC does and talk with scientists
- **Discuss** the challenges facing the world when it comes to food and medicine

and tomorrow

- **Explore** some examples of JIC's work (again, with scientists)
- **Discuss** ideas for different strategic decisions
- **Make recommendations together** for values and principles

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Housekeeping rules

- Everyone can have their say
- Everything you say is anonymous
- Please turn off mobile phones
- If something isn't clear, ask us!
- Lots of breaks (on Friday and Saturday)
- Have fun!

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About the John Innes Centre

JIC's Mission……Using

- **Generate knowledge of plants and microbes through innovative research**
- **Apply our knowledge of nature's diversity to benefit agriculture, the environment, human health and well-being**
- **Train scientists for the future**
- **Engage with policy makers and the public**

Microbiology

Cell biology

Biochemistry

Molecular biology

Genetics

Computational & mathematical biology

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4 Institute Strategic Programmes

Growth and Development Underpinning Yield
Food security

Biotic interactions for crop productivity
Living with environmental change

Understanding and Exploiting Plant and Microbial Metabolism
Healthy ageing

Wheat Improvement Strategic Programme
Food security & Living with environmental change

John Innes Centre

BBSRC

The type of research JIC does…

Typically very early stage - "**basic**" or "**blue sky**"

Sometimes with an aim in view, sometimes just to find knowledge

Over time, **basic** research can be **applied** to understanding a problem in more detail..

Some avenues never lead to useful outcomes

Over time some **applied** research is **transferred** into making new products, medicines or crops.

Benefits can take **many years** to be realised
We can't always draw a direct line between basic research and eventual outcomes

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Key question for today

"How should the John Innes Centre's research meet the challenges we face in the future when it comes to food and medicine?"

- What should the John Innes Centre be trying to achieve in the world?
- What values and principles should JIC draw on when designing research projects?

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Ethical challenges perspectives

"Are scientists focusing on the right challenges?"

"So we have a problem with not enough nitrogen in the soil, and too much nitrogen in waste. Growing plants that fix nitrogen is not the only way to solve it. I expect businesses would like scientists to focus on this because it's likely to lead to new, high-yield seeds to sell, but scientists should have a wider agenda.

Publicly funded scientists should look at ways to increase all mineral nutrients in the soil, or ways to recover nitrogen from waste and put it back into the soil; not just about fixing nitrogen in the plant.

If scientists don't think about the wider issues of soil nutrients in the long term, they might end up making matters worse".

"I am concerned about who benefits from any new technology"

"Scientists need to think about the products that their research might eventually lead to, especially if products are made with new traits (either from GM or conventional breeding).

If a new seed product is sold to farmers, the farmer might not be able to go back to the varieties they had before, because of cross-contamination. So the farmer ends up in a long-term relationship with the seed producers , the fertiliser and weedkiller makers. These companies end up with all the power. Who's to stop them charging high prices?

Scientists have to think about whether their research is likely to lead to one-size-fits all crops, promoting monoculture and owned by big companies.

Scientists have a duty to use public money to give local people, especially farmers in the developing world, more control over their own food supply. They could help create programmes of shared open-source experiments and crop breeding, to help farmers find the right solutions for their local conditions".

"There's no harm identified from GM, but that's not the same as knowing it's safe"

"Even if we cannot identify what harm GM crops may cause, harm still might be possible. Scientists don't know everything about how every gene works in a plant. Perhaps we have not looked enough at the lifetime consequences of eating GM in humans and animals. We should go very cautiously and wait before we let scientists use these new techniques.

Who would pay for any damage if people or animals were harmed by new technologies?

I believe we should think about this for both food and medicines."

"We should change our diets"

"Scientists should be focusing on how we can change our behaviour – finding ways to stop waste, help change diets, help distribute food better. We might still need higher yield crops, but we should put our public money into looking at waste first".

Appendix C: Day plan for dialogue events

Friday Evening	Session & key question covered	Exercises and materials (materials highlighted yellow)
7–7.50pm	Introduction to the day and warm up exercise	Fill in initial questionnaires (10 min) PLENARY presentation • Aims of the dialogue and plan for today and tomorrow • **"How should the John Innes Centre's research meet the challenges we face in the future when it comes to food and medicine?"** Brief introduction to the aims of the dialogue • Ipsos MORI team and other experts/observers/evaluators intro themselves. Housekeeping. • Some information about JIC presented by Ipsos MORI and Steve R. • Initial questions about JIC – spontaneous. May be parked for later (add to flip chart) • Could include – questions about the 4 ISPs, about basic vs applied research, JIC's aims… *NB objectives left up on posters around the room*
7.50 – 9.00	**Challenges faced by the world** Gather spontaneous views of the challenges and uncertainties, gain a sense of priority, get responses to the key challenges and choices	SMALL GROUPS: IN PAIRS picture sort: how do you feel when you think about science? *Introduce all and get everyone talking* Refer to aims and objectives again: (7.50- 8.20) **What do you think are the main challenges we face when it comes to food and medicine in the future?** Gather information unprompted first. Each group collects on flip chart. • Are you thinking of a 10 year, 20 year horizon…? • Whose responsibility is it to address these challenges? • What can scientists do about these challenges? (8.20- 9.15) **Handouts of challenges slides. Facilitator presents the first slide (feeding the world) then others. Groups discuss each in turn.** • Any surprises / misunderstanding / need more info? • How important is this issue to you, and why? • How do you think we should meet this challenge? • How can research, (funded by the public sector), address these challenges? • What should public sector research NOT do (i.e. what's someone else's responsibility – and whose is it?)

		• Should the public have a say in how this problem is addressed? • Lay out all 6 and compare; most urgent, most important, most relevant to you
9ish- take break if necessary		
9.15- 9.30	Summary	PLENARY (10 min) From each group, a presentation of the issues you think are most important. Which ones do you think JIC should concern itself with? Why? Who else should take responsibility for addressing these? Explain that tomorrow we will be looking at more details of the kinds of work JIC does, and giving our views on **what researchers should consider when they are developing research projects.**
EVENING BREAK – take information home to reread BRING IT BACK TOMORROW		

Saturday	Session & key question covered	Exercises and materials (materials highlighted yellow)
10am – 10.40	Revisit objectives and more info about JIC	INDIVIDUAL post it exercise to warm up • Find a partner from the other group and share thoughts about last night • Write on a post it (one each) the issue that <u>you</u> think is most urgent to address – the thing you are most concerned about, after hearing about it • We have a 'washing line' on the wall – one end is "Science can help us solve this problem" the other is "Science can't help us solve this problem" • Participants place the post it in the right place on the line PLENARY • brief discussion – what thinking lies behind your positioning? • Summary of any questions they asked last night and how we hope to answer them today PLENARY Handout on funding **Steve** talks about how JIC gets funding, how it makes decisions on what research to support; making the point that there are

		recruitment decisions to be made which should support JIC's underlying strategy. We will come back to this later.
10.40-11.00	GM answering questions & collecting views –very brief	SMALL GROUPS • Present GM handout (plus any extra info tbd) • Questions, comments • Implications for JIC (NB can do this later if not required early in the day)
11.00 11.25	Scientists discuss own work	SMALL GROUPS On each table the scientists go through their own projects, how it fits with JIC's wider remit and how decisions were made about their work How well do you feel this work meets the challenges of the world? Tease out any misconceptions about the way research is done or funded The role of basic research in science At the end – any changes to what you think JIC should prioritise in terms of recruitment?
11.25-12.30	Exploring research which JIC does – in order to understand public's principles	SMALL GROUPS Showing the case studies one at a time. Rotate order of presenting each theme between the groups; talk about each one and then about each theme as a whole. For each case study: - What seems appealing, interesting? - Anything confusing? - Any concerns? - Who would this benefit? - How could this science be put to use in the way that would do the most good? - What future social changes might this bring about? *Background – instructions to facilitator – these questions gets at the possible future consequences and the social futures that these areas of research might bring about. These aspects are fundamentally important. Please probe on issues of their purposes, control, ownership, regulation, distribution of risk and benefits, how they will be implemented; how fair might the potential social changes prove to be, or otherwise. Who stands to win or lose?* Specific questions: Nitrogen fixing How important is this in solving world problems – and should JIC be considering this How does this contribute to sustainable future – how should JIC scientists consider the unintended or long term consequences? How risky is this – what kinds of risks are they (scientific, social, political, economic…)

		How far should JIC commit to investing in this research frontier when there are many uncertainties? GM slippery slope - is developing one trait through GM likely to lead to a world of farming where we are having to use more GM crops in future – do the public mind? And should JIC scientists consider this? Potato blight Potatoes are a crop particularly relevant in UK and Ireland – should JIC focus its attention here rather than on crops more suited to e.g. sub-Saharan Africa? How should JIC justify the value for money spent on this research? How risky is this – what kinds of risks are they (scientific, social, political, economic…) If the UK market eventually doesn't want to eat GM potatoes could this be a risk of developing them? Should JIC be considering this? How can JIC justify the value for money spent on this research? If there are already conventionally bred potatoes available is the investment on research justified? JIC is producing a research model – the value of this will be affected by whether this is picked up by commercial breeding companies and the food industry. Should JIC consider this when deciding whether or not to do such research? (Or is this a distraction from their real purpose, making research models?) Wheat reducing rust How important is this in solving world problems – and should JIC be considering this How does this contribute to a sustainable future How risky is this – what kinds of risks are they (scientific, social, political, economic…) If commercial producers make rust resistant wheat seeds and sell them to farmers – should JIC think about potential consequences or is that not their role? New wheat from old varieties * if no time can leave this out* How important is this in solving world problems – and should JIC be considering this This is 'pre-breeding' and typically the commercial sector doesn't do this but focuses on developing products at a later stage. Is it important that JIC fills the gap left by the commercial sector? Why/ not? How does this contribute to sustainable future (e.g. how would this contribute to reducing chemical use? Biodiversity? Mitigating climate change? Stabilising food prices? etc) How risky is this – what kinds of risks are they (scientific, social, political, economic…) How far should JIC scientists consider the involvement of business in making their discoveries available to farmers Should we be looking at how to improve wheat production? Or is it better to look to eat other cereals? How about if JIC focused on making tastier or more nutritious wheat? Or low calorie wheat etc? where should be priority? Pod shatter * if no time can leave this out* How important is this in solving world problems – and should JIC be considering this

		How does this contribute to sustainable future How risky is this – what kinds of risks are they (scientific, social, political, economic…) The uncertainty of whether it will spread to other crops – how should this be balanced against the financial and other reasons for doing it? How far should JIC be considering these issues? Purple tomatoes Does the UK public benefit from this research? Is it up to scientists to decide whether or not to make these products? Would you like the public to have the chance to decide themselves or should government or others decide? Should it be up to the public to source foods that will benefit their health (e.g. choosing blueberries) or does science have a role in making these foods more accessible, cheaper etc? How risky is this – what kinds of risks are they (scientific, social, political, economic…) Is it necessary to do this research if healthy alternatives already exist – and should it be up to the JIC to make that decision? What happens if JIC's work stops people choosing healthier lifestyles, is that a risk? Leaf shape How important is it? Who should pay for it? How important is this in solving world problems – and should JIC be considering this How does this contribute to sustainable future How risky is this – what kinds of risks are they (scientific, social, political, economic…) Streptomyces How important is it? Who should pay for it? How important is it that JIC looks at work which could lead to benefits in medicine, vs in food; or should they be focusing on both, or on 'curiosity driven' research which might lead to either? How does this contribute to our problem with antibiotic resistance – what should be the main focus of our attention in trying to solve the problem? What should be the role of business in this? And how can JIC take this into account? Who should fund research like this? Producing vaccines quickly How important is it? Who should pay for it? Should the UK benefit from developing new products from research or is it OK to licence to other countries? How does JIC ensure that the benefits of this are distributed fairly – or is it someone else's responsibility to think about this? How important is it that JIC looks at work which could lead to benefits in medicine, vs in food; or should they be focusing on both, or on 'curiosity driven' research which might lead to either?

		Anti cancer drugs from yeast How important is it? Who should pay for it? Should the UK benefit from developing new products from research or is it OK to licence to other countries? How does JIC ensure that the benefits of this are distributed fairly – or is it someone else's responsibility to think about this? How important is it that JIC looks at work which could lead to benefits in medicine, vs in food; or should they be focusing on both, or on 'curiosity driven' research which might lead to either? How is attitude to GM different between food and medicine?
12.30 – 1.10 LUNCH		
1.10 – 1.40	Facilitator may wish to finish case studies for 10 mins: or finish GM if this has not been covered	Finish case studies Feed back between groups in plenary if this is needed for energy levels
1.40 – 2.15	Summarising ideas from case studies	(1.40- 2.10) MINI GROUPS OF 4 PEOPLE IN EACH • Place case studies on spectrum – which would you say most worth doing? • How are you defining "worth doing"? Discuss why and give reasons • One person from each mini group presents back to wider group – defend your choices • If time – add one more example of a project you'd like to see JIC do which would be "worth doing" (2.10– 2.15) INDIVIDUAL WALK-ROUND EXERCISE • Indicative budget allocation. Individually, you have 10 stickers – represent budget allocation for research next year. Looking at these types of research, where would you place the stickers? You can't just split them one on each case study – and you can't divide them. • Facilitator looks to see which are most stickered and discusses in PLENARY. • Can invent new research priorities or projects to put your stickers on.
2.15-2.35 Small break	Have break and do your stickers	
2.35 – 2.50	JIC recruitment priorities	PLENARY – summarise where the stickers are and any principles which emerged from the group exercise In MINI GROUPS again – JIC can prioritise recruitment (cf handout on funding) depending on what it wants to achieve What would you prioritise to ensure JIC is doing the most important research? What would ensure the most long term excellence and sustainability? Putting cards in order:

		• Maintaining expertise in established areas • Building up expertise in a new field • Diversity of projects and researchers to encourage new ideas from different areas • Saving some resources to respond to new challenges as they occur Table to discuss and present back in PLENARY – facilitator question benefits/drawbacks of different approaches
2.50 – 3.30	Voices from the outside	Ethical challenge roleplay SMALL GROUPS There are voices in wider society which might critique some of JIC's choices on an ethical basis. Here are some that we (Ipsos MORI) have made up (NOT taken from real people) – to illustrate some different points of view. We read through these and tell us how important you think it is that JIC should address these challenges
3.30-3.50	Principles for good governance and openness around research as well as strategic directions	Please develop some principles for how JIC should decide on research in the future SMALL GROUPS then feed back in PLENARY - What would long term excellence and sustainability look like for JIC? - Revisit your priorities for their **recruitment** – anything to add/change? (Overall principles – all eggs in one basket vs spreading bets?) *Prompts for facilitator if relevant* - What's the right **balance** – how should JIC scientists think about sustainability vs increasing yields vs climate change vs food prices vs equality … Who should they speak to, to help decide? - Should JIC be **solving commonly insoluble problems**, and leaving it up to the public to decide if they want to use the science? Or getting involved with questions of how the science should be used? Or should they just be creating knowledge for its own sake? Is that even possible? - Should JIC scientists be thinking about problems of **today**, or 5 years' time, 25, 100 years…? - How should JIC think about the **financial** value of its research (e.g. should it focus on things which can be easily commercialised or stand to bring in most revenue to UKplc or to the science sector) - What else should JIC take into account in its strategy – what have we **missed**? - How should JIC work with the public at all stages of its research?
3.50 - 4.00	Winding up	PLENARY evaluation qaires

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Job Title
Ipsos <Specialism>
firstname.lastname@ipsos.com

Firstname Lastname
Job Title
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About Ipsos MORI's Social Research Institute

The Social Research Institute works closely with national governments, local public services and the not-for-profit sector. Its c.200 research staff focus on public service and policy issues. Each has expertise in a particular part of the public sector, ensuring we have a detailed understanding of specific sectors and policy challenges. This, combined with our methodological and communications expertise, helps ensure that our research makes a difference for decision makers and communities.