

ECONOMIC IMPACT BASELINE, 2009 UPDATE

BBSRC DELIVERING ECONOMIC IMPACT



“This award is a showcase for how funding by BBSRC is able to provide major tangible benefits not only to the UK science base but also to the biotech and pharmaceutical industries”

Professor Stephen Jackson, first winner of the Innovator of the Year Award

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SUMMARY AND KEY INDICATORS

BBSRC is the leading UK public funder of bioscience research which underpins directly or indirectly key economic sectors, including:

- Food and drink: UK's largest manufacturing sector, with turnover of c £74Bn, and total exports of c£11.5Bn ^[25, 26]; employing over 3 million across the sector as a whole in 2007 ^[24]
- Agriculture: worth £5.8Bn to the UK economy in 2007, accounting for 1.7% of the UK workforce^[24], including:
 - Livestock industry: market value of c£8Bn from over 150,000 farm businesses in 2005 ^[20]
- Biotechnology: the UK industry is one of the most advanced in the world, but this sector is vulnerable in the current economic climate ^[27]
- Pharmaceuticals: accounting for exports of over £14.6Bn, employing 73,000 directly and a further 250,000 indirectly ^[28], and particularly biopharmaceuticals, a highly bioscience research intensive sub-sector with potential to grow significantly ^[27]
- Chemicals: turnover >£50Bn, accounting for 2% of GDP and 11% of UK manufacturing ^[29]

Research from BBSRC also has wide impact on social well being as it informs policy development in crucial areas including healthcare, food security, climate change, sustainable agriculture and land use, and renewable energy.

BBSRC therefore has a vital role encouraging delivery of economic and social impact from the bioscience research and training it funds; the Council:

- has an excellent track record in establishing mechanisms to facilitate impact
- is building on its achievements by widening its interpretation of impact and its approach to identifying evidence
- characterises impact by five elements, and monitors progress under each

1 Attracting R&D investment from global business

- The UK still leads the world in the impact of its publications: citation rates in biological sciences are more than one and a half times world average ^[30]
- c350 biological science research leaders are generating highest quality research as defined in the 2008 RAE, and BBSRC invests significantly in the largest groups of highest performing researchers in biological science ^[31, 2]
- In 2007 the pharmaceuticals industry invested £3.9Bn in R&D in the UK ^[28]
- BBSRC institutes continue to produce excellent research underpinning UK priorities ^[11] :
 - John Innes Centre research has helped increase wheat production by £75M pa, and its impact on world wheat production could be as much as £4.6Bn pa ^[16]
 - Animal health: Institute for Animal Health bluetongue research is valued at £45M, saves £485M pa through prevention of outbreaks, and protects 10,000 jobs ^[18]

"The continuing strength of basic bioscience research in the UK is a major factor in multinational companies' decisions to locate and invest in the UK" [VP of R&D, UCB Group, January 2007] ^[6]

2 Working with UK industry

- BBSRC now runs three Research and Technology Clubs, involving 43 companies
- Bioscience departments funded by BBSRC receive 5% of their research income from industry or commerce, with a further 1% from exploitation income ^[15]
- From BBSRC-funded fundamental research in plant and microbial sciences, new or improved contacts with UK industry were developed by 12% of research leaders; 13% of research leaders received financial support from industry ^[12]

"[Bioprocessing Research Industry Club] BRIC has been instrumental in stimulating activity into the UK Bioprocessing community. A vibrant community is essential for providing cutting edge technologies and skilled people to UK based companies" [BRIC industrialist, February 2009] ^[14]

3 Delivering highly skilled people

- BBSRC supports 2,000 PhD students, including 540 trained with industry through CASE (over 200 companies) and over 2,000 postdoctoral researchers on research grants; in 2008 we doubled the number of CASE awards made
- Of BBSRC students awarded their PhD in 2006-07:
 - 34% moved to industry or commerce (25% of those awarded in 2005-06)
 - 37% started academic careers (36%)
 - 94% were employed (87%)
- BBSRC has launched a new Industrial Impact Fellowships scheme, to bring professionals from industry to work with BBSRC-funded researchers and support translational aspects of their projects; interest in this has been high

“The UK has a rich bioscience base. Developing commercial success from this base depends on nurturing and developing a pool of talented bioscience professionals by attracting and retaining the best current talent and supporting leaders of the future”^[27]

4 Encouraging entrepreneurship and commercialisation

- Over the last ten years, university bioscience departments funded by BBSRC have generated over 200 spin-out companies, now employing over 1,000 people ^[15]
- BBSRC Institute spin-out companies now employ over 130 staff, up from 100 in 2006-07
- In 2008-09 BBSRC introduced the Innovator of the Year Award; the first winner was Professor Stephen Jackson, University of Cambridge, for his work turning research on DNA damage and repair into cancer therapies
- The most recent Research Council Business Plan Competition attracted a high percentage of bioscience related ideas (c30%), with three of the six finalists applying bioscience expertise

“This award is a showcase for how funding by BBSRC is able to provide major tangible benefits not only to the UK science base but also to the biotech and pharmaceutical industries” [Professor Stephen Jackson, first winner of the Innovator of the Year Award]

5 Improving public policy and public services

- Research on the biology of natural changes associated with ageing is identifying opportunities for interventions that could prolong health and independence in the elderly
- Research understanding the nitrogen conversion process in grassland soils has led to the development and application of tools and models which reduce leaching of NO₃ by 38% ^[22]
- Food safety: research at IFR contributes >£100M pa through improved techniques to chill foods, extended shelf life, and reduced food poisoning ^[21]
- Successful public discussion meetings (with MRC) in stem cells and ageing have been key to underpinning public confidence in our research
- The RCUK 2008 attitudes to science survey shows that, since 2005: ^[33]
 - a higher percentage of people agree “I am amazed by the achievements of science”
 - confidence in science has grown
 - a lower proportion are confused by science

“Science ... is the bedrock on which so much of agriculture’s progress has been based and is essential to help deliver the efficiency of production in agriculture and horticulture so critically needed.”^[29]

ECONOMIC IMPACT BASELINE, 2009 UPDATE: BBSRC DELIVERING ECONOMIC IMPACT

CONTEXT

The BBSRC is the UK's principal funder of basic and strategic research across the biosciences, and has a mission to support high-class science and research training, to promote knowledge transfer to all relevant users and to encourage public engagement in bioscience research. The Council currently invests c£380M pa in research at universities, sponsored research institutes and other organisations through a range of funding schemes. Trends in investment over recent years are shown in Annex 1.

As a leading UK public funder of bioscience research which underpins key economic sectors, BBSRC plays an essential role in encouraging the uptake and translation of bioscience research to address user needs, and through this to deliver economic and social impact from the research and training it funds. BBSRC research underpins agriculture, the food and drinks industry, biotechnology, pharmaceuticals, and the chemical industry and strives to engage users from these sectors in the development and translation of its research base. Agriculture, food and drink, biotechnology and the biopharmaceuticals industries in particular rely extensively on bioscience research. In the broader pharmaceuticals and chemicals sectors BBSRC-funded research in basic biology provides the crucial understanding of basic concepts which can then be exploited both directly by industry and indirectly through related strategic or translational research funded by other agencies, including other Research Councils and research charities.

The path from fundamental research to tangible impact is often long and unpredictable. Significant, science-led economic or social developments can happen serendipitously, and researchers cannot guarantee whether or when their research will deliver such impact. Nevertheless BBSRC encourages researchers to think about the potential for their research to contribute, for example, to the economy, to improving social wellbeing, healthcare, or the natural environment, or to the development of sound policy.

As well as significantly enhancing the elements of the BBSRC programme previously designed to facilitate the realisation of economic impact from bioscience research, we are committed to demonstrating the broad range of impact from our portfolio as a whole.

In April 2008 BBSRC published a preliminary Economic Impact Baseline (BBSRC Delivery Plan 2008-11, Annex 2 ^[1]). This presented a snapshot of the economic impact (EI) of BBSRC investments, reflecting our awareness and interpretation of EI and the evidence of EI available at the time, and established a baseline against which to demonstrate a step change in BBSRC's delivery of EI. Since then there have been developments in how BBSRC conceptualises EI and in our approaches to identifying relevant evidence. There have also been changes in the economic context (national and international) within which BBSRC is operating. This document therefore:

- Reports BBSRC's progress against the 2008 EI baseline document, and refines the key indicators
- Demonstrates the relevance to EI of an increased range of BBSRC's activities
- Sets out BBSRC's plans to provide further evidence of EI through formal evaluation
- Outlines planned investments, and how these should enhance the EI of our research and training

ATTRACTING R&D INVESTMENT FROM GLOBAL BUSINESS

A fundamentally strong research base producing the highest quality bioscience research is essential for the delivery of economic and social impact. All research funded by BBSRC must be internationally competitive and advance world-wide understanding of basic biological principles. The UK's track record in the biosciences is first class; this must be maintained and BBSRC's role

in doing so is vital. BBSRC currently invests c£420M in a mixed economy of funding schemes designed to sustain the UK biosciences research base. ^[1]

Excellent basic research acts as a magnet for investment by UK-based companies in science-based industry and for inward investment by multinationals:

- *“The continuing strength of basic bioscience research in the UK is a major factor in multinational companies’ decisions to locate and invest in the UK”* ^[6]
- *“Nearly a quarter of the world’s top 100 medicines were discovered and developed in Britain. This is a result of the considerable investment by the industry in pharmaceutical R&D and a strong research base. Britain has a long history of world-class biomedical and chemical research ...”* ^[32]

Developments since the 2008 baseline

The success of BBSRC’s investment in bioscience research is on-going. Compared with the 2008 document:

- The UK has maintained its world-leading position in terms of quality of publications in the biological sciences, with citation rates at 154% of world average, slightly up from the previous year, despite a slight reduction in the UK’s share of world citations as the emerging economies increase their scientific output ^[30]
- The number of FTE biological science researchers generating the highest quality research in the 2008 Research Assessment Exercise was approximately 350, higher than any other biomedical area ^[31]
- BBSRC’s funding is being channelled to HEIs with the biggest groups of highest performing biological scientists ^[2]; further analysis available from BBSRC Office]
- BBSRC sponsored institutes continue to deliver excellent research with impact; in the most recent Institute Assessment Exercise 82% of assessed programmes scored high international/international (quality of science) or outstanding/good (strategic relevance) ^[11] These assessments are broadly equivalent to the 4* and 3* ratings in the 2008 Research Assessment Exercise in UK universities ^[31]. Recent institute achievements include:
 - Wheat: John Innes Centre research has helped increase wheat production by £75M pa, and its impact on world wheat production could be as much as £4.6Bn pa ^[16]
 - Bluetongue: Animal health: Institute for Animal Health bluetongue research is valued at £45M, saves £485M pa through prevention of outbreaks, and protects 10,000 jobs ^[18]

WORKING WITH UK INDUSTRY

BBSRC seeks interactions with users and industry and other users their participation in its programmes wherever this adds value, such as strategic direction, to its research and/or facilitates uptake of research outputs. Higher Education Institutions, industrialists and other research users are well represented on BBSRC Council, Boards, Panels and Committees, and other formal and informal interactions are woven into all aspects of BBSRC activity. BBSRC runs and participates in numerous schemes to encourage collaborative working, including Research and Technology Clubs, Industrial Partnership Awards, and LINK.

- *“BRIC has been instrumental in stimulating activity into the UK Bioprocessing community. A vibrant community is essential for providing cutting edge technologies and skilled people to UK based companies”* [BRIC industrialist, February 2009] ^[14]

Developments since the 2008 baseline

The effectiveness and success of interactions between the BBSRC research community and the users of their research are demonstrated by:

- BBSRC now runs three Research and Technology Clubs (Integrated Biorefinery Technologies has been added to Bioprocessing Research, and Diet and Health Research Clubs), involving 43 companies.

- Total income to BBSRC institutes from LINK collaborations and other collaborations and contracts with industry held up well over the SR2004 period despite the reduction in size of the institute base: £11.6M in 2006-07 and £11.4M in 2007-08
- Bioscience departments funded by BBSRC (c£220M in 2007-08^[2]) receive on average 5% of their research income from industry or commerce, with a further 1% from exploitation income^[15]
- BBSRC-supported responsive mode research projects in the plant and microbial sciences generated new or improved contacts with industry in the UK for 12% of grantholders, and 13% of grantholders received financial support from industry; there was also high potential substantially to increase the level of interaction with industry and other users^[12]
- £6M allocated in 2007-08 to Industrial Partnership Awards, at a similar level to that in 2006-07

DELIVERING HIGHLY SKILLED PEOPLE

BBSRC is committed to maintaining the strength of the UK bioscience base through its funding of postgraduate and postdoctoral training, and by working with the universities to attract and retain the best bioscientists. The high-quality training supported by BBSRC, frequently in cutting edge areas of interdisciplinary research, has a substantial economic impact, by maintaining the supply of quality research expertise for key areas of the knowledge-based economy and across the economy more widely: individuals trained through BBSRC schemes are highly employable, and bring important skills into the economy. The pre-eminence of UK bioindustries is substantially based on the availability of high-level skills and expertise in the UK.

BBSRC works with industry on two CASE studentship schemes: Industrial CASE funds allow leading companies to decide which universities to collaborate with, and individual CASE awards, which have recently been refreshed to bring in new industrial partners.

- *“The UK has a rich bioscience base. Developing commercial success from this base depends on nurturing and developing a pool of talented bioscience professionals by attracting and retaining the best current talent and supporting leaders of the future”^[26]*

Developments since the 2008 baseline

BBSRC's continues to invest extensively in postgraduate and postdoctoral training and skills development. Compared with 2008:

- BBSRC supports 2,000 PhD students, including 540 trained in collaboration with industry through CASE, involving over 200 different companies. In the most recent competition, over 110 four-year PhD studentships were awarded to over 30 companies (including SMEs) for collaborative research, doubling the number of awards made over the previous competition
- Over 2,000 postdoctoral researchers are supported on BBSRC research grants, working in innovative and cutting edge areas of research
- Of BBSRC students awarded their PhD in 2006-07, 34% moved into industry or commerce (compared with 25% of the 2005-06 cohort), 37% started academic careers (36%), 11% moved to the public sector (9%), 4% went to teach (3%); 94% were employed in some capacity (87%)
- BBSRC has launched a new Industrial Impact Fellowships scheme, to bring professionals from industry to work with BBSRC-funded researchers and support translational aspects of their projects; interest in this has been high
- BBSRC is now operating 3-monthly policy secondments for PhD students to prepare briefing material and reports at the Parliamentary Office of Science & Technology; one fellow is working with the advisory team for the Innovation, Universities, Science and Skills Select Committee

ENCOURAGING ENTREPRENEURSHIP AND COMMERCIALISATION

BBSRC supports schemes to encourage an entrepreneurial culture within the academic bioscience research base and to help identify and develop specific, exploitable research outputs. These include: the Biotechnology YES (Young Entrepreneurs Scheme) competition to raise awareness of the commercialisation of bioscience ideas among postgraduate students and postdoctoral scientists; the Research Council Business Plan Competition, to help entrepreneurial researchers from across the UK find successful routes to market; the Enterprise Fellowships scheme, run with the Royal Society of Edinburgh, to support researcher involvement in commercialising their research; the Follow-on Fund, run with EPSRC, NERC and STFC, to increase the level and accelerate the rate of commercialisation of ideas arising from the research community.

- *“This award is a showcase for how funding by BBSRC is able to provide major tangible benefits not only to the UK science base but also to the biotech and pharmaceutical industries”* [Professor Stephen Jackson, first winner of the Innovator of the Year Award]
- *“With visionary coaching during the RCUK Business Plan Competition, a2sp Ltd has become an emerging drug discovery company; with in-house research funded by revenues generated from our Magic Tag® service”* [Dr Suzanne Dilly, BBSRC Enterprise Fellow]

Developments since the 2008 baseline

Achievements continue to accrue from these schemes:

- Over the last ten years, university bioscience departments funded by BBSRC have generated over 200 spin-out companies, now employing over 1,000 people ^[15]
- BBSRC Institute spin-out companies now employ over 130 staff, up from 100 in 2006-07
- In 2008-09 BBSRC introduced the Innovator of the Year Award; the first winner was Professor Stephen Jackson, University of Cambridge, for his work turning research on DNA damage and repair into cancer therapies
- Increased commercial awareness of UK bioscientists at the postgraduate level through the Young Entrepreneurs Scheme (YES), 318 trained in 2007-08 compared with 247 trained in 2006-07; 43% of YES ‘graduates’ moved into the private sector following their PhD (study commissioned by BBSRC from University of Nottingham Business School, December 2005)
- The most recent Research Council Business Plan Competition attracted a high percentage of bioscience related ideas (c30%), with three of the six finalists applying bioscience expertise

IMPROVING PUBLIC POLICY AND PUBLIC SERVICES

Although the bioindustries are vital users of BBSRC’s research, that research has a far wider impact, the most significant of which include its impact on public policy makers and on the provision of public services. In the policy arena, research supported by BBSRC sheds light on many issues of public interest and which are of growing importance, particularly climate change, food security, sustainable agriculture and land use and renewable energy.

The level of public confidence in research-based policy making requires the public to be engaged with, and supportive of, research within the Research Councils’ remit. Openness and responsiveness to issues of public concern are key elements of BBSRC’s activities to maintain public trust in UK bioscience. BBSRC organises public consultation and dialogues events, commissions attitudinal surveys, and runs web-based consultations, public meetings and events.

- *“Science matters to the security of world food supplies and the global environment more than ever. It is the bedrock on which so much of agriculture’s progress has been based and is essential to help deliver the efficiency of production in agriculture and horticulture so critically needed.”* [Peter Kendall, NFU President, October 2008] ^[23]

Developments since the 2008 baseline

This area of the baseline is still under development, but significant progress has been made.

- Basic research on the biology of natural changes associated with ageing is identifying opportunities for interventions that could prolong health and independence in the elderly, for example research at the University of Birmingham suggests a way of boosting the naturally lower effectiveness of white blood cells in old people, helping to fight infections better; and findings from Manchester Metropolitan University show exercise can reverse some age-related changes in muscle structure and performance, improving mobility and reducing the risk of falls.
- Research at North Wyke understanding the nitrogen conversion process in grassland soils has led to the development and application of tools and models which reduce leaching of NO₃ by 38% without reducing yield^[22]
- Food safety: Contributions from research at IFR valued at £23M pa (improved techniques for chilling foods), £25M pa (extended shelf life) and £60M pa (reduced food poisoning)^[21]
- Defra/FSA investment in BBSRC institutes stands at £22.2M (2007-08). However, this is a very partial indicator, and BBSRC is currently developing more refined measures, to cover the HEI portfolio as well as the institutes and a wider range of government partners
- Bioscience research leaders provide expert advice to government on a regular basis. Currently, representatives from the BBSRC senior executive and research community sit on policy advisory bodies, including the Advisory Committee on Releases to the Environment (ACRE), the NPL Advisory Committee and the TSEs funding forum
- Significant progress made in engaging the public on the emerging area of synthetic biology, with review undertaken and brochure published^[7]
- An experiment in the Sciencewise Nanodialogues project (run by Demos) exploring public views of basic underpinning nanoscience and its applications, and focusing on the challenges of upstream engagement.
- The RCUK 2008 attitudes to science survey shows that, since 2005:^[33]
 - a higher percentage of people agree “I am amazed by the achievements of science” (82% compared with 75%)
 - confidence in science has grown (25% agree “the more I know about science the more worried I am”, down from 35%)
 - a lower proportion are confused by science (56% agree “science and technology is too specialised for most people to understand”, down from 66%)

FUTURE PLANS A: DEVELOPING THE EVIDENCE BASE

To build up our understanding of EI from **excellent research** BBSRC will refocus its evaluation strategy to address EI questions directly, and:

- Produce a meta evaluation of the responsive mode remit as a whole, drawing on the detailed evaluations of each responsive mode area, to bring together all the relevant evidence
- Undertake an evaluation of the quality and achievements of BBSRC support for centres for investigating gene function and related responsive research
- Develop a programme of case studies of the impact of BBSRC funding of research, starting with *Streptomyces*

Further evidence of EI through **collaboration** will gathered from:

- An evaluation of the IPA scheme, to identify specific and potential impact
- An evaluation of the first RTC, the Bioprocessing Research Industry Cub (BRIC), which will identify impact and achievements, and will inform BBSRC's future strategy on RTCs
- A joint evaluation with TSB of the research funded in collaboration with the Board

Further evidence of EI through **training and skills development** will be sought by:

- Embedding evaluation of all training/skills development schemes within the new evaluation strategy
- Examining evidence on the role of postdocs in delivering responsive mode research
- A formal evaluation of BBSRC's David Phillips fellowships schemes
- In association with The Association of the British Pharmaceutical Industry (ABPI), an analysis of the economic impact of CASE PhD students in the workplace

We expect to demonstrate the continued effectiveness of our approach to **commercialisation and entrepreneurship** through increased and more widespread demand for funding through KT schemes in coming years. In addition BBSRC will:

- Evaluate the enterprise fellowship scheme, to provide a baseline against which future progress may be identified
- Work with other Research Councils to evaluate the RCUK Business Plan Competition
- In 2010 commission an external evaluation of attitudes to assess changes since 2007
- Enhance the knowledge transfer and commercialisation performance of BBSRC-sponsored Institutes, which are key players in the delivery of economic impact, and demonstrate outcomes through the next Institute Assessment Exercise, and a review of KT arrangements

Further evidence of impact through **public policy and engagement** will be developed by:

- Working with other RCs to develop methodologies, including evaluation of cross-Council RELU programme
- Regional impact study planned with the Babraham Institute
- Identification of further policy-related impact from increased monitoring of EI at institutes
- The meta evaluation of BBSRC's responsive mode portfolio
- The forthcoming RCUK Science in Society Unit evaluation of joint Council activities

FUTURE PLANS B: INVESTMENT FOR FUTURE EI

BBSRC will continue to support the **highest quality bioscience research** through responsive mode and research programmes and to sustain the dynamic UK bioscience research base. Specifically over 2008-11 BBSRC will: Ensure the continued health and international competitiveness of UK bioscience, by:

- Investing £115M in systems/predictive biology including tools and resources to effect further change and consolidate advances made under SR2004
- Increasing responsive mode funding by 3% a year
- Providing £80M for FEC, to support investigator-inspired research, the lifeblood of innovation

BBSRC has major plans to extend its portfolio of **collaborative research**, in partnership with other funders, particularly the TSB. Specifically, BBSRC plans to:

- Increase business interactions by redirecting £50M to research directly relevant to industry
- Provide at least £34M for complementary and collaborative activities with the TSB
- Operate at least four Research and Technology Clubs by 2011, with over 40 companies
- Increase the number and effectiveness of business-university links, including fostering specific larger-scale partnerships in the biomedical sector and supporting technology development approaches in the agri-food sector

BBSRC will provide the **skilled people** for our science base, bioindustries and economy, by:

- Increasing by a third, to £62M, funding for fellowships and training and skills development, and increase the number of PhD students to 2,400 by 2010-11.
- Virtually doubling funding for fellowships to £10M, developing early career bioscientists
- Investing up to £2M in new Industrial Impact Fellowships, to bring professionals from industry to work on BBSRC-funded projects, programmes, and in BBSRC centres, to support the translation of academic research into economic and social benefits for the UK

BBSRC regards a further **change of culture within the academic community** as key to delivering a step change in economic impact of its research. To facilitate this BBSRC will:

- Provide up to £15.5M over the SR 2007 period to strengthen business awareness and focus on academic research through entrepreneurship and commercialisation
- Introducing Excellence with Impact awards for promoting a culture of EI within university departments, to complement the Innovator of the Year celebrating the delivery of EI by individuals
- Increase by 50% the number of Enterprise Fellows supported

BBSRC plans significant investments in research relevant to **public policy development** and will run further programmes to encourage public engagement:

- BBSRC to lead a cross-Council programme of research to address the grand challenges of food security for the next spending review
- Commit £22M to research in underpinning food security during environmental change, including £7M to help secure agriculture and animal health in the developing world (with DfID)
- Secure national research capability and unique facilities in key strategic areas, particularly in animal health and welfare with major capital commitments of around £200M, focusing on redevelopment of IAH-Pirbright, as vital national facility
- Increase the impact of public dialogue activities, including public dialogue on energy research and activities to celebrate the Darwin bicentenary
- Share good practice between BBSRC institutes through networking activities, and among HEIs through the RCUK Beacons

BIBLIOGRAPHY

BBSRC General

1. BBSRC Delivery Plan, Delivery Reports and EIRF/Outputs frameworks
http://www.bbsrc.ac.uk/publications/policy/bbsrc_delivery_plan.html (2005-06; 2006-07; 2007-08)
2. BBSRC Annual Reports: <http://www.bbsrc.ac.uk/publications/accounts/index.html>
3. Bioscience Biomillions (May 2008):
http://www.bbsrc.ac.uk/publications/corporate/bioscience_biomillions.html
4. Link Applied Genomics (April 2005)
http://www.bbsrc.ac.uk/publications/innovation/applied_genomics_link_booklet.html
5. Biotechnology YES Showcase (January 2005):
http://www.bbsrc.ac.uk/publications/innovation/yes_showcase_booklet.html
6. Bioscience for industry:
http://www.bbsrc.ac.uk/publications/corporate/bioscience_for_industry.html
7. Synthetic Biology: http://www.bbsrc.ac.uk/publications/corporate/synthetic_biology.pdf
8. BBSRC Business (2008-09): <http://www.bbsrc.ac.uk/publications/business/index.html>
 - “Spin-out takes forward new clues for increasing oilseed yields”; “Farmers highlight the value of scientific research”; “Supporting the dairy industry; Licensing agreement for Institute's rapid bluetongue test”, (January 2009)
 - “Nanoscience outputs” (October 2008)
 - “Sheffield spin-out wins additional investment for novel therapeutic proteins” (July 2008)
 - “Industry-academic partnership aims to clean up”; “‘Chance’ idea leads to successful spin-out”; “Vets, researchers and industry fight serious pig disease”; “Centre brings together BBSRC-funded researchers and 17 industrial affiliates”; “Major scientific push to tackle agricultural productivity and food security in the developing world”; “Bioscience in the Home Office”; “Chinese celebrations for new Babraham bioincubator”; “Novacta Biosystems receives £3.2M Wellcome Trust Award”; “41-year study reveals link between forest pest and global warming”; “From scientist to newshound” (April 2008)
9. Social and policy impacts: <http://www.bbsrc.ac.uk/organisation/achievements/social.html>
10. Economic impacts: <http://www.bbsrc.ac.uk/organisation/achievements/economic.html>

BBSRC Evaluations

11. Institute Assessment Exercise outcomes
http://www.bbsrc.ac.uk/organisation/policies/reviews/operational/0606_institute_assessment.html
12. Responsive mode portfolios: Animal Sciences (February 2006), Biochemistry and Cell Biology (November 2006), Genes and Developmental Biology (February 2007), Agri-food (March 2008), Engineering and Biological Systems (December 2008):
http://www.bbsrc.ac.uk/organisation/policies/reviews/funded_science/
13. Initiatives: Biology of the Spongiform Encephalopathies (December 2007), Science of Ageing and Experimental Research on Ageing (January 2008):
http://www.bbsrc.ac.uk/organisation/policies/reviews/funded_science/
14. Evaluation of the Bioprocessing Research and Industry Club (report pending)
15. Survey of BBSRC-supported university Bioscience departments (report pending)

BBSRC Institutes

16. “Economic impact of the John Innes Centre”:
http://www.jic.ac.uk/corporate/about/publications/impact/economic_impact.pdf
17. “Making a difference: the past and future economic and societal impact of Rothamsted Research”: <http://www.rothamsted.bbsrc.ac.uk/intopractice/Impact.html>
18. “The economic and social impact of the Institute for Animal Health’s work on Bluetongue disease (BTV-8)”: <http://www.iah.ac.uk/ecosoc/index.shtml>
19. “The economic and social impact of the Institute for Animal Health’s work on Foot and Mouth disease” (July 2008): <http://www.iah.ac.uk/ecosoc/index.shtml>
20. “Economic and Social Impact of Science at the Institute for Animal Health”:
<http://www.iah.ac.uk/ecosoc/index.shtml>

21. "The economic impact of the Institute of Food Research":
http://www.ifr.ac.uk/Publications/Impact/IFR_economicimpact.pdf
22. "The past and future economic and societal impact of IGER's research" (Available from BBSRC Swindon Office)

Other

23. "Why science matters for farming" (NFU, October 2008):
<http://www.whyfarmingmatters.co.uk/x393.xml>
24. "Agriculture in the UK" (Defra, 2007):
<https://statistics.defra.gov.uk/esg/publications/auk/2007/default.asp>
25. "Working for the UK: our contribution to the economy" (Food & Drink Federation, 2007):
https://www.fdf.org.uk/resources/fdf_competitivereport_v32%20amended.pdf
26. "UK Food export facts" (Food from Britain, 2008):
http://www.foodfrombritain.com/whatwedo/fast_facts.asp
27. "The review and refresh of bioscience 2015" (Bioscience Innovation and Growth Team, 2009):
http://www.bioindustry.org/biodocuments/BIGTR2/BIGT_Review_and_Refresh.pdf
28. "The Association of the British Pharmaceutical Industry Annual Report 2007" (ABPI, 2007):
<http://www.abpi.org.uk/publications/pdfs/AnnualReview07.pdf>
29. SCI e-bulletin (December 2008):
http://www.soci.org/SCI/ebulletin/archive/index_10_Dec_08.html
30. "International comparative performance of the UK research base" (Evidence Ltd for DIUS, July 2008): <http://www.ltnetwork.org/site/upload/document/DIUS.pdf>
31. Research Assessment Exercise 2008 results: <http://submissions.rae.ac.uk/results>
32. "Pharmaceutical industry issues: research and the science base", (ABPI, 2004)
33. "Public attitudes to science 2008: a guide" (RCUK, 2008): <http://www.rcuk.ac.uk/sis/pas.htm>
34. "The need for a new vision for UK agricultural research and development" (The Commercial Farmers Group; available from BBSRC Swindon Office)

Chart 1: BBSRC Research Funding: Analysis of Gross Expenditure by Funding Type

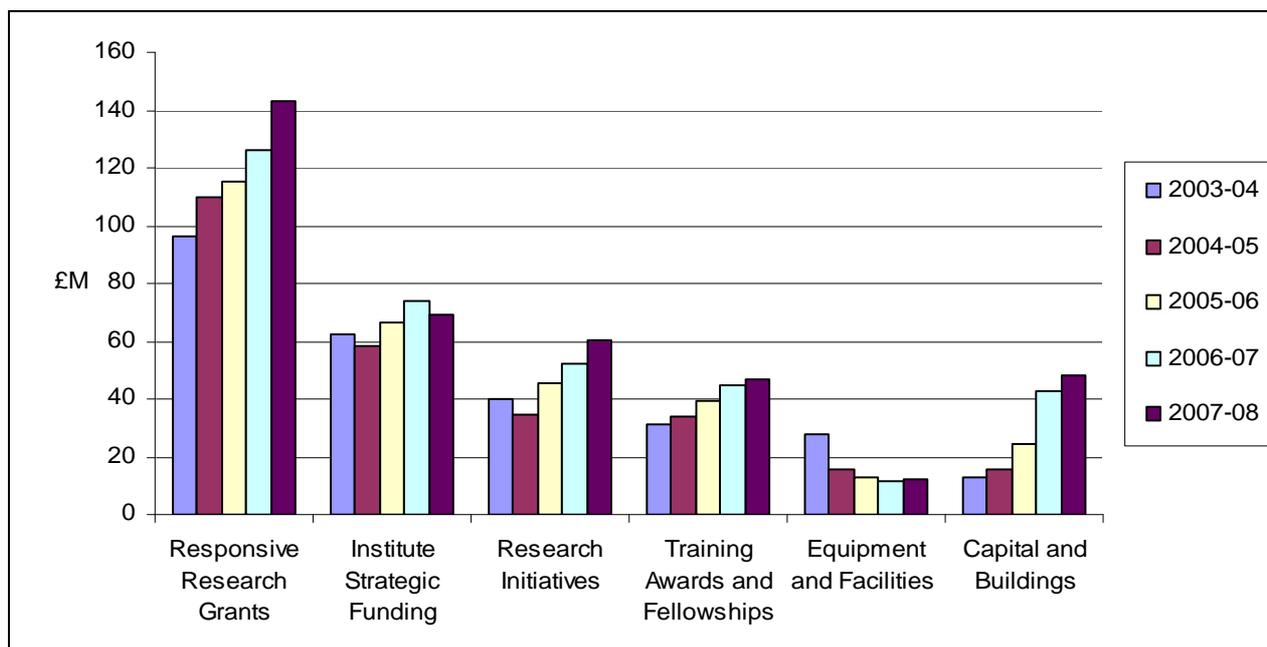
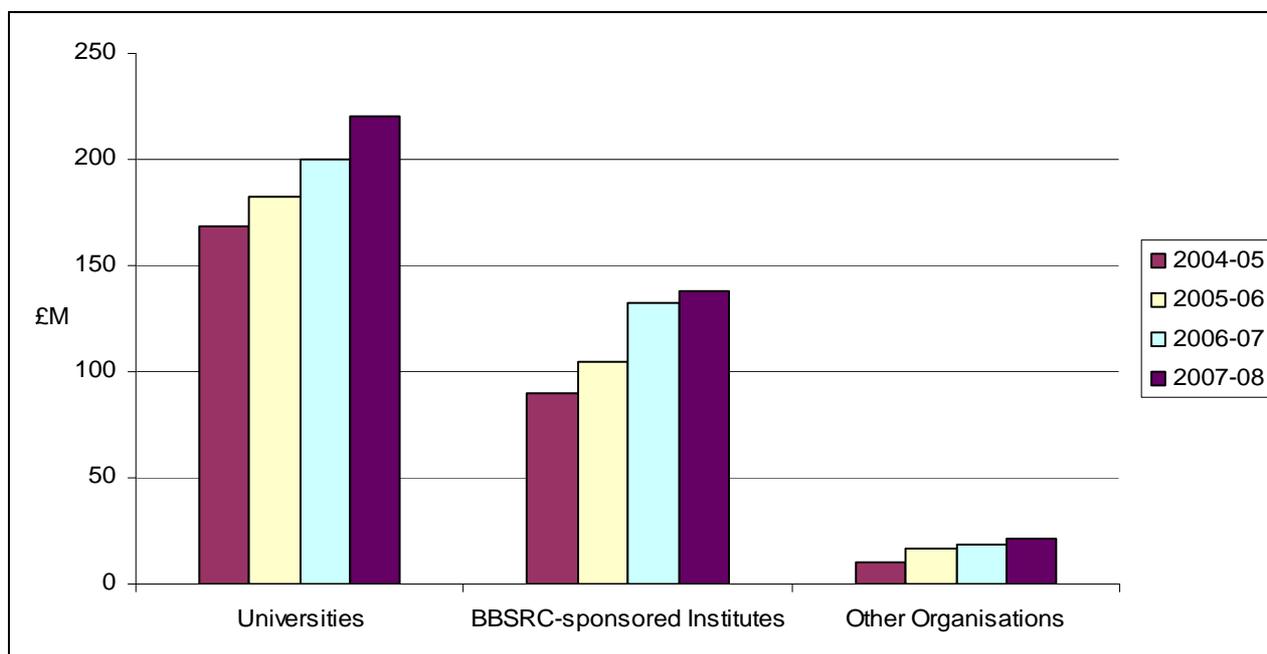


Chart 2: BBSRC Research Funding: Analysis of Gross Expenditure by Institution Type



Source: BBSRC Annual Reports ^[2]