

# BBSRC ECONOMIC IMPACT REPORTING FRAMEWORK

## Introductory statement

This is the third annual Economic Impact Reporting Framework published by the BBSRC. These reports were implemented across all the Research Councils in 2005 and form part of the new Economic Impact Framework managed by the Department for Innovation, Universities and Skills. More information about the Economic Impact Framework can be found at: [www.berr.gov.uk/dius/science/science-funding/framework/page9306.html](http://www.berr.gov.uk/dius/science/science-funding/framework/page9306.html).

The economic impact reporting framework contains data on selected aspects of BBSRC performance relevant to the Government's objectives for the UK science base.

1. Overall economic impacts
2. Investment in the research base and innovation
3. Knowledge generation
4. Framework conditions
5. Knowledge exchange efficiency

The framework shows, where possible, data for 2005-06, 2006-07 and 2007-08.

The Council's outputs framework should be read in conjunction with its 2007-08 Delivery Report and Annual Report, which provide a comprehensive summary of achievements over the period.

Highlights from the framework include:

- The UK continues to be the world leader in terms of the impact of its research on the global bioscience research community
- The quality of BBSRC's responsive mode research over the last ten years has been good and has improved over time
- Basic research funded by BBSRC in biomolecular sciences has led to £600M of external investment in companies and £15M p.a. sales revenue from start-up companies
- At 80%, submission rates within four years among BBSRC-funded PhD students is well above target
- Through its estates strategy, BBSRC plans investment of over £500M in infrastructure and facilities at its institutes over the next 10 years. BBSRC institutes are centres of crucial national capability in strategic areas such as food security, animal health and biomedicine
- BBSRC continues to exceed its efficiency targets and to generate growing efficiency savings
- Over the SR2004 period BBSRC's investment in collaborative research with industry has increased significantly, with new commitment representing a high proportion of overall commitment (around 65% in 2007-08)
- The high quality and effectiveness of BBSRC's schemes to promote commercialisation of its research have been clearly demonstrated through formal evaluations of the Business Plan Competition and the Follow-on Fund.

## 1: OVERALL ECONOMIC IMPACTS

- 1.1 The relationships between research and economic impact are complex, but the Research Councils have an essential part to play in identifying and funding excellent research ideas and in supporting the exploitation of research results, in whichever arena these are relevant. A key element of BBSRC's role is therefore to engage in the translation of bioscience research to address user needs, and through this to enhance the economic impact of the research and training it funds. The mechanisms designed to facilitate BBSRC's contributions to economic impact are set out in Section 5.
- 1.2 Because of the complexities and long time-frames involved it is not straight forward to identify how research investment translates into economic impact. Nevertheless, BBSRC continues to develop an understanding of the economic and social impact of its research, by working with RCUK on cross-Council approaches and by undertaking analyses of the impact of bioscience research. BBSRC has also introduced ways of capturing impact more effectively by:
- reporting on the economic and social impact of BBSRC-sponsored institutes' activities;
  - reviewing the schemes designed to enhance economic impact; most recently the Follow-on Fund has been reviewed;
  - capturing 'exploitation' outcomes from research portfolio reviews;
  - agreeing with DIUS a 10-point Economic Impact (EI) baseline;
  - gathering university innovation returns.
- 1.3 The recent RCUK economic impact study focused on three areas of BBSRC-funded research and showed: basic research funded by the Biomolecular Sciences committee leading to £600M external investment in companies and £15M p.a. sales revenue from start up companies; research at the Institute for Animal Health which contributed to the eradication of rinderpest in Africa with a net economic benefit of over \$1000 million annually; and research funded through the Applied Genomics LINK Programme that has accelerated the drug development process with a multi-million pound impact. ([www.rcuk.ac.uk/innovation/impact/default.htm](http://www.rcuk.ac.uk/innovation/impact/default.htm)). Further details of impacts and potential impacts from BBSRC research and training are described in Section 5.

## 2: INVESTMENT IN THE RESEARCH BASE AND INNOVATION

- 2.1 BBSRC's grant-in-aid from the Department for Innovation, Universities and Skills (DIUS) has increased over the last three years, and in 2007-08 stood at £393.7M (Table 2i). This money is invested by BBSRC in a mixed economy of funding schemes designed to sustain the UK biosciences research base while responding flexibly to emerging opportunities.

2005-06	£321.8M
2006-07	£365.8M
2007-08	£393.7M

Figures from BBSRC Annual Reports (these differ from Departmental Expenditure Limit (DEL) figures which include non-cash costs associated with depreciation and cost of capital).

2.2 BBSRC reserves around 15% of the budget for research initiatives which address specific research themes (Table 2ii). BBSRC's Strategy Board and Strategy Panels are responsible for considering and adjusting the Council's research priorities in the light of scientific opportunities and user needs. Research initiatives are developed to exploit those opportunities and/or to meet those needs: examples from the SR2004 period include integrative systems biology, crop sciences, and bioinformatics and biological resources. As well as responding to emerging opportunities with changing research initiatives, BBSRC maintains dynamism in the system through the turnover of all grants and projects, between 30% and 40% of which change every year (Table 2iii).

Year	Expenditure (£M)
2005-06	£45.2M
2006-07	£52.2M
2007-08	£60.8M

Figures from BBSRC Annual Reports.

A. Projects/grants current at 1 April		B. Projects/grants in A completed by March 31		C. Projects/grants started, 1 April to 31 March*	
2005	2,706	2006	897 (33%)	2005-06	769
2006	2,854	2007	1,086 (38%)	2006-07	774
2007	2,662	2008	1,012 (38%)	2007-08	797

\* Includes projects started and completed within the year, which do not appear in section B.

2.3 In common with other Research Councils, BBSRC monitors investment in inter-disciplinary research as an indicator of the health of its research base (see Table 2iv). The metrics used are:

- percentage of HEI grant expenditure invested in non-bioscience departments
- percentage of responsive mode expenditure invested jointly in bioscience and non-bioscience departments
- BBSRC investment in cross-Research Council programmes.

Year	% HEI grant expenditure in non-bioscience depts*	% responsive mode in joint bioscience/non-bioscience grants*	Expenditure on cross-Council programmes
2005-06	14.7	29	n/a
2006-07	14.8	31	£21M
2007-08	14.6	31	£13M

\* In these columns, data are derived from grants live on 1 April 2006, 2007, 2008 respectively.

2.4 Although only partial indicators, these figures show that a healthy proportion of BBSRC research funding is in multidisciplinary research throughout the SR2004 period. It should be noted that, as well as BBSRC's direct investment in cross-Council programmes, an additional £2M and £1.5M was contributed to ESRC for grants awarded through the Rural Economy and Land Use (RELU) programme in 2006-07 and 2007-08 respectively. The fall in funding in 2007-08 arises mainly from the

reduction of expenditure on Postgenomics and Proteomics programmes from previous Spending Reviews, which are coming to an end.

### 3: KNOWLEDGE GENERATION

#### A: Stock of publicly available knowledge

- 3.1 BBSRC is a key funder of UK biological research, an area which continues to thrive, as shown by the number and share of citations to UK authors (Table 3i) and the citation impact of UK-authored papers relative to world baseline (Table 3ii).

	2004	2005	2007
No. of UK citations	11,724	12,901	11,109
UK rank by no. of citations	2	2	2
% share of world citations	14.6	12.7	12.5

	2004	2005	2007
Rebased impact	1.40	1.53	1.54
UK rank	3	1	1

Data in Tables 3i-3ii from Evidence Ltd, *International comparative performance of the UK research base*. 2008.

- 3.2 BBSRC does not currently hold comprehensive data on published outputs from grants awarded to HEIs. However, over the last three years a rolling programme of evaluations of responsive mode funding since the mid-1990s indicates that the quality of the research funded has been good and improving over time, with a median of three papers from awarded grants. Evaluations of major research initiatives show that a similar standard and level of output has been achieved. Moreover evaluations of all final reports on grants show that more than three quarters of awards at least meet the majority of their objectives and deliver good quality results, and that very few awards fail altogether (Table 3iii).

	A	B	C	D
2005-06	32	46	20	2
2006-07	35	44	19	1
2007-08	37	48	14	1

A: Very high class work that has produced results of considerable scientific importance in a cost effective way and met all or almost all of the agreed or related key objectives;  
 B: Work that has added significantly to knowledge in the field and met the majority of its agreed or related key objectives;  
 C: Work that has fallen short of the contribution to knowledge or cost effectiveness expected from the original proposal even though it may have met some or all of its agreed or related key objectives;  
 D: Work that has not added significantly to knowledge in the field and/or has failed to address the agreed or related objectives.

- 3.3 BBSRC sponsors a number of research institutes and monitors and makes available details of all the published outputs from them

([www.bbsrc.ac.uk/science/grants/staff\\_publications.html](http://www.bbsrc.ac.uk/science/grants/staff_publications.html)). Analysis of these data over the last three years shows that while numbers of publications in refereed journals and total numbers of publications are falling slightly, this reflects the falling numbers of research staff as the institute sector is restructured. The number of publications per research leader has been maintained at about 4 refereed publications per research leader (Table 3iv).

	2005	2006	2007
All publications*	1,836	1,704	1,611
Refereed publications	1,082	980	1,059
All publications per research leader	6.6	6.7	6.7
Refereed publications per research leader	3.9	3.9	4.4

\* All publications include refereed papers, books and book chapters, edited conference contributions, technical reports, theses and popular articles.

- 3.4 Overall therefore BBSRC remains a key funder of a section of the UK research base which continues to perform very well in generating new knowledge that is having a significant impact on the world bioscience community.

## **B: Human capital: newly trained people**

- 3.5 BBSRC is committed to maintaining the strength of the UK bioscience base by funding postgraduate training to ensure the continued supply of well qualified new researchers, and by working with the universities to attract and retain the best bioscientists. The numbers of students undertaking PhD training is steadily increasing, as is the percentage of those students studying biological sciences (Table 3v). However, a more detailed breakdown of the biological sciences figures gives rise to some questions as they suggest that the main increases are in sports sciences and psychology while the numbers opting for biochemistry or biophysics are falling slightly (see 2008 report to Funders' Forum on health of disciplines: [www.rcuk.ac.uk/aboutrcuk/publications/corporate/hod.htm](http://www.rcuk.ac.uk/aboutrcuk/publications/corporate/hod.htm)). Numbers of veterinary students are not growing as rapidly as biological sciences, although the percentage of students opting for veterinary training remains steady, and the numbers and percentages of students in agriculture is falling. It must, however, be remembered that robust trends cannot be established from just three years of data.

	2004-05	2005-06	2006-07
Total number registered	89,390	91,820	96,935
Biological sciences	11.9%	11.7%	11.9%
Veterinary sciences	0.5%	0.5%	0.5%
Agriculture and related subjects	1.0%	0.8%	0.7%

Data from HESA Students in HEIs, Tables A and E

- 3.6 BBSRC funds between 600 and 650 PhD students every year, and is typically supporting around 2000 such studentships at any one time. A number of PhD

studentships is reserved for priority research areas, which currently include ageing research, systems biology, and integrative mammalian physiology (Table 3vi). Targeted studentships help to create and maintain a critical mass of expertise in strategically important areas. BBSRC is also increasingly keen to monitor diversity among its students to help ensure the most able students are recruited. Data on gender are reported here (Table 3vii) and robust systems for monitoring ethnicity are being developed.

	2006	2007
Ageing		12
Bioprocessing	5	9
Comparative genomics	9	
Crop science	9	
Integrative mammalian physiology	12	
Selective chemical intervention in biological systems	9	
Systems approaches to biological research (SABR)		20*
Systems biology		10**
Technologies for regenerative medicine	6	

\* alongside SABR research initiative

\*\* joint Doctoral Training Centres with EPSRC

	2005-06	2006-07	2007-08
Male	43	48	44
Female	57	52	56

- 3.7 BBSRC is committed to maintaining a threshold of 70% for the proportion of students submitting PhD theses within four years; this will continue to be the case for four-year programmes. This target continues to be met, with an increasing margin (Table 3viii).

Start year	%
2001-02	73
2002-03	79
2003-04	80

Figures from BBSRC Annual Report

## **C: Human capital: trained people pool**

- 3.8 The numbers of people employed in the biological sciences and related disciplines at UK HEIs are growing at all levels (Table 3ix). Comparison with earlier data shows that the numbers of bioscientists employed in HEIs grew from <14,000 in 1998/99 to around 18,000 in 2004/05. Whilst the highest percentage increase was among bioscientists over 50 (up by c1,300, or >60%), which could be a cause for concern, the highest increase in numbers of researchers was in the age range 35-50, up by over 2,200.

	2004-05	2005-06	2006-07
Professors	1,940	2,055	2,125
Senior Lecturers	3,020	3,235	3,655
Lecturers	4,550	4,485	4,750
Researchers	8,275	8,445	8,545
Total	17,785	18,220	19,075

Data from HESA; Report to Funders' Forum: [www.rcuk.ac.uk/aboutrcuk/publications/corporate/hod.htm](http://www.rcuk.ac.uk/aboutrcuk/publications/corporate/hod.htm).

- 3.9 Approximately 1500 principal investigators in HEIs hold BBSRC grants at any one time and of these around 18% are women, similar to the proportion of women senior scientists at the BBSRC-sponsored institutes (Table 3x). The number of staff at BBSRC-sponsored institutes is falling as a result of restructuring, but there is still a relatively healthy level of turnover of staff, helping to keep the institute base dynamic and at the forefront of research (Table 3xi).

	2005-06	2006-07	2007-08
Universities	18.7	17.6	18.7
Institutes	17.7	18.9	17.6

	2005-06	2006-07	2007-08
Recruited	246	282	242
Leaving	379	362	342

- 3.10 The future health of the trained people pool for the biosciences will depend on current capacity at undergraduate and postgraduate levels. Between 1998-99 and 2004-05 in biological sciences the number of undergraduate and postgraduate students increased significantly. However figures for veterinary and agricultural students are not growing very strongly, particularly at undergraduate level (Table 3xii).

<i>Undergraduates</i>	
Biological sciences	36.2%
Veterinary science, agriculture and related subjects	2.0%
<i>Postgraduates</i>	
Biological sciences	49.5%
Veterinary science, agriculture and related subjects	17.2%

Data from HESA; Report to Funders' Forum: [www.rcuk.ac.uk/aboutrcuk/publications/corporate/hod.htm](http://www.rcuk.ac.uk/aboutrcuk/publications/corporate/hod.htm).

- 3.11 The Research Councils, through RCUK, collaborated with the Equality Challenge Unit on a mapping study of equality data in higher education and are now working with the Higher Education Statistics Agency (HESA) and the funding councils to build on this.
- 3.12 The Research Councils are also working together to obtain information on the career paths followed by those who have completed research studies. An options analysis recommended that data be gathered through enhancement of HESA's survey of the destinations of leavers of higher education (DLHE), seeking responses from all the research graduates who responded to the 2005 DLHE survey, shortly after their graduation. This will build a picture of their career path roughly 3½ years after graduation. The first results of the study will be available in May 2009, and will inform future phases of the study, which will follow doctoral graduates' career paths over a number of years. In addition, the Research Councils plan to commission an analysis to inform the higher education sector, policy development and graduates' decisions about their career options.

#### **4: FRAMEWORK CONDITIONS**

- 4.1 To enable the UK research base to deliver high quality research with impact it is important that the framework within which the research takes place is as effective as possible. Aspects of the framework which can be influenced by the Research Councils include the extent to which the public is engaged with, and thereby supportive of, the research within the Councils' remits, the suitability and financial sustainability of the research facilities and infrastructure, and the efficiency with which the research system operates. The BBSRC monitors each of these aspects in the area of biosciences research.

##### **A: Public engagement**

- 4.2 Consultation and dialogue events encourage stakeholder participation in BBSRC policy, planning and funding decisions, and help build confidence. Over the last three years, BBSRC has held three open meetings which, in addition to overall BBSRC activities, have highlighted public engagement, knowledge transfer and research training provision. These were attended by policy makers, academics, industrialists and NGO representatives. In addition, over the SR2004 period, BBSRC has:
- undertaken consultations on topics including: data sharing policy, biodiversity research, priorities for farm animal genomics research, and research committee structures;
  - organised public exhibitions and discussion meetings on stem cell science (with MRC), ageing (with MRC) and photosynthesis and biodiversity (with NERC);
  - led on the development of a range of activities to show the relevance to contemporary research of Darwin's theory of evolution as part of the celebrations in 2009 to mark the bicentenary of his birth.
- 4.3 To evaluate the impact of its consultation and dialogue events, BBSRC seeks feedback from participants; feedback to date has been positive from visitors at public exhibitions, from schools and from formal evaluation by consultants, including Demos. For example, an appraisal of a public meeting on the development of low-carbon,

- renewable energy sources showed this to be a successful event, with a high level of audience participation. Feedback from attendees showed satisfaction with the format and delivery of the event and confirmed the popularity of interactive voting.
- 4.4 BBSRC also contributed to the RCUK-led public dialogue on energy research, which provided valuable insight into the public's priorities for energy research, and has led to the development of a guide for researchers on what the public considers important in this area of research.
- 4.5 Openness and responsiveness to issues of public concern are key elements of BBSRC's activities to maintain public trust in UK bioscience. As well as the consultations mentioned above, BBSRC runs web-based consultations on selected new research initiatives, with views taken into account by initiative managers. The Bioscience for Society Strategy (BSS) Panel advises Council on its interactions with the public including responding to issues of public concern.
- 4.6 Over the last three years, BBSRC has commissioned several attitudinal studies and reviews. Key issues arising were:
- social aspects of research into ageing (with MRC): prevention of age-related conditions was identified as the most important area for research, followed by research to maximise the quality of life for older people. The findings were used to inform future research policy and to develop a touring exhibition.
  - diet and health: there was strong support for basic research in areas with a direct benefit to public health and on the effects of food on health and protection against disease. The conclusions of this study contributed towards the development of BBSRC's food research strategy.
  - joint funding with industry: joint research between industry and academia was supported, but not publicly-funded research that benefits only the commercial partner. This study increased our understanding of public perceptions of joint working with industry and highlighted the need for openness and transparency, as well as a clear exposition of the nature and purpose of the research.
  - synthetic biology: the BSS Panel commissioned a study by social scientists at the University of Nottingham into the ethical and social issues surrounding this emerging technology. The findings have been published and will help to identify BBSRC's funding policy and ensure that our researchers address societal issues, as well as identifying how the public could participate in future debate about the potential applications.
- 4.7 BBSRC worked with EPSRC on an experiment in the Sciencewise Nanodialogues project (run by Demos) which explored people's views of basic underpinning nanoscience and its applications. The experiment focused on the challenges of upstream engagement. BBSRC also contributed to the RCUK management of the Public Attitudes to Science survey, funded by DIUS, which was published in January 2008 and provides valuable trend data about what the public thinks about science, scientists and science policy.
- 4.8 BBSRC is a member of the Coalition for Medical Progress (CMP) Steering Group and has worked with other funders to publish guidelines for the use of animals in research ([www.bbsrc.ac.uk/publications/policy/animals\\_in\\_bioscience\\_research.pdf](http://www.bbsrc.ac.uk/publications/policy/animals_in_bioscience_research.pdf)).

- 4.9 BBSRC has regular formal and informal interactions with relevant Government Departments and agencies, RCUK strategy group and the other Research Councils. [See also section 5: Knowledge exchange efficiency.]

	2005-06	2006-07	2007-08
Media releases	60	64 <sup>1</sup>	47
Corporate publications	12	11	7 <sup>2</sup>
Exhibitions	11	13 <sup>3</sup>	8
Public meetings and events	4	5	6
Grants for National Science Week (through RCUK)	13	7 <sup>4</sup>	9
Public engagement awards	9	7	6
Local schools' coordinators	26	22	20
Science communication courses	9	8 <sup>5</sup>	8 <sup>5</sup>

<sup>1</sup>includes three with other research councils; <sup>2</sup>excludes publications produced with other research councils; <sup>3</sup>includes nine with other research councils; <sup>4</sup>out of a total of 42 awards; <sup>5</sup>includes two developed with other research councils and two university-led courses.

- 4.10 The Research Councils have invested significantly in supporting public engagement within HEIs through the development of the Beacons for Public Engagement scheme (£9.2M over four years, in collaboration with the funding councils and the Wellcome Trust). This initiative will pilot ways to improve reward, recognition and support for academics undertaking public engagement. BBSRC also plays a full part in the schools programme delivered by RCUK and has led on initiatives with local coordinators and mathematics for biology students.

## **B: Financial sustainability: facilities and infrastructure**

- 4.11 BBSRC sponsors a number of specialist research institutes which provide dedicated facilities and infrastructure for the UK bioscience base. The focused missions, multidisciplinary, long-term research and unique resources and facilities of the institutes provide a critical national capability in key areas, including plant science, animal health, sustainable land use and diet & health. The overall performance and contributions to the UK research base of the institutes are assessed regularly and, as a result, BBSRC redistributes funding to ensure the institutes continue to deliver high quality, strategically important research outputs. The 2005 Institute Assessment Exercise showed that 45 out of the 55 assessed programmes scored high international/international (quality of science) or outstanding/good (strategic relevance). Following this assessment BBSRC is:
- increasing the proportion of core institute funding for animal health and welfare from 22% to 26% by 2009-10
  - providing £35M in capital funding for the proposed research centre in Edinburgh
  - increasing core institute funding in sustainable agriculture and land use
  - increasing core institute funding in biomedical and food sciences.
- 4.12 BBSRC is committed to ensuring the financial sustainability of its institute base: the institutes' average annual surplus level is increasing, as is capital expenditure as a percentage of total estate building replacement, and maintenance as a percentage of

replacement cost (Table 4ii). In addition, BBSRC continues to invest in dedicated facilities at the institutes (Table 4iii).

<b>Table 4ii: Capital investment in BBSRC-sponsored institutes</b>			
	2005-06	2006-07	2007-08
Average institute annual surplus level	£682.6k	£705k	£799.6k
Capital expenditure as % of total estate building replacement	3.0%	6.5%	6.8%
Maintenance as % of replacement cost	1.2%	1.3%	1.6%

<b>Table 4iii: Total expenditure on institute facilities</b>	
2005-06	£15.8M
2006-07	£17.1M
2007-08	£8.0M

### C: Financial sustainability: efficiency

- 4.13 BBSRC remains committed to operating as efficiently as possible in all its activities, and to meeting agreed efficiency targets. BBSRC is in regular discussion, through its Committees, with the research community, to reduce the number of lower quality applications; the success rates of HEIs in obtaining grants are published on the website (Table 4iv) and, from effective reprioritisation of programme spend, BBSRC has achieved savings of £24.8M against a target of £22.0M. Expenditure on administration continues to fall as a proportion of total outturn, and BBSRC has exceeded its target of admin expenditure as a percentage of science budget for the last two years, and generated increasing savings on administration (Tables 4v and 4vi).

<b>Table 4iv: Success rates for responsive mode applications</b>	
2005 session (April 2005 to March 2006)	26%
2006 session (April 2006 to March 2007)	26%
2007 session (April 2007 to March 2008)	25%

<b>Table 4v: Expenditure on administration</b>			
	2005-06	2006-07	2007-08
Total	£9.3M	£11.1M	£9.4M
Outturn	2.78%	2.67%	2.35%
Admin spend : science budget ratio	0.07% below target	0.02% over target	0.29% below target

<b>Table 4vi: Gershon administrative savings generated</b>	
2005-06	£0.6M
2006-07	£1.0M
2007-08	£2.4M

- 4.14 BBSRC ensures that its institutes operate as efficiently as possible, by leveraging savings from industrial research collaborations, and restructuring (Table 4vii).

2005-06	£2.33M
2006-07	£7.94M
2007-08	£8.03M

## 5: KNOWLEDGE EXCHANGE EFFICIENCY

### A: Ease of collaboration and cooperation

- 5.1 BBSRC encourages interactions with users and user participation in its programmes wherever this will add value to the research funded and/or facilitate uptake of research outputs. The HEI sector is well represented on BBSRC Council, Boards, Committees and Panels (Table 5i). Interactions with HEIs are a routine part of BBSRC business, and take place at all levels. In addition to formal Committee/Panel/Board meetings, the Council holds scientific workshops, meetings with heads of HEI bioscience departments, and public events, all involving interchanges with HEIs. There is also a significant amount of daily business in relation to grant, fellowship and studentship applications, and funded awards. The BBSRC-sponsored institutes also have many formal and informal links with HEIs, including several hundred research collaborations (Table 5ii).

	2005-06	2006-07	2007-08
Council & Boards	54	52	53
Research Committees	74	75	74
Strategy Panels	54	63	56

	2005-06	2006-07	2007-08
Number	993	891	623
Value	£14.1M	£13.4M	£14.4M

- 5.2 Other key stakeholders also provide valuable input to BBSRC's decision making through representation on Council, and all other senior fora, (Table 5iii) with the Bioscience for Industry Strategy Panel in particular focusing on interactions with the private sector. In addition, users are central to decision making at the sponsored institutes, representing around half of the membership of governing bodies and senior policy committees (Table 5iv).

<b>Table 5iii: % user representation on BBSRC Council, Boards, Research Committees and Strategy Panels</b>			
	2005-06	2006-07	2007-08
Council & Boards: all users	29	33	39
• Industry representatives	21	22	22
Research Committees: all users	15	10	10
• Industry representatives	12	10	10
Strategy Panels: all users	33	27	26
• Industry representatives	21	15	17

<b>Table 5iv: % user representation on BBSRC-sponsored institute Governing Bodies and institute policy committees</b>			
	2005-06	2006-07	2007-08
Governing Bodies: all users	57	60	43
• Industry representatives	34	27	26
Policy Committees: all users	44	46	42
• Industry representatives	32	27	19

- 5.3 The success of such interactions may be seen in the growing level of co-funding of research within the BBSRC remit and the level of planned investment within the BBSRC 10-year estates strategy (Tables 5v, 5vi). The latter includes a significant investment (over £120M) in rebuilding facilities at Pirbright and £15M towards the £22M redevelopment of Babraham. In addition, institutes are continuing to attract funding from many external sources, including government departments and agencies, industry, charities and international organizations (Table 5vii), as well as working with relevant organizations operating in the local economy (Table 5viii).

<b>Table 5v: Investment in new collaborative research*</b>	
2005-06	£2.01M
2006-07	£5.2M
2007-08	£13.7M

\* Figures from Gershon returns

<b>Table 5vi: Current planned investment within BBSRC 10-year estates strategy</b>	
2005-06 to 2014-15	£432M
2006-07 to 2015-16	£421M
2007-08 to 2016-17	£557M

Source	2005-06	2006-07	2007-08
BBSRC	61	61	59
Defra/FSA	14	14	15
Industry	5	3	3
International	4	4	5
Other (including research charities)	16	18	18

\* Pre-audit figures

	2005-06	2006-07	2007-08
Number	183	174	125
Value	£1.5M	£1.5M	£0.6M

- 5.4 Further indicators of BBSRC's interactions with HEIs and other users include the range of first destinations of BBSRC-funded PhD students (Table 5ix), the number of institute publications co-authored with industry (Table 5x) and the level of licensed IP income to the institutes from IP licenses held by the institutes and from licenses assigned to collaborators (Table 5xi).

Government and public sector	11
Higher Education	37
Industrial and commercial sector	34
Further training	8
School teaching/other	4
Not employed	6

Data collected by HESA; no earlier data available because of changes to destination categories

	2005	2006	2007
Refereed publications	65	82	71
Per scientist	0.2	0.3	0.3
% of all refereed publications	6	8	7

2005-06	£0.7M
2006-07	£0.8M
2007-08	£0.7M

- 5.5 Over the SR2004 period BBSRC's investment in collaborative research has increased significantly, with new commitment representing a high proportion of overall

commitment (Table 5xii). BBSRC employs a number of mechanisms to allocate resource, each designed to meet sector-specific or priority-specific needs. Individual research projects may be funded through the collaborative R&D (CRD) route, through LINK programmes and projects, and through Industrial Partnering Awards (IPAs).

	2005-06	2006-07	2007-08
Total value of BBSRC commitment to research involving collaboration with industry and/or research relevant to technology priorities (collaborative R&D product (CRD), LINK, Research and Technology Clubs (RTCs) and underpinning research)	£9.9M	£17.4M	£17.7M
Total value of new BBSRC commitment to research involving collaboration with industry and/or research relevant to technology priorities and including IPAs:	£9.7M	£16.8M	£11.6M
<ul style="list-style-type: none"> <li>• Total value of new BBSRC commitment to research involving collaboration with industry and/or research relevant to technology priorities (CRD, LINK, RTCs and underpinning research)</li> </ul>	£2.6M	£10.6M	£5.8M
<ul style="list-style-type: none"> <li>• Total value of new BBSRC commitment to Industrial Partnership Awards (IPAs)</li> </ul>	£7.1M	£6.2M*	£5.8M

\* includes IPAs awarded through initiatives relevant to Technology Strategy priorities

5.6 BBSRC's commitment to collaborative R&D activities such as CRD and RTCs has continued to develop during 2007-08 (Table 5xiii). Awards were made in Bioprocessing (through the Bioprocessing Research Industry Club), and through the Technology Strategy Board (TSB) Grants for Collaborative Research and Development, in Development and Manufacture of Biopharmaceuticals, and Smart, Bioactive and Nanostructure Materials for Health. Applications were also sought for research in Diet and Health, through the Diet and Health Research Industry Club (planned commitment £9M over 3 years), and through the TSB Grants for Collaborative Research and Development in Cell Therapies and Technologies for Healthcare. In addition, BBSRC has partnered with EPSRC and TSB in a call to establish Innovation and Knowledge Centres (IKCs). A Biorefineries Research and Technology Club was also launched in collaboration with 10 companies (planned commitment £4M over 2 years).

	2006-07	2007-08
Number of projects	22	36
Number of industrial participants*	40	56
New projects	22	14
Total value of BBSRC commitment	£8.8M	£11.9M
Total value of new BBSRC commitment	£8.8M	£4.1M

\* includes club company members

5.7 BBSRC continues to support pre-competitive academic/industrial research collaborations through the LINK mechanism, both through programmes and using the LINK franchise. In 2007-08, one LINK award was also made through the Exploiting

Systems Biology Initiative (Table 5xiv). It should be noted that during this period the LINK scheme stopped being a government-wide initiative and the then Department of Trade and Industry, one of BBSRC's major LINK partners, withdrew from it.

- 5.8 BBSRC also supports Industrial Partnership Awards (IPAs), which encourage industrial awareness of, and involvement in, research projects funded by BBSRC. IPAs are science base-led responsive mode research grants that have significant industrial involvement and to which industry contributes 10% to the cost of the project. In 2006-07, IPAs were also awarded through initiatives relevant to the Technology Strategy in the areas of Crop Science, and Farm Animal Genetics and Genomics (Table 5xv), and responsiveness to issues of public concern are key elements of BBSRC's activities to maintain public trust in UK bioscience. As well as the consultations mentioned above, BBSRC runs web-based consultations on selected new research initiatives, with views taken into account by initiative managers. The Bioscience for Society Strategy Panel advises Council on its interactions with the public including responding to issues of public concern. Over the last three years, BBSRC has commissioned a variety of attitudinal studies and reviews on social aspects of research into ageing (with MRC), diet and health, joint funding with industry and synthetic biology. BBSRC worked with EPSRC on an experiment in the Sciencewise Nanodialogues project (Demos) and contributed to the RCUK management of the Public Attitudes to Science survey. BBSRC is also a member of the Coalition for Medical Progress (CMP) Steering Group and has worked with other funders to publish common guidelines for using animals in research.

	2005-06	2006-07	2007-08
Number of projects	61	40	29
Number of industrial participants	86	93	70
New projects	10	3	4
Total value of BBSRC commitment	£9.9M	£8.6M	£5.8M
Total value of new BBSRC commitment	£2.7M	£1.8M	£1.6M

	2005-06	2006-07	2007-08
Number of awards	24	22	15
Total value of awards	£7.1M	£6.2M	£5.8M

- 5.9 The BBSRC-sponsored institutes undertake a significant level of industrial collaboration. As well as attracting funding for research collaborations (including LINK), where they work jointly with others on a project where all partners contribute intellectually, institutes receive funding for 'contracts', to carry out routine testing or specified research for a contractor (Tables 5xvi and 5xvii). The figures have held up well over the SR2004 period despite the reduction in the size of the institute base.

<b>Table 5xvi: BBSRC-sponsored institutes LINK collaborations</b>			
	2005-06	2006-07	2007-08
Number of projects	54	48	44
New projects	16	7	5
Number of industrial participants	222	282	260
Annual value to institutes	£3.6M	£3.6M	£3.8M

<b>Table 5xvii: BBSRC-sponsored institutes industrial contracts and collaborations</b>			
	2005-06	2006-07	2007-08
Contracts: annual value to institutes	£6.1M	£3.7M	£4.0M
Collaborations: annual value to institutes	£2.7M	£4.3M	£3.6M

- 5.10 All collaborative research projects supported have to be internationally competitive. This is ensured through peer review by appropriate assessment panels or research committees. Research grants funded through Clubs are monitored through a coordinator and annual report to ensure the relevance of research projects to industry as they progress.
- 5.11 The longer-term excellence of the collaborative research supported by BBSRC is demonstrated through assessments of individual final reports, publications records and evaluation of science programmes. Evaluations of BBSRC funded science can be found at [www.bbsrc.ac.uk/organisation/policies/reviews/funded\\_science/index.html](http://www.bbsrc.ac.uk/organisation/policies/reviews/funded_science/index.html). A Study of the Economic Impact of Research Councils, commissioned as an RCUK activity, reported in autumn 2007.
- 5.12 The satisfaction of industrial collaborators with such collaboration was reviewed through a User Survey commissioned by RCUK in March 2007. The report confirms that BBSRC is performing strongly in the extent to which it meets users' needs through its activities; moreover, the majority of users were satisfied with BBSRC's service delivery ([www.rcuk.ac.uk/innovation/impact/default.htm](http://www.rcuk.ac.uk/innovation/impact/default.htm)).
- 5.13 In May 2008 BBSRC hosted the event 'Bioscience: BioMillions' at HM Treasury to showcase and celebrate the contribution of bioscience research to the UK economy and social well being ([www.bbsrc.ac.uk/publications/corporate/bioscience\\_biomillions.pdf](http://www.bbsrc.ac.uk/publications/corporate/bioscience_biomillions.pdf)).

## **B: Transit of information flows: commercialisation of research**

- 5.14 BBSRC supports schemes to encourage an entrepreneurial culture within the academic bioscience research base and to help identify and develop specific, exploitable research outputs:
- Biotechnology YES (Young Entrepreneurs Scheme) is an innovative competition developed to raise awareness of the commercialisation of bioscience ideas among postgraduate students and postdoctoral scientists
  - The Research Council Business Plan Competition, which builds on the success of the earlier bioscience Competitions, is designed to help entrepreneurial

researchers from across the UK find successful routes to market. It provides regional training workshops, and coaching and mentoring, with a prize being awarded to the team producing the best business plan.

- The Enterprise Fellowships scheme, run jointly by BBSRC and the Royal Society of Edinburgh, supports researchers who wish to be actively involved in commercialising their research. The Fellowships provide business training, access to networks of mentors, business experts and professional advisers, and a salary to allow them to concentrate on developing the commercial potential of their research.
- Intellectual Property Workshops are run to encourage awareness of IP and KT issues within the research community. They inform existing and potential BBSRC-funded scientists of the issues surrounding the identification, protection and exploitation of intellectual property and cover all aspects of the commercialisation process.
- The Follow-on Fund, run jointly with EPSRC, NERC and STFC, aims to increase the level and accelerate the rate of commercialisation of ideas arising from the research community. It provides funds for proof-of-concept studies to enable ideas to be brought to a stage where commercial opportunities (e.g. licensing, seed or equity funds) can be secured.

5.15 BBSRC commitment to and investment in all these schemes increased over the SR2004 period (Tables 5xviii and 5xix) and will grow significantly over the next three years.

	2005-06	2006-07	2007-08
Total value of activities to support the commercialisation of R&D	£1.5M	£1.54M	£1.8M
Total number of individuals trained/mentored through these activities	1,236	1,485	1,704

		2005-06	2006-07	2007-08
Biotechnology YES	Number of participants	198	247	318
Research Council Business Plan Competition	Number of teams	110	110	111
Enterprise Fellowships	Fellowships awarded	4	2	4
Intellectual Property Workshops	Number of courses	29	30	42
	Individuals trained	934	1,128	1,271
Follow-on Fund	Number of awards	15	15	16
	Total value of awards	£1.1M	£1.3M	£1.5M

5.16 The longer term quality of BBSRC's grant schemes to promote commercialisation (BPC, FoF and Enterprise Fellowships) is ensured by applying scientific and commercial quality standards at the selection stage, and is demonstrated through the assessment of final reports and evaluation studies. The two Bioscience Business Plan

Competitions undertaken were evaluated by external contractors in 2003 and again in 2006. The 2006 Review confirmed the very positive impact the Business Plan Competition has had on enhancing the commercial knowledge and understanding of participants and of stimulating them to commercially exploit their research outputs. The review showed that:

- The competitions significantly increased the attractiveness of commercial exploitation for 88% of respondents and better equipped all but 5% of them to identify research outputs with commercial potential.
- At the individual team level:
  - Commercialisation for four teams has seen their IP acquired by and absorbed into other organisations. All but three of the remainder were still in existence as of September 2006, with 13 businesses being commercially active. It is estimated that these companies currently employ between 50 and 52 FTE employees.
  - As of June 2006 the total R&D spend of the 13 active respondent companies was £5.34M, and they had secured £5.66M of funding. Performance across all key metrics was heavily skewed towards four key companies whose performance significantly outclassed that of the others. Those four have secured investment from knowledgeable investors/business angels and recruited experienced commercial management.
  - The proportion of investment by regionally-based venture funds and RDAs had almost doubled between the 2003 and 2006 reports, to stand at 26% of total investment in June 2006. Grant funding has been the second most important source, accounting for 17% of the total raised.

5.17 A review of the BBSRC Follow-on Fund was carried out in 2007 by Qi3 Ltd. This showed that, of the 26 projects reviewed, 18 were being commercialised, with 9 start-up companies established and 4 licensing deals. Case studies from the review are at [www.bbsrc.ac.uk/business/commercialisation/follow\\_on.html](http://www.bbsrc.ac.uk/business/commercialisation/follow_on.html).

5.18 A longer term review highlighting the career progression of past participants in YES, completed in 2006 in collaboration with the University of Nottingham (UNIEI), showed:

- entrepreneurs, past participants of Biotechnology YES, have raised over £5M of equity investment for their ventures
- 43% of participants have gone on to work in the private sector
- 77% of participants now working in private industry said the competition helped them gain their current position
- 12% of participants are working in technology transfer or IP management roles.

The Enterprise Fellowship scheme will be reviewed during 2008-09.

5.19 Within the HEIs BBSRC works with a number of leading bioscience departments to encourage commercialisation of research outputs, where appropriate. This is an area in which BBSRC currently has limited influence, although exploitation metrics are collected from leading BBSRC-funded university departments (Table 5xx). These show some growth in the level of exploitation income. Plans are being developed to build strategic partnerships with key institutions, through which it is intended to encourage increased awareness of the commercial potential of much bioscience research.

	2005-06	2006-07	2007-08
Number of departments	15	13	12
BBSRC funding	£39.7M	£36.1M	£39.8M
Exploitation income	£1.9M	£0.8M	£4.5M
Spin-out companies	38	37	22

5.20 BBSRC has a longer tradition of working with its institutes to support commercialisation, and collects and reviews a range of exploitation data (Table 5xxi). BBSRC encourages the formation of new business ventures and has funded activities to help establish spin-out companies, including trading arms, service companies and entrepreneurial life science companies (Table 5xxii). Moreover, a proportion of income received from exploitation of IP is distributed among the staff involved in the exploitation, including: royalties and licensing payments, sale of IP, advance/milestone payments (Table 5xxiii). The data suggest growing activity in protecting IP and setting up licensing arrangements, with a reasonable level of income generated from a reducing institute base.

	2005-06	2006-07	2007-08
Number of patents and plant breeders rights held by institute	126	136	140
- Number of current licensing agreements	37	41	53
- Royalty income	£0.4M	£0.6M	£0.5M
Number of patents and plant breeders rights held by collaborators	15	14	16
- Number of current licensing agreements	8	7	7
- Royalty income	£0.2M	£0.2M	£0.3M
Number of patents and plant breeders rights which generated income	76	78	82
Number of licensing agreements involving companies with significant research or manufacturing capacity in the UK	26	23	36
Income from sale of equity in start-up companies	£0.4M	£0.5M	-
Income from any other exploitation of research	£0.6M	£0.7M	£0.6M
Total exploitation income	£1.7M	£2.0M	£1.3M
Total cost associated with IP protection	£0.5M	£0.5M	£0.4M
Number of employees involved in commercialisation activities	9.5	9.8	10.6

<b>Table 5xxii: BBSRC-sponsored institutes, spin-out companies</b>			
	2005-06	2006-07	2007-08
Number of companies incorporated	1		5
Number of trading companies	16	17	17
Number of dormant companies	7	5	11
Number of staff employed in trading companies	92	104	134

<b>Table 5xxiii: BBSRC-sponsored institutes, awards to inventors</b>			
	2005-06	2006-07	2007-08
Number of awards	19	19	24
Total value of awards	£80,830	£33,229	£52,360

### C: Transit of information flows: cooperative training

5.21 BBSRC encourages industrial participation in bioscience research training through two main mechanisms: CASE and Industrial CASE PhD studentships, and Modular Training for Industry. CASE and Industrial CASE awards fund top quality bioscience graduates to undertake a three-to-four year programme of research (leading to a PhD) on a subject selected and supervised jointly by academic and industrial partners. The Modular Training for Industry Programme provides up to date, industrially-relevant technical training for graduates working in industry. Support is provided for the development of individual training modules. Overall investment in this area exceeded £10M pa over the SR2004 period (Tables 5xxiv, 5xxv, 5xxvi and 5xxvii).

<b>Table 5xxiv: Cooperative training, summary data</b>			
	2005-06	2006-07	2007-08
Total value of spend on education and training activities involving industry	£11.6M	£11.6M	£13.1M

<b>Table 5xxv: CASE/Industrial CASE total awards</b>			
	2005-06	2006-07	2007-08
Number of studentships awarded	251	253	253

<b>Table 5xxvi: CASE/Industrial CASE, BBSRC-sponsored institutes</b>			
	2005-06	2006-07	2007-08
Number of CASE awards	49	49	41
Number of Industrial CASE awards	9	10	16

<b>Table 5xxvii: Modular Training for Industry</b>			
	2005-06	2006-07	2007-08
Number of awards	10	8	6
Total value of awards	£298k	£182k	£153k

Number of companies supported	67	51	60
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- 5.22 The quality of BBSRC-funded cooperative research training is ensured through assessments by expert panels. Industrial CASE awards go to institutions providing an excellent training environment for postgraduate students, as assessed by the Studentships and Fellowships Panel. Modular training courses are of high quality and meet industrial need as assessed by an expert panel, which ensures in particular that all supported modules have significant industrial involvement. The MTI panel also ensures delegate attendance and evaluates the quality of the outcomes of modules.
- 5.23 A formal evaluation of the MTI scheme was completed in autumn 2006. This was very positive and showed good evidence that highly industrially relevant courses had been funded with a good level of industrial involvement. Case studies highlighting successful courses were also identified (see [www.bbsrc.ac.uk/business/cpd/mti06.pdf](http://www.bbsrc.ac.uk/business/cpd/mti06.pdf)).

#### D: Transit of information flows: people exchanges

- 5.24 BBSRC encourages the flow of people and knowledge between science and industry by running a flexible interchange scheme between industry and academe. In addition, Knowledge Transfer Partnerships (KTPs) enable collaborative partnerships between the bioscience base and industry. They serve as a mechanism to transfer knowledge and to develop graduate and postgraduate personnel for industrial careers. Over the SR2004 period, BBSRC has invested around £300K pa in activities to promote people exchanges between the bioscience base and industry (Tables 5xxviii and 5xxix).

Table 5xxviii: People exchanges, summary data			
	2005-06	2006-07	2007-08
Total spend on activities involving the interchange of people and knowledge between the science base and industry*	£0.2M	£0.4M	£0.3M

\* Includes £50k contribution to the Royal Society Industry Fellowships scheme

Table 5xxix: Schemes to support people exchanges				
		2005-06	2006-07	2007-08
Annual spend on interchanges between the science base and industry	Number of awards	6	7	3
	Total value of awards	£180k	£262k	£86k
Knowledge Transfer Partnerships	Number of programmes	7	11	13
	Total expenditure	£45k	£66k	£163k

- 5.25 For BBSRC managed schemes, the quality of outcomes is assured through assessment of Final Reports and evaluation studies. An external evaluation of BBSRC-supported KTP Programmes carried out in 2005-06 in collaboration with Momenta and with co-funding from DTI indicates that life science companies benefit less from KTP compared with other sectors, which supports BBSRC plans to reduce investment in this Programme

([www.bbsrc.ac.uk/organisation/policies/reviews/business\\_activities/index.html](http://www.bbsrc.ac.uk/organisation/policies/reviews/business_activities/index.html)). The high quality of all interchanges supported is determined through peer review against the criteria for the scheme. People exchange activities at the sponsored institutes are assessed regularly through the Institute Assessment Exercise.

- 5.26 BBSRC staff employed at the sponsored institutes are also encouraged to work with colleagues in industry wherever appropriate. Table 5xxx reports situations in which Institute staff working in industry or industrialists working in institutes result in a significant outcome or output. Institute staff may also carry out formal consultancies, for which the institute receives a financial return.

<b>Table 5xxx: People exchanges: BBSRC-sponsored institute staff</b>			
	2005-06	2006-07	2007-08
<i>Staff exchanges:</i>			
Number of staff exchanged with industry			2
Number of industrial staff exchanged with institutes	2		
<i>Staff industrial consultancies:</i>			
Number of staff involved	69	65	64
Number of industrial customers	60	94	76