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Socio-Economic Impact of The Pirbright Institute

SQW

Contents

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Glossary of terms

APHA – Animal and Plant Health Agency

ASF(V) – African swine fever (virus)

AVRI – Animal Virus Research Institute

BBSRC – Biotechnology and Biological Sciences Research Council

BSPS – Berkshire and Surrey Pathology Services

BT(V) – Bluetongue (virus)

CL3/4 – Containment Level 3/4

CVIM – Centre for Veterinary Vaccine Innovation and Manufacturing

Defra – Department for Environment, Food and Rural Affairs

DSTL – Defence Science and Technology Laboratory

EFSA – European Food Safety Authority

EMS – Estates Maintenance Services

FAO – Food and Agriculture Organisation

FCDO – Foreign, Commonwealth and Development Office

FMD(V) – Foot-and-mouth disease (virus)

GVA – Gross Value Added

IB(V) – Infectious bronchitis (virus)

KEC – Knowledge Exchange and commercialisation

LSD – Lumpy skin disease

MD(V) – Marek's disease (virus)

NBAF – National Bio and Agro-Defense Facility

NPU – Neuropathogenesis Unit

PHE – Public Health England

PPR – Peste des petits ruminants

RSB – Royal Society of Biology

SGP – Sheep and goat pox

STP – Science and Technology Platforms

UKHSA – UK Health Security Agency

VIDO – Vaccine and Infectious Disease Organisation

WOAH – World Organisation for Animal Health

1. Introduction

1.1 The Pirbright Institute is a world-leading centre of excellence in the research and surveillance of viral diseases of livestock and viruses that spread from animals to humans. An independent company, limited by guarantee and a registered charity, Pirbright is a UKRI Biotechnology and Biological Sciences Research Council (BBSRC) strategically supported institute, serving as a National Capability to understand, predict, detect, and control viral diseases of livestock.

1.2 The Institute delivers fundamental and applied research, enabled by world-class high- and low-containment laboratories and specialist animal facilities, and supported by cross-cutting Science Technology Platforms. Pirbright hosts ten 'Reference Laboratories' for viral diseases including bluetongue, African swine fever, and lumpy skin disease, designated by bodies, including Defra, the World Organisation for Animal Health (WOAH), and the Food and Agriculture Organisation (FAO). The Institute is the 'World Reference Laboratory' for foot-and-mouth disease, one of the most contagious and economically damaging animal diseases.

1.3 SQW was appointed in 2024 to undertake a Socio-Economic Impact Study of the Institute. The remit of the study was to: (1) quantify the economic impact of Pirbright's operational, knowledge exchange and commercialisation (KEC) activities on the UK economy; and (2) identify and highlight the wider impacts of the Institute's activities on society and the economy in the UK and internationally, including its strategic effects. In this report, these are referred to as 'quantified' and 'non-quantified' impacts, respectively.

1.4 The study focusses on 2015-16 to 2023-24. This 'impact period' was selected to cover activity since the last impact study (in 2014). It also coincides with the starting point for scientific activity in the BBSRC National Virology Centre (The Plowright Building) in early 2015, which represented a major milestone in the development and capability of the Institute.

1.5 The study involved consultations with 33 individuals that worked at Pirbright during the impact period[1] and nine external strategic stakeholders. We would like to thank all individuals involved in the consultations. We extend particular thanks to the study steering group: Prof John Hammond (Director of Research), Dr Louise Barton (Head of Research and Innovation), Lizelle Gouverneur (Head of Business Development), and Dr Rebecca McLean (Impact Manager); and to Helen Watts (Director of Finance).

1.6 The report is structured as follows: Section 2 profiles the Institute; Section 3 introduces the impact framework; Section 4 presents the quantified impacts; Section 5 presents the non-quantified impacts; and Section 6 summarises the impacts and considers future prospects. Annex A contains 'case examples' showcasing key areas of the Institute's economic and global impact in the animal health sector. Annex B contains further details of the study methodology.

[1] 28 current members of staff, and five former staff members at the point of the consultation.

2. About The Pirbright Institute

Then …

2.1 The Pirbright Institute has been in existence in various forms for over 110 years. Livestock surveillance activities began at Pirbright in 1914, with the establishment of a cattle testing station for tuberculosis. In the mid-1920s, this station began undertaking research on foot-and-mouth disease (FMD), and by the 1930s, it had become the sole UK centre for FMD research. Pirbright broadened its focus in the 1960s to include research on other viral diseases in livestock, becoming known as the Animal Virus Research Institute (AVRI).

2.2 In 1986, the Institute for Animal Health was formed by bringing together the AVRI at Pirbright, with research laboratories at Compton in Berkshire, Houghton in Cambridgeshire, and the Neuropathogenesis Unit (NPU) in Edinburgh. Subsequently in 1992, the Houghton Laboratory closed, and poultry research moved to Compton.

2.3 Then in the late 2000s, the NPU in Edinburgh left the Institute for Animal Health to become part of The Roslin Institute. A new Institute for Animal Health science strategy in 2009 focused on the growing threat of viral diseases to livestock, and indicated there would be a strategic move to consolidate activities on one site at Pirbright. Reflecting this, in 2012, the institute was renamed The Pirbright Institute (with the Compton site closing fully in 2015).

2.4 The new science strategy and move to consolidate activities at Pirbright involved the launch of a major development programme from 2010 onwards to improve and enhance the facilities on the site. This involved significant capital investment from UK Government and the BBSRC. This reflected in part a recognition of the need to invest substantially in biosafety management and failing infrastructure at the Institute.

2.5 Phase 1 of the development programme included the construction of the BBSRC National Virology Centre: The Plowright Building, a high-containment (Level 4) laboratory for researching high-risk, exotic and zoonotic viruses such as FMDV, ASFV and bluetongue. This was completed in 2014.

2.6 Development phase 2 included the construction of the BBSRC National Vaccinology Centre: The Jenner Building, a low-containment (Level 2) facility supporting research on endemic poultry and livestock viruses such as Marek's disease virus (MDV) and infectious bronchitis virus (IBV), immunology, and genomics. This was completed in 2017. Also, in 2023, The Biggs Avian Research Building opened, enhancing capacity to undertake research into infectious diseases of poultry.

2.7 Development phase 2 also included the construction of a unique to the UK high-containment (Level 4) science facility dedicated to the study of livestock diseases and zoonotic viruses that infect animals and humans, including Rift Valley fever virus and Japanese encephalitis virus.

Practical completion of this facility, The Brooksby Building, occurred in late-2024, and was in the occupation phase before planned operation start in 2026 at the time of writing this report.

… and now

Purpose

2.8 The strategic purpose of the Institute can be summarised as follows:[2]

***Mission**: To be the world's leading innovative centre for preventing and controlling viral diseases of livestock. **Vision**: To apply scientific research to prevent and control viral diseases, protecting animal and human health and the economy.*

2.9 The Institute plays complementary roles as both a leading centre for surveillance and disease control, and for fundamental and applied research, on serious viral diseases of livestock and viruses that spread from animals to humans. Serving as a National Capability, Pirbright provides the UK with the capacity to predict, detect, understand, and respond to the threat of viral diseases of livestock that are circulating in and outside the UK.

Figure 2-1: Roles of the Institute

Source: SQW, based on Pirbright Science Strategy 2020-2025[3]

[2] The Pirbright Institute, 2025, Our Mission and values. Available here
[3] The Pirbright Institute, Science Strategy 2020-2025. Available here

2.10 This dual and complementary expertise, in both surveillance and research, was highlighted consistently in consultations for this Impact Study as crucial to the distinctiveness, added-value, and strength of the Institute.

> **Research groups conducting fundamental research are able to work in parallel with diagnostics teams, on the same site, allowing frontline research to come together**
>
> *Internal consultee*

Profile

2.11 The Institute is home to around 250 scientific staff, organised across over 30 research groups and eight Science Technology Platforms (STPs). The Institute also hosts around 45 PhD students, with students supervised by Pirbright experts and affiliated with universities across the UK and international Institutes, ensuring a comprehensive support structure for doctoral research. This includes supporting iCASE studentships, which involve collaboration with industry.

2.12 Covering research on over 30 viral diseases of livestock and zoonotic diseases of global significance, the Institute's science is structured through two strategic research programmes:

- **Virus Life Cycles at Multiple Scales:** Focussed on understanding how viruses replicate within infected cells, induce species-specific disease, transmit between hosts, and circulate around the globe.
- **Host Responses to Viral Infection:** Focussed on understanding what properties of the host response determine the outcome of viral infection, to inform new control measures and develop improved vaccines.

2.13 The 250 scientific staff at the Institute are supported by around 130 non-scientific staff. This includes dedicated specialist teams for:

- health, safety & biosafety, reflecting the level of risk of Pirbright's activities, and the need to ensure the safe and reliable operation as a major hazard site.
- estates management services, with a substantial on-site team in place, reflecting the need to maintain highly specialised scientific and animal facilities and other infrastructures in both high and low containment environments.
- animal services, to ensure the highest standards of animal care in research, adhering to strict ethical guidelines and legislation.
- research and innovation (including business development), and other professional and support services (IT, finance, HR etc) to facilitate, enable, and exploit the benefits of the world-class science and surveillance activities delivered at the Institute.

2.14 An independent organisation and registered charity, Pirbright funds its activities through a variety of sources. These include: (i) 'core' grant funding from BBSRC for strategic research programmes and to ensure that the Institute's facilities are maintained at the necessary level to provide a National Capability; (ii) generating income from collaborative, commissioned and competitively awarded research projects from UKRI and its councils, and other UK and international funding agencies and philanthropic bodies; and (iii) knowledge exchange activities, including skills development and training, diagnostic testing and the sale of reagents and other scientific products, and the provision of specialist consultancy services.

2.15 The Institute also generates income and delivers services through its Reference Laboratories. These are specialist laboratories designated to provide expert advice, testing, and data on specific viral diseases. Dedicated funding is provided by Defra to enable Pirbright to provide diagnostic capacity to support the detection and control of national disease outbreaks; funding is also provided by WOAH and FAO for international Reference Laboratory activities. The Reference Laboratories also perform commercial services, such as evaluating diagnostic kits and testing disinfectants. The Reference Laboratories cover: African horse sickness; ASF; BTV; FMD; LSD; MD; PPR; Rinderpest; SGP; and Swine vesicular disease. This list includes three of the four animal diseases covered in the UK's 2025 National Risk Register.[4]

Key capabilities

2.16 The key capabilities of the Institute – spanning its people in both scientific and technical contexts, its specialist facilities, and collections – are summarised in the box below.

- World-class scientists, experts in virology, vaccinology, immunology, epidemiology, entomology, biomathematics and genetic engineering
- Unique high-containment research facilities to study animal viruses of economic importance in the natural host (*in vitro* and *in vivo* study facilities)
- International reference laboratories accredited to ISO/IEC 17025, a UKAS accredited laboratory number 4025
- Genetically defined and inbred lines of animals, collections of arthropod vectors and a range of well characterised virus stocks
- Production and engineering of recombinant antibodies for veterinary research
- Multidisciplinary immunological research to enable detailed understanding of recognition and control of viral infection by the natural host
- Facilities for infection of insect vectors with viruses
- Next generation sequencing and *in vitro* bioimaging in high containment
- High containment engineering and health, safety and biosafety expertise

Source: SQW, based on Pirbright Science Strategy 2020-2025[5]

2.17 This set of re-enforcing capabilities was consistently highlighted as a key strength of the Institute in consultations. Specifically, the combination of world-class facilities and the

[4] HM Government, 2025, National Risk Register. Available here
[5] The Pirbright Institute, Science Strategy 2020-2025. Available here

scientific and engineering expertise to leverage them fully was a key theme. We return to this theme in later sections, but the quotation below exemplifies this well:

"The Institute is the only place in the UK able to do research at the highest level of containment for animal/livestock pathogens …. Additionally, the combination of human and animal health in high containment is unique in Pirbright due to the CL3 lab within high containment … For example, avian influenza is a SAPO4 disease for animals[6] and a CL3 disease for humans; to work on this disease, Pirbright is one of very few places for this and it has the most extensive capabilities. The expertise needed to operate the facilities is also crucial. Having the technology is not enough – Pirbright has an extensive history of knowing how to operate it as well … and a critical mass of scientists working on this, and the expertise to do so."

Internal consultee

2.18 The Institute's facilities, resources and expertise are supported by STPs. The STPs enable and enhance science activity and accelerate the use of emerging technologies and techniques. They cover: Bioimaging, Bioinformatics, Cell Culture, Flow Cytometry, Insect Transgenesis, High Throughput Sequencing, Containment Level 3 (CL3) Virology and Immunological Toolbox (see Impact Spotlight below).

Impact Spotlight – Immunological Toolbox

The Immunological Toolbox is a repository of antibodies, reagents and resources to advance veterinary immunology research. A partnership with The Roslin Institute, the Toolbox aims to provide accurate data on currently available reagents, alongside the capacity to expand the veterinary reagent portfolio through the production and characterisation of new immunological reagents, tools, and assays to promote research. At Pirbright, the focus is on sequencing existing cell lines and the generation of recombinant (i.e. synthetic) antibodies. Roslin is focussed on the development of new reagents, and validation of existing reagents for specificity and cross-reactivity. The Toolbox website has c. 3,000 registered users, and 1,000 active users internationally.

A core beneficiary of the Toolbox capability is the Antibody Hub at The Pirbright Institute, which was established following a grant from the Bill & Melinda Gates Foundation. The Hub aims to apply Pirbright's expertise in livestock viral diseases, cutting-edge technology and unique high-containment facilities to bring antibody discovery, manipulation and testing up to the level seen for rodents and humans. The research will be used to drive vaccine selection and design and test antibody therapies, to improve animal health and ultimately human health, within the 'One Health' agenda.

[6] A disease producing organisms which are either exotic or produce notifiable disease and have a high risk of spread from the laboratory.

Position in the research and disease control landscape

2.19 Pirbright collaborates extensively with organisations across the research and disease control landscape, both in the UK and internationally. For example, the latest annual report indicated that the Institute entered into over 50 new collaboration agreements in the 2023-24 financial year alone. This involved collaborations with nearly 60 organisations based in 13 countries.[7]

2.20 This breadth of engagement was reflected in consultations for the Impact Study, with a wide range of organisations cited as key partners in realising socio-economic impact by Institute staff and stakeholders. This included funding agencies, universities and research institutes, disease control and health agencies, and other partners (e.g. commercial and charitable organisations). Figure 2-2 highlights key partners identified in the research, both in the UK and internationally. Note the Figure is illustrative – identifying some of the Institute's key partners to highlight its role in the research and disease control landscape. It does not seek to capture each and every partner of the Institute (including research project collaborators).

2.21 The types of relationships vary, both within and across the partners identified. The nature of the partners is also broad; this reflects the unique position of the Institute, and its work across animal and human health, fundamental and applied research, and viral and host responses. The Institute is also extensively involved in multi-lateral projects, partnerships and networks, both nationally and internationally. The consultations also highlighted Pirbright's role working at a strategic level to provide policy or specialist technical advice. This included advice on both disease control and prevention, and in relation to accreditation and professional standards, and skills and training development. These are important routes to socio-economic impact, as discussed in more detail later in the report.

2.22 The 'interconnectedness' of Pirbright, the scope and depth of partnership working, and commitment to collaboration were consistently identified as key characteristics and strengths of the Institute, by both internal and external stakeholders consulted. This was seen to reflect the Institute's reputation as a leading centre for viral disease control, surveillance, and research, which helps to attract partners. The 'culture' of the Institute was also regularly cited; Pirbright was reported by both staff and external stakeholders to regard partnership working as core to its operation, recognising its role in the broader bioscience ecosystem.

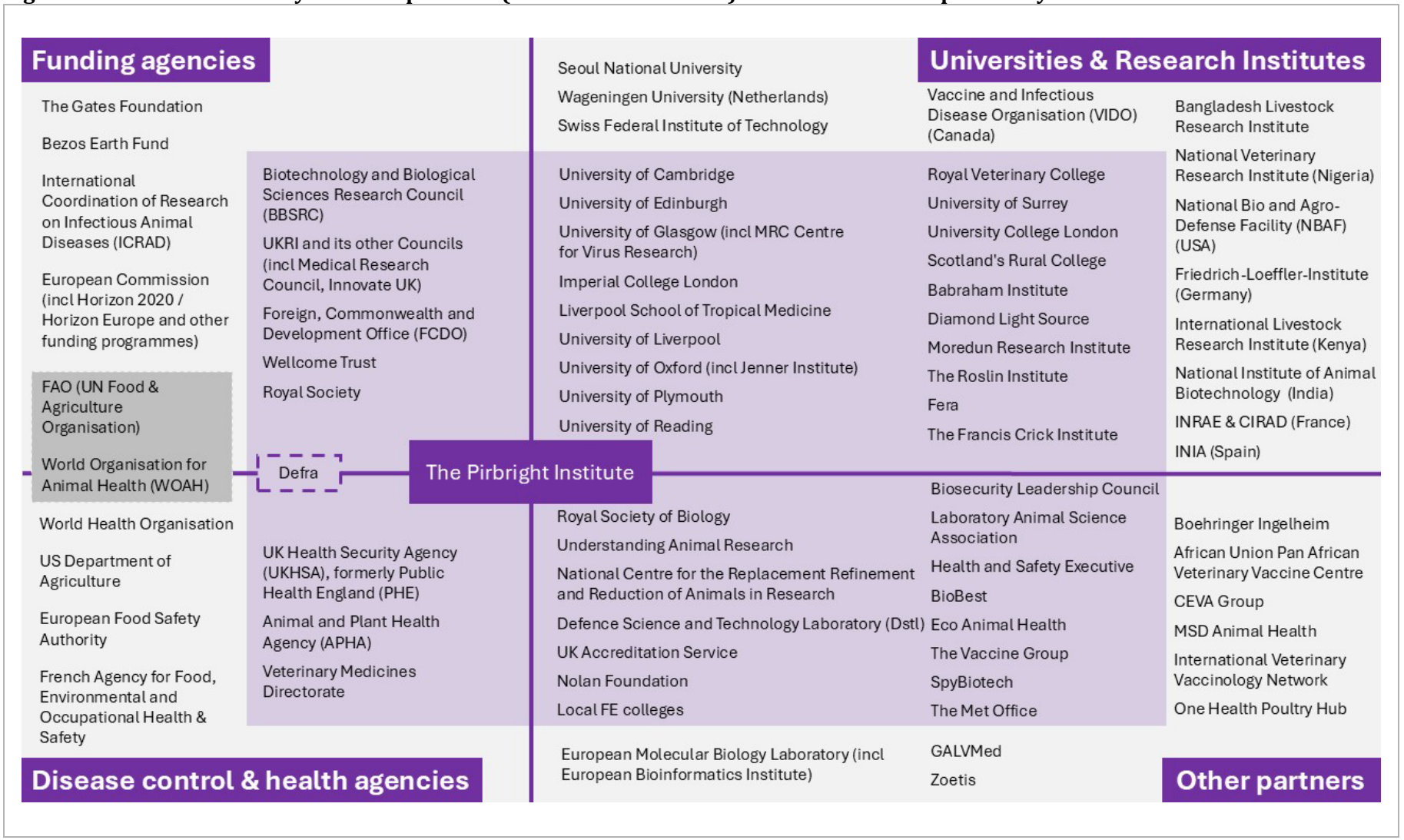
2.23 Both the 'pull' of Pirbright, and its 'openness to collaborate' were seen as key in enabling the Institute to realise socio-economic impact. One consultee summarised this as follows:

"Because a lot of the research done is collaborative in nature, having these strong networks is key … Sometimes this can be taken for granted, but it is definitely crucial, and a unique asset of The Pirbright Institute."

Internal consultee

[7] The Pirbright Institute, 2025, Annual report and Accounts for the Year ended 31 March 2024. Available here

Figure 2-2: Illustration of key Institute partners (UK and international) identified in the Impact Study



Note: National partners are in the inner box; international partners are in the outer box
Source: SQW, based on consultations with Pirbright and document review

3. Impact framework

3.1 The Institute realises socio-economic impact through a range of different mechanisms, reflecting its mission to prevent and control viral disease of livestock through diagnostic and surveillance services, and applied and fundamental research.

An impact framework that sets out the Institute's routes to socio-economic impact is presented in Figure 3-1. This framework provides a depiction of the 'theory of change' for how Pirbright realises socio-economic impact – and the scope and nature of these impacts – including:

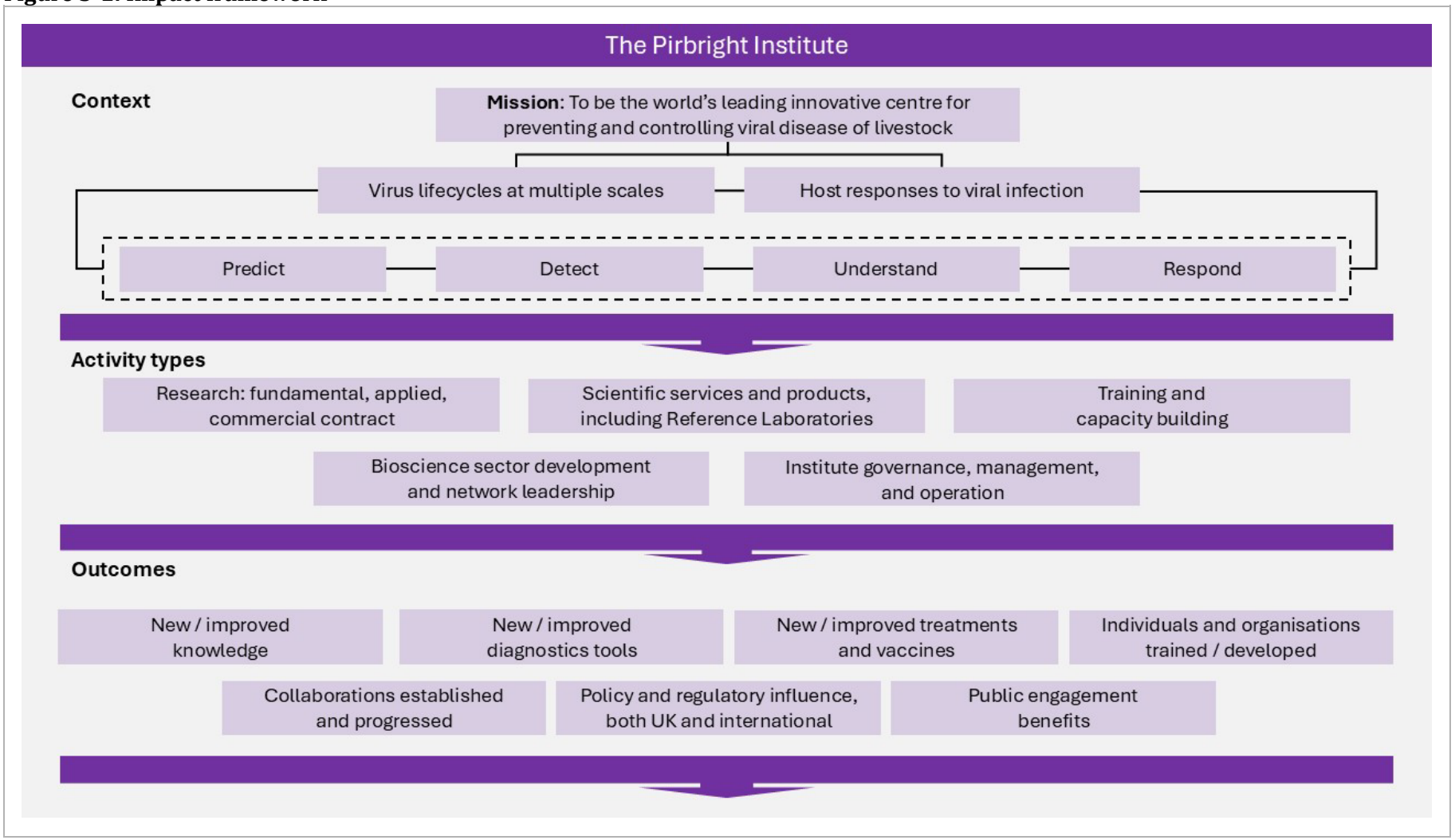
- the **context** for the Institute in terms of its mission and roles
- the range of **activities** delivered by the Institute
- the immediate effects of these activities in terms of the **outcomes** generated
- the longer-term **impacts** that these give rise to, including the UK economic impacts that have been quantified in the study, and the wider effects both in the UK and internationally that have been captured in six categories of non-quantified impact (which are presented separately, but which have important linkages in practice)
- the ultimate **results** that are realised for society and the economy.

3.2 Two points are noted on the impact framework. First, central to the Institute's role is to undertake activity, both diagnostic/surveillance and research, that seeks to **prevent and control the outbreak of diseases**. The contribution is essentially an avoided negative impact on society, and the economy, from the emergence or continuation of an outbreak. The full scope of the potential negative impact avoided is inherently unknowable, particularly given the diverse range of diseases covered by Pirbright. Therefore, this study has not sought to quantify or aggregate these effects. That said, where existing research or evidence has been identified in the Impact Study that does seek to estimate these effects for specific diseases, these have been reported. While no 'single figure' estimate can fully reflect the scale of the Institute's impact in avoiding adverse effects across its activities, in some cases these are substantial, and this should be recognised.

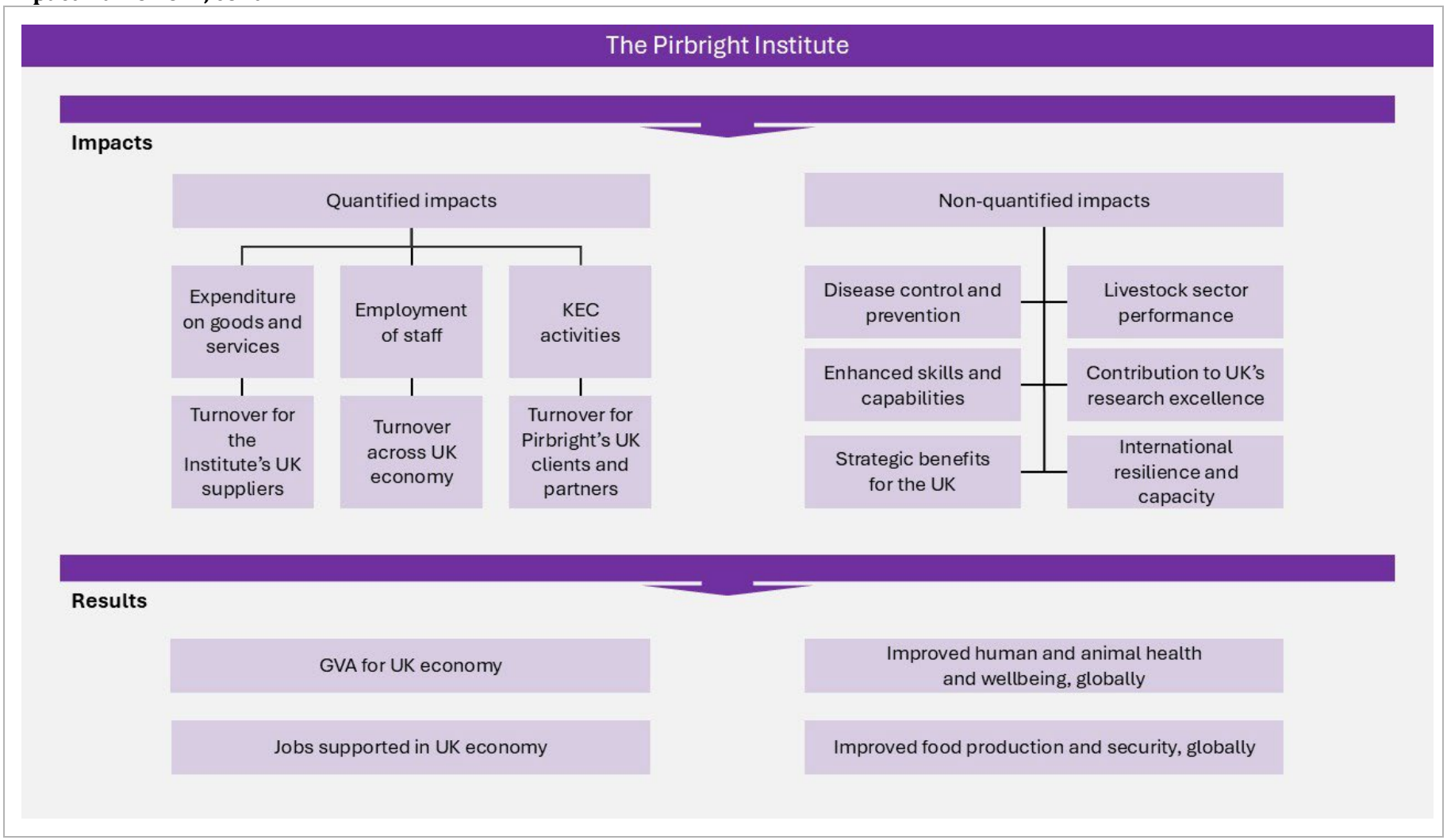
3.3 Second, **the focus of the quantified assessment is on the UK economy specifically**. The Institute also contributes to economic impact overseas – for example through training, and the purchase of goods and services. However, these have not been quantified in this study. The international contribution of Pirbright is considered via the non-quantified effects.

3.4 The two sections that follow consider these quantified (UK) and non-quantified (UK and international) effects in more detail.

Figure 3-1: Impact framework



Impact framework, cont.



Source: SQW

4. Quantified impacts

4.1 Consistent with the framework set out in Section 3, this section presents quantified estimates for the economic impact of operational activities – i.e. expenditure on goods and services and employment of staff – and KEC activities undertaken at the Institute from 2015-16 to 2023-24 on the UK economy. All values presented in this section are in real terms, using 2023-24 £s, to correct for the effects of inflation over time.

Overview of estimates

4.2 Economic impact is quantified in terms of gross value added (GVA) and full-time equivalent (FTE) jobs. GVA is a measure of the economic value generated by the Institute through its activities. In the case of Pirbright, it includes generating demand for suppliers, i.e. turnover in a particular industry. The measure accounts for costs of intermediate inputs, the value of subsidies and taxes, and displaced demand from other industries.

4.3 The Institute's operational and KEC activities from 2015-16 to 2023-24 are estimated to have: (1) generated a total of £471m in GVA, or approximately £52m per year, on average; and (2) supported approximately 1,088 FTE jobs per year, on average.

4.4 The breakdown of GVA and jobs supported by category is summarised in Table 4-1 below. The GVA estimates are cumulative, i.e. they represent the aggregate impact over the assessment period. The employment figures are shown on a per annum basis (average in the period).[8]

Table 4-1: Summary of economic impact model estimates (2015-16 to 2023-24)

	GVA generated	Jobs supported (FTE)
Expenditure on goods and services	£308m	489
Employment of staff	£160m	594
KEC activities	£3m	6
Total	**£471m**	**1,088**

Source: SQW

[8] This is because GVA generation is an instanced effect. It is captured by considering all effects during the year (a sum), which can be aggregated over time. Jobs supported is a persistent effect – the same job can be performed by two or more people over a period of time, but it does not mean that multiple jobs were supported; aggregating the annual figures would provide a misleading picture of impact.

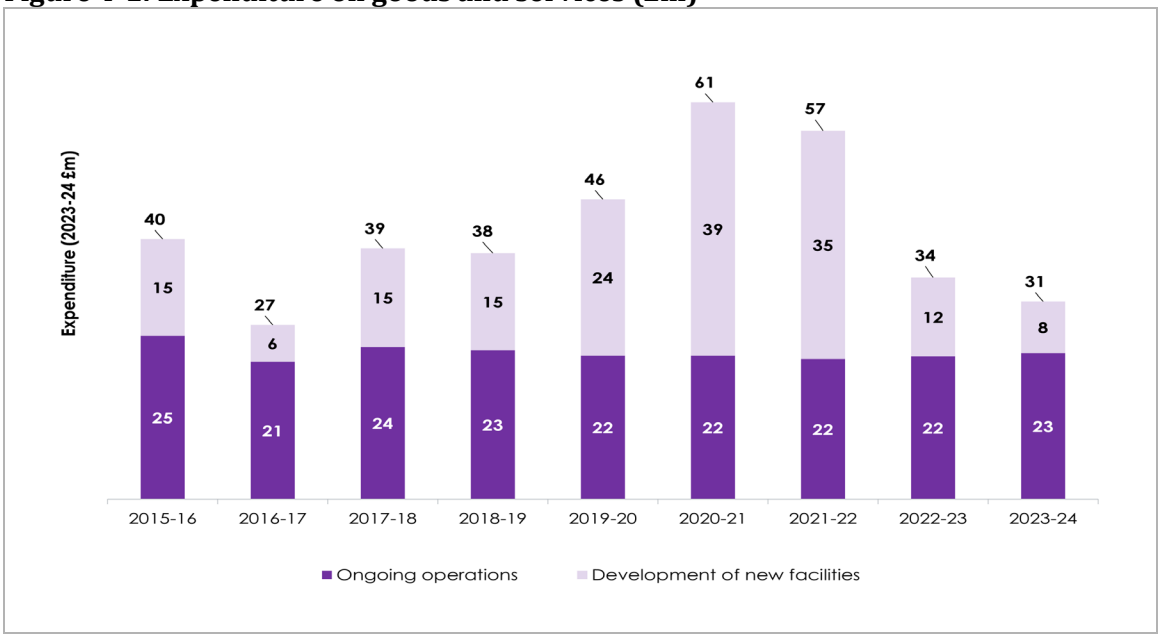
Detailed estimates

Operational impacts

Expenditure on goods and services

4.5 The total estimated value of the Institute's annual expenditure on goods and services over the impact period in the UK is shown in Figure 4-1. Expenditure to support day-to-day operations, e.g. on research consumables, energy, and travel costs, was broadly consistent over the period at approximately £21-25m per annum. Additionally, Pirbright's investment into the construction of new specialist facilities – including the BBSRC National Vaccinology Centre: The Jenner Building, The Biggs Avian Research Building, and The Brooksby Building – contributed between £6m and £39m in per annum expenditure over the 2015-16 to 2023-24 period. This expenditure profile was more variable than day-to-day operations, reflecting the timing of construction activity.

Figure 4-1: Expenditure on goods and services (£m)[9]



Source: The Pirbright Institute Annual Reports

4.6 By generating this revenue for supplier businesses (some £373m in total), and in turn their supplier businesses, the Institute's expenditure generated an estimated total of £308m in GVA to the UK economy over 2015-16 to 2023-24. This is equivalent to an annual GVA contribution of approximately £34m on average. Additionally, this revenue is estimated to have supported about 489 FTE jobs per year across the period.

4.7 Given the breadth of goods and services purchased by the Institute to support its operations, the economic impact is spread across many industries, such as manufacturing, electricity and

[9] Figures are adjusted to reflect expenditure taking place in the UK only; this is estimated at approximately 95% of total expenditure shown in the 2015-16 to 2023-24 Annual Reports.

gas supply, energy, and professional services. Further, Pirbright's investment into developing new facilities has a particularly significant impact on the construction industry, with about half of the total GVA from expenditure on goods and services being generated in that industry (46%).

Table 4-2: GVA and jobs impact of expenditure on goods and services

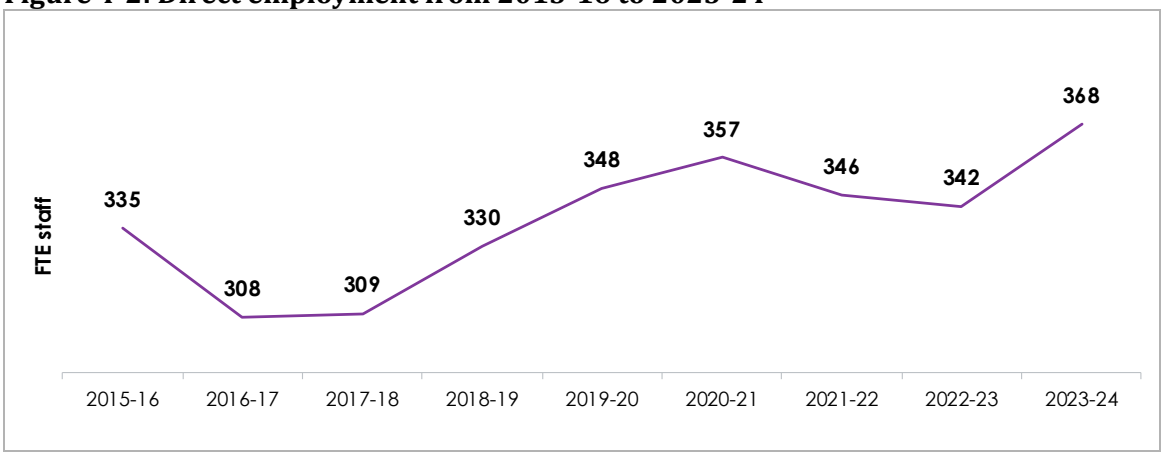
Impact metric	Financial year								
	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
GVA (£m)	£33m	£22m	£32m	£31m	£38m	£51m	£47m	£28m	£25m
Jobs (FTE)	454	297	441	431	538	834	695	378	329

Source: SQW

Employment of staff

4.8 Across the 2015-16 to 2023-24 financial years, Pirbright employed between 308 and 368 full-time equivalent staff per year. This figure includes both scientific staff, i.e. researchers, and operational staff i.e. engineering, animal services, security, and other administrative staff that support and enable the Institute's operations. In the latest year (2023-24), scientific staff accounted for around two-thirds of employment, with operational staff accounting for around a third of employment. This direct employment, illustrated in Figure 4-2, makes up a significant part of the Pirbright's contribution to supporting jobs in the UK economy.

Figure 4-2: Direct employment from 2015-16 to 2023-24[10]



Source: The Pirbright Institute Annual Reports

4.9 The Institute's employment of staff generates further indirect benefits for the UK economy. First, when staff spend their salaries on personal goods and services, this generates revenue for and supports jobs among businesses and suppliers across the wider economy. Second, the Institute's payment of National Insurance (NI) and pension contributions has an impact on

[10] Please note that figures are presented in FTE terms, rather than as a count of the individuals working at The Pirbright Institute. Data from the Institute indicate that in the latest financial year (2023-24) there were 384 individual members of staff, which equated to 368 FTEs (a ratio of 96%). This ratio has been used to convert staff members to FTEs for previous years, based on guidance from the Institute.

the economy, through Government spending and pension fund investments, respectively. Real terms figures for salary, NI, and pension spending are shown in Table 4-3.

Table 4-3: Salaries, NI and pension contributions[11]

Area of spend	Financial year								
	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
Salaries	£20m	£16m	£16m	£16m	£16m	£17m	£17m	£15m	£15m
NI cont.	£1m	£2m	£2m	£2m	£2m	£2m	£2m	£2m	£2m
Pension cont.	£4m	£3m	£3m	£3m	£3m	£3m	£3m	£3m	£2m

Source: The Pirbright Institute Annual Reports

4.10 The total GVA and jobs impact through employment of staff by the Institute is summarised in Table 4-4. The estimated GVA contribution is £160m in total (£18m per year on average). The number of jobs supported – both direct employment and indirect jobs supported through salary, NI and pension contribution spending – is estimated at 594 per annum on average.

Table 4-4: GVA and jobs impact of employment of staff

Impact metric	Financial year								
	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
GVA (£m)	£22m	£17m	£18m	£17m	£18m	£18m	£18m	£16m	£16m
Total jobs (FTE)	633	555	553	577	592	629	612	585	608
Indirect jobs (FTE)	297	247	244	247	244	272	266	243	240
Direct jobs (FTE)	335	308	309	330	348	357	346	342	368

Source: SQW

Impact of KEC activities

4.11 The Institute's KEC activities include: licensing of proprietary technology; the sale of specialist products, e.g. diagnostics and laboratory reagents; contract research undertaken for industry partners on a commercial basis; providing expert consulting services (e.g. on international disease control policies); and designing, developing, and delivering in-person and online training courses for bioscience, engineering and biosecurity professionals. These activities support businesses, enabling them to generate turnover and support employment.

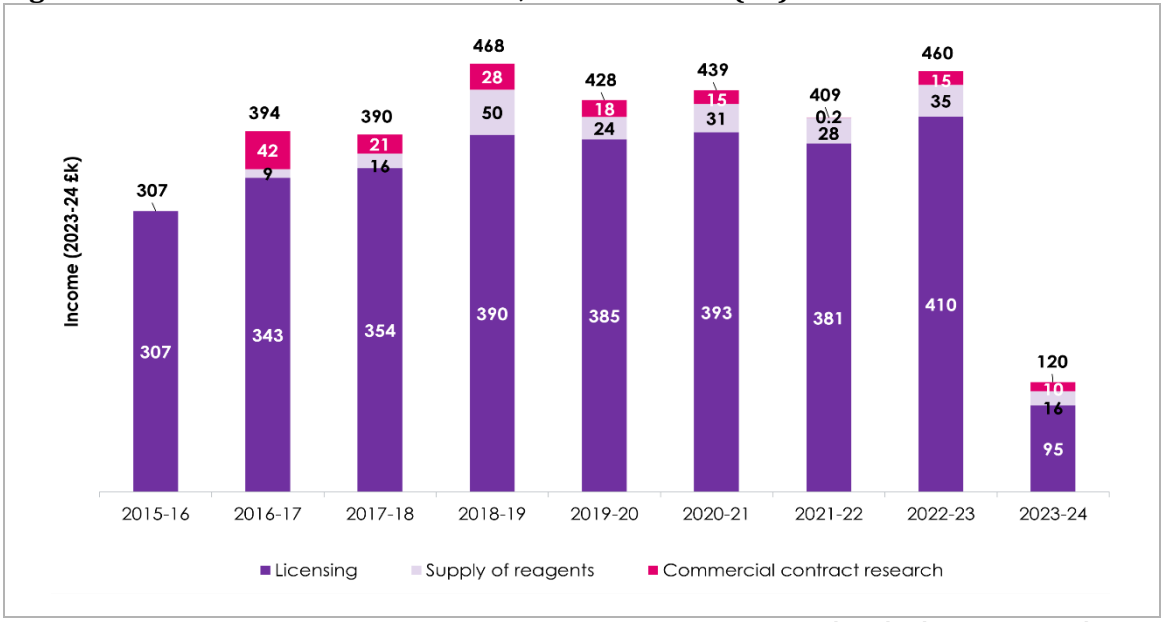
4.12 KEC activity involves both UK and international clients. In modelling economic impact, the focus was on benefits for UK clients only. This means that the impact of activities targeting

[11] The fall in salary costs is a reflection of: (1) the adjustment of nominal to real-terms salary costs, i.e. accounting for inflation, which was particularly high at the end of the assessment period; (2) different mixes of individuals employed at the Institute in particular years.

international clients (e.g. the sale of diagnostic tests and training activities), are not quantified. However, these are important benefits and should be seen in the context of the broader international contribution of the Institute, as discussed further in Section 5.

4.13 The income generated by Pirbright from UK businesses through KEC activities (specifically licensing, the supply of laboratory reagents, and commercial contract research) in the impact period is set out in Figure 4-3. The average was £412k per year (excluding 2023-24[12]).

Figure 4-3: Income from KEC activities, UK businesses (£k)



Source: The Pirbright Institute Annual Reports

4.14 As shown in Table 4-5, the estimated GVA impact of KEC activities is £3.4m in total over 2015-16 to 2023-24. This is estimated to have supported 6 FTE jobs per year on average. This impact is modest relative to the scale of operational impact. However, much of the impact from KEC activities is realised internationally, and therefore not quantified; non-quantified impacts on an international basis are considered in Section 5.

Table 4-5: GVA and jobs impact of KEC activities

Impact metric	Financial year								
	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
GVA (£k)	£307k	£394k	£390k	£468k	£428k	£439k	£409k	£460k	£120k
Jobs (FTE)	5	6	6	7	7	7	6	7	2

Source: SQW

4.15 Additionally, KEC is a growing area for Pirbright, with the potential for higher economic impact in the future, driven by and aligned to, the scale, progression, and success of the Institute's research activity. For example, in 2023, Pirbright established the Centre for Veterinary Vaccine Innovation and Manufacturing (CVIM). This has the potential to generate

[12] Lower licensing income in 2023-24 was owing to a delayed payment (received in 2024-25).

significant economic impact in the future, through the development of commercially viable vaccines for major diseases. Further details are discussed in the Impact Spotlight below.

Impact Spotlight – Accelerating the development and production of novel vaccines

With support from BBSRC, FCDO and the Gates Foundation, CVIM was established to fulfil an unmet global need to accelerate the development and production of novel vaccines that can be produced at scale, cost-effectively, and formulated for mass deployment. Targeted principally at developing vaccines for use in Low/Middle Income Countries, CVIM will also strengthen the UK's emergency response capability and vaccine development capacity.

CVIM is part of the Institute but scientifically independent and will benefit from a dedicated new-build specialist facility, which is under construction at the time of writing. Prior to the new building becoming available, several research projects have been launched within Pirbright's existing facilities. This includes projects to evaluate different vaccine platform technologies for suitability in the animal sector, for example, a vaccine candidate to prevent a high-consequence disease of livestock. CVIM works closely with industry partners and has signed a memorandum of understanding with the Vaccine and Infectious Disease Organization in Canada to support expanded collaborations and training around vaccine manufacturing.

5. Non-quantified impacts

5.1 Consistent with the framework set out in Section 3, this section presents the key messages on the non-quantified impacts of the Institute. Findings are based on consultations with Institute staff and stakeholders, complemented by a desk-review of documents and data. To build on the quantified impacts at a UK level, the impact perspectives are both UK and international, reflecting the scale, reach, and importance of Pirbright's international activities.

5.2 Three further points are highlighted regarding the depiction of non-quantified impacts.

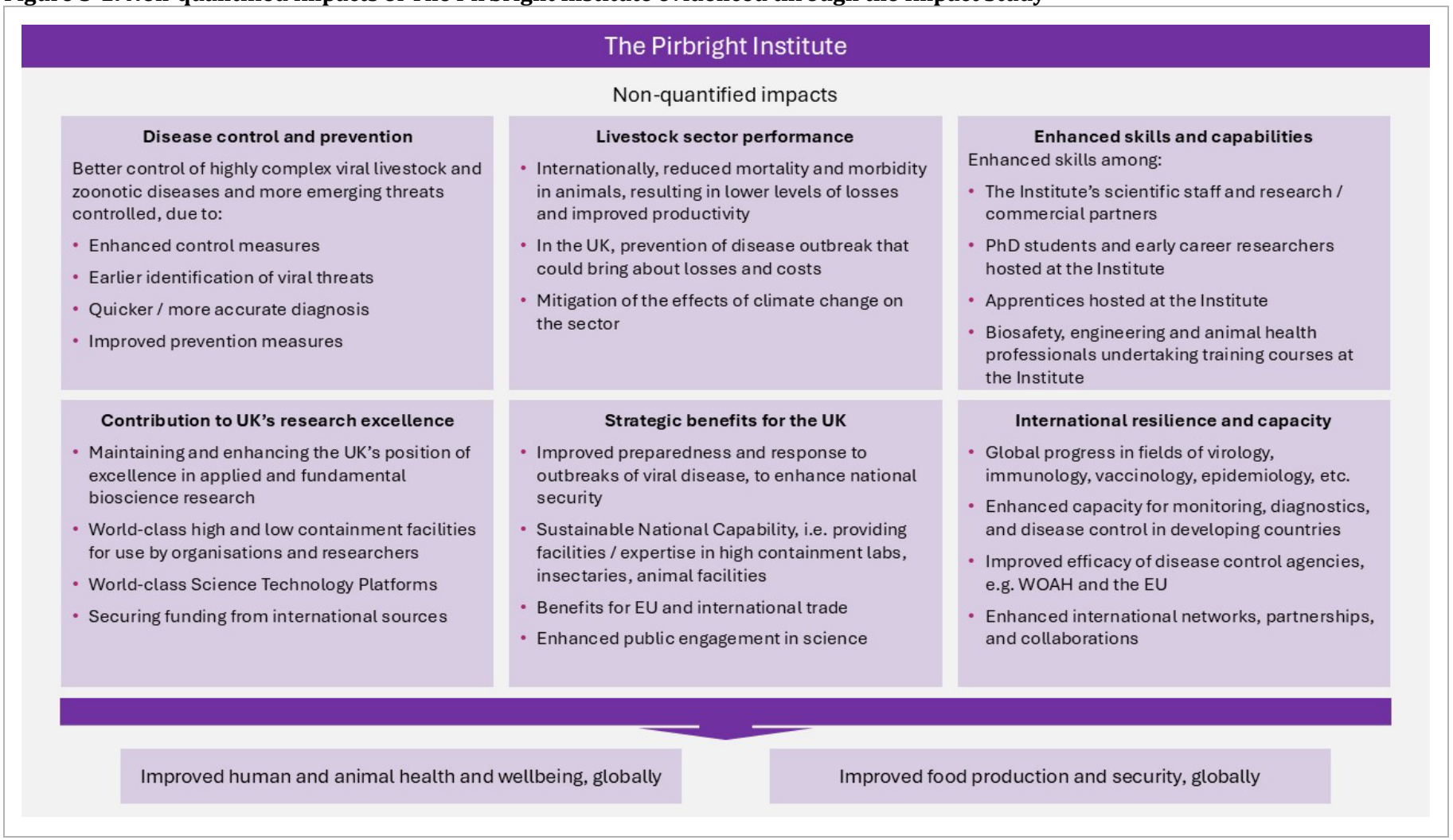
- First, six 'categories of impact' are used to capture the scope and nature of the Institute's non-quantified impacts. In practice, the six categories are re-enforcing, closely inter-related, and complementary. For example, it is through (in part) maintaining and enhancing 'research excellence' that the Institute is able to effectively realise 'disease control and prevention', which in turn leads to 'livestock sector performance' benefits and 'strategic benefits' for the UK. However, these relationships are not linear, and the six categories of impact have been discussed separately, with key links drawn out where relevant.

- Second, the 'disease control and prevention' impact category is genuinely cross-cutting; this is fundamentally what the Institute seeks to achieve across its activities, and it is related to all other impact categories. However, this category of impact has been discussed specifically to highlight the crucial role of Pirbright in controlling and/or preventing major outbreaks which can have devastating socio-economic impacts, both in the UK and internationally.

- Third, to evidence and illustrate the non-quantified impacts, specific examples have been used throughout this section. It is noted explicitly that these are *examples*, principally identified by study consultees, which were seen to be significant and impactful. The examples are not comprehensive, and the section does not (and does not seek to) capture and describe every specific impact generated by the Institute. Rather, the focus is on drawing out examples that *demonstrate the ways in which Pirbright generates impact*. In this context, further exploration of 'case examples' that showcase key areas of the Institute's economic and global impact in the animal health sector is in Annex A.

5.3 The categories of non-quantified impact of the Institute, and the types of impacts within each area that have been identified and evidenced through the Impact Study are set out in Figure 5-1 below. These are discussed in more detail in the pages that follow.

Figure 5-1: Non-quantified impacts of The Pirbright Institute evidenced through the Impact Study



Source: SQW, based on desk research and consultation

Disease control and prevention

5.4 Disease control and prevention is a central aim of the Institute, and core to its impact on society and the economy. Consultees consistently highlighted that this intent underpins Pirbright's activities, with two key routes to impact: advising on control measures to mitigate adverse effects in the event of outbreaks; improving diagnostic tools and technologies, and progressing novel vaccines and other control measures, to prevent future outbreaks.

Advising on control measures

5.5 Crucially, **where there is an outbreak of a viral disease of livestock, research and advice from the Institute is used to directly shape and inform control strategies,** both in the UK and internationally. There are numerous examples across the 30+ viruses studied at Pirbright, and over the impact period, including related to zoonotic diseases.

5.6 One notable example is the **key role played by the Institute in the UK's response to the 2023 outbreak of BTV**: a virus spread primarily by biting midges, which causes disease in sheep, cattle, and other ruminants.[13] As the national Reference Laboratory for BTV, Pirbright has a network of traps that enable ongoing surveillance of midge activity. Combined with knowledge from fundamental studies by the Institute on the impact of BTV on symptoms and infectiousness of animals infected with BTV, this trap data was used by Institute scientists to model the impact of various control measures, and their combinations, on the spread of the virus. Findings were used to advise Defra on the most effective control strategies.

5.7 Additionally, through webinars and radio presentations, the Institute spread awareness of BTV symptoms and recommended actions for farmers, thus contributing to earlier disease detection, reporting, and management. In the case of the most recent outbreak, Pirbright's advice and media activity was particularly important due to the ineffectiveness of BTV vaccines against the BTV-3 and BTV-12 strains of the virus. In this context, advice on movement restrictions and designations of control zones, informed by Pirbright's diagnostic testing, was vital to reduce the spread of the virus. This prevented potentially very significant adverse effects and losses, both in animal health and economically (e.g. via reduced milk yield of cattle leading to productivity losses, and potentially animal fatalities).

5.8 There are also examples of the Institute contributing to **full disease eradication in geographic areas, such as during the LSD outbreak in South-East Europe from 2015-2017**. The disease, endemic in most African countries, which affects cattle and buffalo, was first recorded in Greece and spread throughout the Balkans. Working with the EFSA, Pirbright scientists used mathematical modelling to understand how the disease was spreading and advised on control measures, including vaccine deployment. More details can be found in the 'Virus evolution and transmission' case example in Annex A.

[13] Defra, 2024. Bluetongue virus risk set out for the year ahead. Available at: https://www.gov.uk/government/news/bluetongue-virus-risk-set-out-for-the-year-ahead

5.9 The **Institute's role in eradicating and subsequently sequencing and destroying Rinderpest** is a further important example of Pirbright's impact through disease control.

Impact Spotlight – Rinderpest

Before the impact period, Pirbright played a key role in the global campaign to eradicate Rinderpest, also known as cattle plague. The Institute developed the main tools used in diagnosis and surveillance of the disease; supported national diagnostic services; undertook research on the virus; and supported the development of novel vaccines. In 2011, WOAH declared the disease fully eradicated, making it the second disease to be globally eradicated after smallpox.[14]

Subsequently, the FAO and the WOAH designated Pirbright as one of six Rinderpest Holding Facilities, to securely hold virus stocks from laboratories around the world to protect against accidental escape from a laboratory. Through its 'Sequence and Destroy Project', the Institute led efforts to record the full-genome sequence of the disease and then destroy archive stocks of the virus. The final archive stock of the virus, held at the World Reference Laboratory for Rinderpest, was destroyed by Pirbright scientists in 2019.

Improving diagnostics, vaccines, and other control measures

5.10 The Institute **develops and improves diagnostic and identification tools, technologies and control measures**, such as vaccines, to prevent future outbreaks of viral disease.

5.11 For example, on diagnostics, the Institute has **supported the WOAH and FAO's global programme to eradicate PPR by 2030**.[15] Specifically, the PPR Reference Laboratory at Pirbright has assisted in the detection of the virus by supplying diagnostic tests, including improved lateral flow assay for on-site testing, developed at the Institute.[16] This technology enables accurate and early detection (when clinical signs are still minimal), enabling prompt and targeted outbreak response. Additionally, a PPR vaccine developed at the Institute has been licensed to an African commercial partner and is currently working towards product registration. If registered successfully and deployed, this vaccine will help to reduce the spread of PPR in Africa, one of the main regions where the disease is currently endemic.

5.12 The Institute has also **contributed to efforts to improve vaccines for avian influenza, more commonly known as bird flu**. This disease, which significantly affects the poultry

[14] The Pirbright Institute, 2019, Pirbright destroys final rinderpest virus samples. Available at: https://www.pirbright.ac.uk/news/pirbright-destroys-final-rinderpest-virus-samples
[15] Food and Agriculture Organization of the United Nations, 2020, Global Strategy for the control and eradication of PPR. Available at: https://www.woah.org/app/uploads/2021/03/ppr-global-strategy-avecannexes-2015-03-28.pdf
[16] Baron et. al, 2014, Development and Testing of a Field Diagnostic Assay for Peste des Petits Ruminants Virus. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC4283758/

sector, can spread to humans. In 2021, scientists at Pirbright developed a new 'targeted antigen delivery vaccine', which triggers a faster and stronger immune response among chickens infected with the H9N2 strain of the virus.[17] The vaccine is both effective against disease, and efficient to manufacture, as it can be produced in a laboratory culture of insect cells. Further, Pirbright scientists working on viral avian diseases have been collaborating with industry to develop 'multivalent vaccines' (which contain multiple antigens within one dose) e.g. to create a vaccine that protects against avian influenza, Newcastle disease, IBV and infectious bursal disease virus (IBDV). This work, which is ongoing, has the potential to significantly improve protection of poultry and reduce the burden of delivery and costs for farmers and industry (also supporting livestock sector productivity, which is discussed in further detail below).

5.13 Other mechanisms to impact in this category include **research and advice on non-vaccine containment measures, including to inform decision-making and activity of those working in agriculture**. As an example, in collaboration with Whipsnade Zoo and ZSL Conservation Zoo, entomologists at the Institute found that small animal housing can be cheaply and easily fitted with readily available materials to protect animals from biting midges and therefore reduce the spread of diseases like BTV.[18] The Institute's work on control measures for ASFV – a disease with no safe and effective vaccine in place – is a further important example of impact in this space; this is considered in more detail in the case example in Annex A.

Livestock sector performance

5.14 Disease in livestock has devastating consequences, in terms of suffering and death in animals, and for the individuals and communities that rely on livestock for their income and/or livelihoods. **The Institute delivers impact by preventing losses for the livestock sector, brought about by animal fatality, reduced productivity, and livestock movement and trade restrictions**. This contributes positively, or helps to avoid adverse effects, for the economies of both developed (including the UK) and developing countries. Further, reduced losses in the livestock sector support environmental benefits, by reducing the need to replace lost stock and therefore saving additional CO2 emissions.

Avoiding the costs of disease in the UK

5.15 Given the demonstrated costs of outbreaks of viral diseases in livestock, the Institute's impact in **preventing viral incursions in the UK is critical and substantial**. Put simply, the investment in the facilities and expertise at the Institute can be seen as providing a vital

[17] Shrestha et. al, 2021, Selectively targeting haemagglutinin antigen to chicken CD83 receptor induces faster and stronger immunity against avian influenza. Available at: https://www.nature.com/articles/s41541-021-00350-3

[18] King et. al, 2025, The efficacy of vector-proof accommodation for the protection of livestock against Culicoides biting midges. Available at: https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-025-06736-9

'insurance' for the UK against outbreaks of disease and the costs that this could entail. Pirbright helps the UK to both prepare for and respond to outbreaks if and when they do occur, to mitigate adverse impact and costs on the livestock sector in particular.

5.16 Notably, the UK has remained free of an FMD outbreak since 2007. The Institute's FMD Reference Laboratory is a key contributor to this. The Laboratory monitors global patterns of disease distribution and advises governments and control agencies on strategies to prevent its spread across borders.

> **"No other disease has the same economic impact as FMD… Pirbright's role here is therefore essential"**
>
> *External consultee*

5.17 The National Audit Office estimated that the 2001 FMD epidemic in the UK cost over £8bn (equivalent to over £14bn in 2023-24 £s).[19] Costs were incurred for the public sector, which was responsible for the purchase of goods and services to eradicate the disease and compensation to farmers. Further, the food production and tourism industries incurred significant revenue losses. Supporting the UK to avoid a further outbreak of FMD, which the National Risk Register[20] estimates could lead to the culling of approximately 1.9 million animals, is therefore central to the impact of Pirbright.

5.18 Research and surveillance activities on other viruses with direct potential adverse impact on the UK agriculture sector include ASFV (pigs), MDV (chickens – see Impact Spotlight on the next page) and BTV (sheep, cattle) were also highlighted by consultees.

Supporting productivity and performance in developing countries

5.19 The Institute also contributes to livestock performance in an international context, particularly **supporting the productivity and resilience of agricultural systems in developing economies**. It does so by: (1) undertaking 'in country' activities, where Institute teams work on the ground with local partners, and (2) through activities delivered at Pirbright on behalf of partners internationally. Through this work, Pirbright helps to contribute to the UN's Sustainable Development Goals (SDG), including 'SDG 1: No Poverty' and 'SDG 2: Zero Hunger'.

5.20 As an example of 'in country' activity, in 2018, the Institute began a collaboration with the Nigerian Bauchi State College of Agriculture, to understand transmission of SGP and LSD in northeast Nigeria. Together, the scientists estimated SGP and LSD caused economic losses at the farm level that could be as high as US$6,340, due to costs of antibiotic treatment; income

[19] National Audit Office, 2002, The 2001 Outbreak of Foot and Mouth Disease. Available at: https://www.nao.org.uk/reports/the-2001-outbreak-of-foot-and-mouth-disease/?nab=2#downloads

[20] HM Government, 2025, National Risk Register. Available at: https://assets.publishing.service.gov.uk/media/67b5f85732b2aab18314bbe4/National_Risk_Register_2025.pdf

lost due to reduced milk production; and reduced value of the herd due to mortality or sale at a lower value.[21] In the long-term, the majority of surveyed farmers did not replace lost livestock due to a lack of resources or concern of further disease outbreaks. Following a further study on the risk factors of SGP at an animal and household level, Pirbright scientists developed an 'SGP Cost and Vaccination Calculation' to help farmers perform cost-benefit analysis of vaccinating their animals.[22] Scientists also helped to develop interventions, such as promoting diagnostic testing and access to water, to further prevent the spread of SGP.

5.21 The Institute's work on Marek's disease highlights how impact is realised for the agriculture sector internationally through fundamental and applied research, and surveillance activities at Pirbright. This includes hosting the WOAH Reference Laboratory for MDV.

Impact Spotlight – Marek's disease

Pirbright has a long history of research into Marek's disease virus (MDV). MDV is a highly infectious pathogen causing cancerous tumours in poultry and is estimated to cost about US$1-2m in economic losses globally each year.[23] Frequent mutations of the virus, its ability to survive in a host for 10-15 years, and the 'leakiness' of vaccines (i.e. prevention of disease, but not transmission) make it impossible to fully eradicate the disease.

Scientists at the Institute support global efforts to control the disease. This includes undertaking fundamental research into how the virus evolves and its effects on birds' immune systems and working with industry to improve vaccines. In 2019, Pirbright scientists used genetic engineering to create a vaccine that protects birds against both MDV and avian influenza, reducing costs to farmers of administering vaccines.[24] In its capacity as the WOAH Reference Laboratory for MDV, the Institute runs a diagnostic survey to check the efficacy of vaccine practice globally, including in Malaysia and Indonesia. Additionally, as outlined in the One Health animal models case example in Annex A, fundamental research on the virus contributes to research on human cancers.

Enhanced skills and capabilities

5.22 **The Institute delivers enhanced skills and capabilities across the bioscience workforce**. Three main mechanisms were identified in the Impact Study: talent development of students, staff, and partners; training; and knowledge sharing activities. Importantly, this spans the bioscience workforce spectrum, including researchers, and technicians and professionals in

[21] Limon et. al, 2020. Epidemiological Characteristics and Economic Impact of Lumpy Skin Disease, Sheeppox and Goatpox Among Subsistence Farmers in Northeast Nigeria. Available at: https://www.frontiersin.org/journals/veterinary-science/articles/10.3389/fvets.2020.00008/full
[22] See: https://www.openasapp.net/portal#!/client/app/edddcdd8-7c33-416f-86fd-7f90dc8c5100
[23] Chauhan et. al, 2021, Dynamics of Marek's disease in poultry industry. Available at: https://www.thepharmajournal.com/special-issue?year=2021&vol=10&issue=1S&ArticleId=5514
[24] Chang et. al, 2019, Application of HDR-CRISPR/Cas9 and Erythrocyte Binding for Rapid Generation of Recombinant Turkey Herpesvirus-Vectored Avian Influenza Virus Vaccines. Available at: https://www.mdpi.com/2076-393X/7/4/192

supporting disciplines. This breadth of capability development is an important characteristic and contribution of the Institute.

Talent development of students, staff, and partners

5.23 Both internal and external consultees for the Impact Study consistently cited **the Institute as an important 'engine' for talent development in virology and immunology, both at a UK and international level**. This operates across levels of experience, i.e. from students to experienced scientists, and the nature of the relationship with the Institute, from staff to visitors.

5.24 The Institute supports development of students. First, it hosts an undergraduate internship programme. It also maintains a sizeable postgraduate student body, comprising on average around 45 PhD students, primarily funded through BBSRC and leveraged funding. During the study period, the Institute was a partner in the Interdisciplinary Bioscience Doctoral Training Partnership led by the University of Oxford. Additionally, through a Fellowship Scheme, the Institute supports early-career researchers on a career development path equivalent to tenure track. Pirbright therefore plays an important role in supporting the skills and talent pipeline in the UK in virology and immunology.

5.25 For staff, consultees highlighted that the Institute provides a strong grounding and platform for ongoing professional development, in both fundamental and applied scientific skills and techniques for staff across experience levels. Complementing project-based learning, and internal training and development programmes, the Institute's connectivity across the research ecosystem was cited as important in this context. Consultees highlighted that Pirbright helps to facilitate career development of staff by providing opportunities for wider experience, for example via facilitating roles at partner institutions, e.g. part-time or short-term teaching or research positions within universities to support learning and development.

5.26 Additionally, the Institute contributes to talent development of 'visitors' of various types, including individuals undertaking post-doctoral research within research groups, and researchers collaborating with Pirbright in the short/medium-term to learn specific techniques, protocols, or methods. An example is a **long-term and large-scale collaboration with twelve international universities focused on avian disease,** to support eradication of viral avian diseases.[25] As part of this collaboration, international visitors periodically participate in training at Pirbright in various techniques and technologies and often publish their research jointly with the Institute. Other examples cited in the consultations providing specific illustrations to exemplify the route to impact, include: (i) bespoke activities to enhance external capabilities on the use of IBV cultures in the context of avian disease; and (ii) demonstration of best practice and methods employed at Pirbright in the use of animals

[25] The Pirbright Institute, 2023, Avian disease research: Pirbright scientists strengthen UK-China collaboration. Available at: https://www.pirbright.ac.uk/news/avian-disease-research-pirbright-scientists-strengthen-uk-china-collaboration

in research led by the Institute's animal services team. This was reported to have helped to improve the welfare of animals used in research at other research centres globally.

5.27 **The experience and skills gained by students, fellows, staff, and visitors in their time at the Institute represent an important contribution to the development of the bioscience researcher base.** It was noted that many individuals trained at Pirbright as early-career researchers progress to more senior roles in the UK and international research and disease control landscape. Demonstrating the spread of Pirbright-trained individuals abroad, consultees cited Pirbright 'alumni', including high ranking scientists and individuals in senior government positions in India, Malaysia, Japan, South Korea, and Central Asia.

> **I do think that alumni network is crucial … Pirbright has built-up an amazing network**
>
> *External consultee*

5.28 The Institute also develops talent across the broader bioscience workforce, including in animal services, biosafety, and engineering. Further details in relation to engineering are highlighted in the Impact Spotlight below.

Impact Spotlight – Engineering excellence and apprenticeship programme

The Institute employs a team of around 65 on-site engineers to ensure that containment envelopes are upheld, and that the specialist scientific facilities are maintained and calibrated effectively to ensure optimal usage. The investment in, and scale and quality of, the specialist and highly skilled engineering team were highlighted consistently as a strength of the Institute. Developing this capacity in-house, and fostering collaboration between the engineering and science teams, was seen by consultees to be crucial for delivering high quality science and therefore delivering socio-economic impact.

Reflecting its commitment to continuous improvement, the team implemented the Estates Maintenance Services (EMS) Strategy, with the aim of introducing more rigorous quality and project management, functional safety, human factors and harmonisation of systems and processes. As part of this, it introduced a two-year Senior Leadership Development Programme, creating a career development pathway for engineers.

The engineering team also participates in the Institute's apprenticeship programme, with apprentices in mechanical and electrical engineering joining on an annual basis. Apprentices are often recruited through links with Farnham College, a local sixth form college focussed on both academic and vocational education.

Training

5.29 As mentioned in Section 4, **Pirbright designs, develops, and delivers specialist training to enhance skills among bioscience and biosafety professionals**. The training offer at

Pirbright evolved over the impact period, primarily in response to the restrictions of the COVID-19 pandemic. However, post-pandemic, and by the close of the impact period, the Institute offered both in-person and eLearning courses across topics in:

- **Science**, e.g. courses on diagnostic testing for specific diseases, virological techniques, and a course on poultry health
- **Engineering**, such as on high efficiency particulate air (HEPA) filtration
- **Biosafety**, including on biological safety cabinets use and operation.[26]

5.30 Through training and building skills in individuals in research, veterinary, and other livestock-related professions, the Institute aims to improve workplace practices. For example, after several knowledge exchange visits between Pirbright and Department of Agriculture, Food and the Marine Agrilabs, Ireland (Backweston), Pirbright has been selected as the preferred provider of biosafety, biocontainment engineering, and disease-specific eLearning. Additionally, the Institute has provided APHA with several training courses on viral diseases for delivery to UK veterinarians. Therefore, the Institute also plays a role in developing skills among civil servants.

5.31 Additionally, **the Institute contributed materially to the development of the Biorisk Professional Registration Scheme (BPRS)**.[27] This scheme, launched in 2024 and approved by the Royal Society of Biology (RSB), supports specialists involved in management, control or containment of biorisk to develop and evidence their professional skills. Drawing on its expertise in biosafety practice, Pirbright developed RSB-accredited training for this scheme. This contribution will help to enhance the capabilities of biorisk professionals, contributing to overall improvements in biosafety practice. More details are in the 'Leadership in Biosafety' case example in Annex A.

5.32 Capability building is also a significant focus of the Reference Laboratories at Pirbright. The Laboratories provide testing and assurance of diagnostic expertise, and 'formal' training, delivered both locally at Pirbright and in-country. This is discussed further in the 'International resilience and capacity' section, below.

Knowledge sharing activities

5.33 The Institute was also reported to have **built capability across the bioscience workforce through extensive knowledge sharing activities**. This is through both ongoing project-based and informal interactions between researchers, and more formal partnerships and arrangements with other organisations. This knowledge sharing impact reflects the inter-

[26] The Pirbright Institute, 2025, Train with Pirbright. Available here
[27] Royal Society of Biology, 2025, Biorisk Professional Registration Scheme. Available at: https://www.rsb.org.uk/careers-and-cpd/registers/biorisk-professional-registration-scheme

connectedness of the Institute discussed in Section 2, and the scope of its partnerships and engagements across the research and disease control ecosystem.

5.34 Capturing these flows of knowledge and the nature of the impact, is challenging. However, important examples cited in consultations with staff and stakeholders included:

- an ongoing partnership with VIDO in Canada, to exchange information and expertise, e.g. on understanding disease models and disease monitoring procedures[28]
- bilateral site visits and knowledge sharing with other research organisations, including universities (e.g. Reading, Southampton, Portsmouth), and research institutes (e.g. Babraham Institute, The Roslin Institute)
- site visits and information sharing with other high containment facilities, to share best practice around biosafety, e.g. Dstl and the APHA in the UK, as well as the NBAF in the US.

Contribution to the UK's research excellence

5.35 The Institute is a world-class centre of research in viral disease of livestock. As evidence of this, Table 5-1 details the number of papers published in high-quality journals each year between 2018-19 and 2023-24; this comes to over 800 in total.[29] The table also sets out grant income and success rates, which are important proxy indicators for the competitiveness of the research at Pirbright. These are all Institute KPIs.

Table 5-1: Performance against KPIs

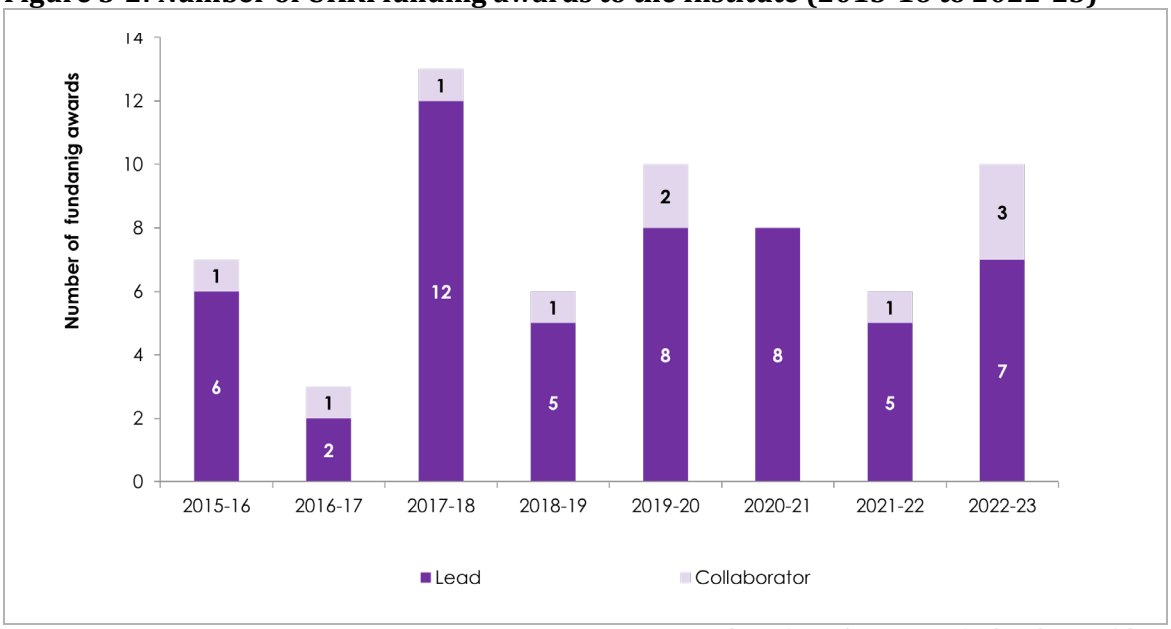
	18-19	19-20	20-21	21-22	22-23	23-24
Papers published in high-impact journals	131	118	144	149	137	137
Grant application success rate	58%	45%	45%	50%	57%	56%
Grant income (£m)	17.0	18.1	14.7	16.1	15.2	17.6

Source: Pirbright Annual Reports 2018/19 to 2023/24.
Note that consistent data on these metrics is not available for previous years

5.36 Complementing this data, Figure 5-2 shows the number of competitive funding awards made to the Institute by UKRI and its Councils over the impact period (data for 2023-24 is not yet available). As shown, the Institute was the 'Lead Organisation' on over 60 competitive funding awards.[30] The BBSRC accounted for most of the competitive funding awards secured by the Institute (55). However, Pirbright also secured competitive funding awards from the Medical Research Council and cross-council funds, such as the Global Challenges Research Fund.

[28] The Pirbright Institute, 2022, Pirbright continues to grow international collaborations to fight and prevent infectious disease. Available at: https://www.pirbright.ac.uk/news/pirbright-continues-grow-international-collaborations-fight-and-prevent-infectious-disease
[29] Further information on publications from the Institute, and associated 'Altmetric' data, are available here Publications | The Pirbright Institute
[30] Note this does not include strategic funding or training awards.

Figure 5-2: Number of UKRI funding awards to the Institute (2015-16 to 2022-23)



Source: SQW analysis of UKRI 'Competitive funding decisions' data

Enhancing the UK's reputation in bioscience

5.37 As emphasised by consultees for this Impact Study and reflected in the data on publications in high-quality journals set out above, the Institute's bioscience expertise is recognised internationally, and **scientists at Pirbright deliver leading, cutting-edge research spanning virus and host biology.** Additionally, consultees highlighted that Institute scientists **contribute extensively to global conferences and professional networks**. This enables the UK to play an important role in shaping international policy related to livestock disease control and prevention (discussed further in the 'Strategic benefits for the UK' section).

5.38 The **facilities and technical capabilities of the Institute are crucial in contributing to the UK's research excellence**. They enable the delivery of research that is genuinely distinctive in the UK, and in some cases, unique internationally. The combination of the facilities – including the high-containment facility which allows for *in vitro* research into viral diseases of livestock and includes specialist sequencing and bio-imaging facilities in high containment – and the expertise and experience of the staff to utilise them fully, enhances the UK's leadership position in both fundamental and applied science.

> **"The unification of the host and virus, insects for studying transmission in the insectary, as well as the reference laboratories all being on the same site is also key"**
>
> *Internal consultee*

5.39 This complements the focus on both the virus and the host response, which was described as a key advantage of the Institute in generating new knowledge and **securing research income, from both UK and international sources.**

Supporting research in the UK

5.40 **The Institute collaborates with and supports other UK-based organisations to carry out research**. Further analysis of the competitive funding awards data cited above indicated 26 UK-based collaborators on UKRI funded projects over 2015-16 to 2022-23. Six organisations led UKRI awards where Pirbright researchers were 'Co-Investigators', with the Institute supporting projects led by the Royal Veterinary College (see Impact Spotlight below) and the universities of Edinburgh, Liverpool, Oxford, Reading, and Surrey.

Impact Spotlight – One Health Poultry Hub

Led by the Royal Veterinary College, and funded by the UKRI Global Challenges Research Fund, the One Health Poultry Hub is an impact-driven development research programme working in Bangladesh, India, Sri Lanka and Vietnam. The Institute is a partner of the hub, alongside other partners in Asia, Australia, Europe and the UK.

The hub supports research on how pathogens and genes can transmit between chickens and from chickens to people and back again: vital information to inform potential interventions. As part of this work, scientists at Pirbright have collaborated with colleagues at Imperial College London, the University of Glasgow, The Francis Crick Institute, and the APHA on a series of studies investigating avian influenza. This included research which found that infection with two strains of avian influenza virus can lead to the emergence of a new virus strain with the potential to jump from birds to humans. This poses a risk to human health and demonstrates the need for constant monitoring for the emergence of new virus strains.

5.41 **Other research centres and universities that collaborate with Pirbright gain access to its cutting-edge facilities and capabilities, and the expertise of staff based at the Institute**. For instance, the CL3 facilities at Pirbright enabled scientists at the University of Cambridge to undertake research on how monkeypox virus exploits a cellular protein to overcome human cell defences, therefore providing insight into how existing drugs that target this protein can be used to treat poxviruses.[31] As another example, scientists at the Institute's Bioinformatics STP supported the APHA to identify a Seneca Valley Virus outbreak in the UK in 2022.[32]

[31] Zhao et. al, 2023, TRIM5α restricts poxviruses and is antagonized by CypA and the viral protein C6. Available at: https://www.nature.com/articles/s41586-023-06401-0
[32] UK Government, 2023, Seneca Valley Virus confirmed in Pigs in England. Available at: https://www.gov.uk/government/news/seneca-valley-virus-confirmed-in-pigs-in-england

5.42 The Institute also hosts data, animal lines, viral collections, repositories and an insectary (dedicated to the rearing and study of insects that transmit viral diseases to livestock and humans) to inform and support bioscience research across the wider research ecosystem.

5.43 **By sharing its expertise through professional bodies, the Institute also helps to drive up standards in animal research in the UK**. Pirbright is represented on the council of the Laboratory Animal Science Association (LASA): a consortium of industrial, university, Government, and research council representatives to ensure the provision and best use of the most appropriate animal models for medical, veterinary, and other scientific purposes.[33] The Institute has provided evidence to inform LASA guidance notes, and advised on guiding principles for Animal Welfare Ethical Review Bodies across the country.

> **Pirbright share to add value to what others are doing… collaboration is part of their culture**
>
> *External consultee*

Strategic benefits for the UK

5.44 **As a designated National Capability to prevent and control viral diseases of livestock, the Institute is of demonstrable strategic importance to the UK**. It plays an important role in the country's resilience and its capability to respond to both animal and human disease outbreaks, by providing knowledge of disease behaviours and treatment approaches to feed into national policy; and strengthening the UK's influence on international policy.

National preparedness

5.45 The Institute **gathers and shares knowledge on disease and approaches to control, from treatment to broader response and management strategies**. This includes 'longitudinal' learning on how diseases spread and change, which are used to feed into policy design and containment responses to help the UK prepare for an outbreak. Notably, this includes work on three of the four animal diseases identified to pose significant risk to the UK in the National Risk Register (FMD, avian influenza, and ASF).[34] This contribution is made possible by long-term strategic funding for research, the sample databases of the Reference Laboratories, and ongoing investment in specialist facilities.

5.46 Consultees highlighted several examples of how this knowledge has been mobilised in collaboration with industry and policy actors, leading to benefits including **better preparedness, and lowered scale or impact of outbreaks**. Examples include the recent advisory role for Defra around the containment of BTV (discussed in the 'Disease control and

[33] See: https://lasa.co.uk/
[34] HM Government, 2025, National Risk Register. Available at: https://assets.publishing.service.gov.uk/media/67b5f85732b2aab18314bbe4/National_Risk_Register_2025.pdf

prevention' section); and inputs into disease containment strategies issued by Defra and the devolved administrations, as well as advice for farmers, during international ASFV outbreaks.

5.47 **The Institute's input to the COVID-19 pandemic response is a further strong example of impact for the UK**. The Institute applied its expertise and understanding of animal coronaviruses to human disease. In addition to supplying equipment to the UK's National Coronavirus testing centre in Milton Keynes and training staff of The Lighthouse Laboratory (a key testing lab hosted by the NHS Berkshire and Surrey Pathology Services (BSPS)), the Institute contributed to the pandemic response by inputting into vaccine approval and lockdown policy: Pirbright scientists tested and evidenced the safety of the Oxford-AstraZeneca vaccine, and contributed to avoidance of a lockdown during the Omicron variant. Further details are provided in the 'Contribution to the COVID-19 response' case example.

5.48 Pirbright also **enables participatory policy development**, engaging with farmers, academics, and policy actors in its work. Specifically, Pirbright's visits to farmers on-site as part of its monitoring and surveillance work were highlighted as an important channel for information sharing and evidence gathering. This was noted to be important to inform more effective disease response strategies and policy decisions by Government.

The UK's influence internationally

5.49 More broadly, **the UK can be seen to benefit strategically from the Institute's position in the international disease control landscape**. The Institute has strong and long-term connections to important international bodies. Notably, several members of staff are named WOAH and FAO experts in multiple diseases.[35] Further, the Institute hosts the FAO World Reference Laboratory for FMD[36] and nine other Reference Laboratories for FAO and/or WOAH (in parallel to the Defra designation at a national level).[37] Prior to Brexit, the Institute hosted EU Community Reference Laboratories and has since provided significant support to the labs taking over this responsibility.

5.50 Pirbright provides the only UK representative on the Biological Standards Commission of WOAH,[38] which oversees the WOAH terrestrial manual (reference methods used in labs) and code. Part of the elected position is to maintain and update the terrestrial manual and code, which must be followed by countries that want to prove their disease-free status to enable trade.

[35] The Pirbright Institute, 2025, WOAH marks 100 years of outstanding Pirbright science. Available at: https://www.pirbright.ac.uk/news/woah-marks-100-years-pirbright-science
[36] As well as the WOAH, and national/Defra designated reference laboratory
[37] See full list: https://www.pirbright.ac.uk/facilities-and-resources/reference-laboratories
[38] World Organisation for Animal Health, 2024, Biological Standards Commission. Available at: https://www.woah.org/en/what-we-do/standards/standard-setting-process/biological-standards-commission/

5.51 Consultees for the Impact Study highlighted that these roles, and the broader profile of the Institute is important for the **UK's ability to enact 'soft influence' through science diplomacy** and therefore shape international policy in relation to animal and disease control. In addition, Pirbright was described as instrumental for developing bilateral relationships with other countries, including related to scientific, funding, and economic partnership activities.

> **The UK has a strong international reputation in research, and Pirbright has a vital influence**
>
> *Internal consultee*

International resilience and capacity

5.52 The Institute engages extensively with research organisations, sector/industry representatives, and policy bodies across the globe. This engagement – which happens through Reference Laboratory work and other projects, as well as through international networks – **enables Pirbright to embed knowledge on preparedness, prevention, and response to outbreaks around the world**.

Capacity building activities

5.53 The Reference Laboratories **build diagnostic and surveillance capacity through training and testing of vaccine efficacy**. Formal training, both locally at Pirbright and in-country, involves up-skilling staff of other national reference laboratories in diagnostic techniques. Projects are usually fixed term, but the Reference Laboratories sustain a cycle of connections with international organisations to ensure longer-term access to advice and expertise. Further, the Reference Laboratories act as third-party independent testers (working with commercial companies) to test vaccines and provide diagnostic reagents, with cross-validation of commercially developed diagnostic assays using panels of samples. This is prevalent among Pirbright's work on FMD, where the Institute runs a Proficiency Testing Scheme to evaluate laboratories' abilities to detect and characterise FMD viruses in samples, as well as conduct serological testing. Where issues arise, the Institute offers direct help to the laboratory. In 2023, labs from 40 countries participated in this scheme. Other examples of checking diagnostic efficacy include work in Malaysia and Indonesia, where the Institute runs a diagnostic survey to check the efficacy of MDV vaccine practice.

5.54 Additionally, as summarised in the Impact Spotlight below, **Pirbright scientists collaborate on projects with local partners**, e.g. to understand viral transmission or advise on control measures. These efforts lead to improved disease control in the event of specific outbreaks and **strengthen countries' capabilities to respond to outbreaks in the future**. We note explicitly these are selective examples; they are not comprehensive.

Impact Spotlight – Selected examples of supporting global progress in disease control and prevention

The Institute worked with partners in Bangladesh to develop three vaccines against Nipah virus: a dangerous zoonotic disease that can spread from pigs to humans.[39] The team assessed the vaccines' ability to trigger immune responses in mice and pigs, and it carried out further trials in 'backyard' pigs in high-risk areas of Bangladesh. All three vaccines were found to be safe and successfully protect pigs from infection.

In India, Pirbright scientists have supported vaccination against both FMD and PPR. On FMD, the Institute worked with industry bodies to assess the effectiveness of FMD vaccines prior to their use in livestock.[40] Further, scientists from Pirbright supported the National Institute of Animal Biotechnology (NIAB) and three other specialist organisations to run a mass vaccination campaign against PPR in Chennai.[41]

Impact through networks

5.55 The **Institute delivers impact through establishing networks.** For example, in partnership with The Roslin Institute, The Pirbright Institute jointly launched the International Veterinary Vaccinology Network (IVVN): an international community, now with over 2,300 members from 93 countries working to develop improved vaccines for livestock and zoonotic diseases.[42] The IVVN focusses on realising impact for low- and middle-income countries, through providing grants for projects and laboratory exchanges; facilitating international networking; and providing training to early career scientists. As another example, through the GNATWORK network, Pirbright scientists brought together vector research communities to improve capacity for fighting disease.[43] This involved forging international connections between scientists working on three insect groups (sandflies, blackflies, and biting midges), with funding, training and resources in countries including Ethiopia, Brazil, and Bangladesh.

5.56 **Pirbright also contributes to existing international networks, thereby enhancing and animating their capacity for coordination in disease control**. Since 2022, it has acted as a consultant to the FAO's Veterinary Diagnostic Laboratory (VETLAB) network,[44] supporting

[39] McLean et al., 2025, Nipah virus vaccines evaluated in pigs as a 'One Health' approach to protect public health. Available at: https://www.nature.com/articles/s41541-025-01212-y
[40] The Pirbright Institute, 2013, New collaborations with India as Pirbright is awarded grants through the Farmed Animal Health and Disease fund. Available at: https://www.pirbright.ac.uk/news/new-collaborations-india-pirbright-awarded-grants-through-farmed-animal-health-and-disease
[41] The Pirbright Institute, 2018, Pirbright scientists run vaccination campaign to eradicate peste des petits ruminants. Available at: https://www.pirbright.ac.uk/news/pirbright-scientists-run-vaccination-campaign-eradicate-peste-des-petits-ruminants
[42] See: https://www.intvetvaccnet.co.uk/
[43] See: https://www.gnatwork.ac.uk/
[44] An association of national veterinary laboratories in African and Asian countries, with planned expansion into Central and Eastern Europe, the Caribbean and Latin America. See: https://www.iaea.org/services/networks/vetlab

member countries to improve national laboratory capacities for early detection; and for the control of transboundary animal and zoonotic diseases by designing protocols. Through FAO and the European Commission for the Control of Foot-and-Mouth Disease (EuFMD), the Institute helped to develop 'regional roadmaps' for FMD in regions of Asia and Africa.[45] These serve as a mechanism to discuss and coordinate controls and responses between countries at international meetings; this is essential as efforts to control FMD in a single country are limited if neighbouring areas do not take similar action.

International resilience through cutting-edge research

5.57 Finally, consultations identified important examples of **Pirbright surfacing implications for public and human health via its cutting-edge research internationally.** This includes undertaking research funded by international organisations including major philanthropic funders such as the Gates Foundation. The Institute also collaborates with international partners on UKRI funded projects. Over 20 international organisations were identified as 'Co-Investigators' on the competitive UKRI funding awards led by the Institute over 2015-16 to 2022-23; including many organisations in South Asia and South-East Asia.

5.58 As an example of research surfacing implications for public and human health, in light of avian flu transferring into cattle in the United States and resulting in an outbreak at the end of the impact period, Pirbright researchers examined virus sequences weekly to learn how the virus evolved and to categorise it into phenotypes. As the UK was able to progress this research faster than US counterparts, Pirbright shared data with national and international groups pre-publication, in order to directly inform policy response in a timely manner. This activity enabled a more timely response to the transfer of avian flu to cattle, therefore, improving international resilience to the disease.

[45] See: https://www.fao.org/eufmd/resources/reports/roadmaps/en/

6. Impact perspectives and prospects

6.1 **The socio-economic impact of The Pirbright Institute is significant, and wide-ranging**.

6.2 In terms of quantified impact, **through its operational and KEC activities, the Institute contributed over £50m a year on average to the UK economy over 2015-16 to 2023-24.** This equates to a total GVA impact of £471m over the impact period.

6.3 The **Institute also supported over 1,000 jobs in the UK economy on average over 2015-16 to 2023-24**. This employment impact was realised through (i) direct employment of highly-skilled scientists, technicians and professional support staff at the Institute, and (ii) the indirect effects on its expenditure supporting employment in businesses across the UK.

6.4 Important to the GVA and jobs impact was the scale of investment in the infrastructure and facilities of the Institute: some £170m in new capital development during the impact period. **This demonstrates the central role of specialist facilities in Pirbright's distinctive offer and route to impact**. This includes high-containment and low-containment research environments (to study high-risk, exotic and zoonotic viruses and endemic viruses respectively), and specialist technology resources such as Science Technology Platforms.

6.5 **The specialist facilities are leveraged by a critical mass of c.250 scientists**, including global experts in virology, vaccinology, immunology, epidemiology, entomology, biomathematics and genetic engineering. Dedicated support staff, including in biosafety, engineering, and animal services, maintain specialist infrastructure, manage risks, and ensure the safe and reliable operation of Pirbright as a major hazard site.

6.6 **The combination of specialist facilities and expert staff is essential to the Institute's delivery of socio-economic impact**. This encompasses its status as a leading centre for both 'diagnostics and surveillance', and 'fundamental and applied research' of viral diseases in livestock and those that spread from animals to humans.

6.7 **Six key categories of non-quantified socio-economic impact were identified in the Impact Study.** These were: disease control and prevention, contribution to the UK's research excellence, livestock sector performance (in the UK and internationally), enhanced skills and capabilities, international resilience and capacity, and strategic benefits for the UK.

6.8 **From a UK perspective, the Institute's status as a National Capability to prevent outbreaks of disease is core to its socio-economic impact**. The impact here is fundamentally avoiding an adverse impact that could be highly economically damaging to the UK. In this context, the Reference Laboratories hosted at the Institute – both national and international – and the dual focus in the current Science Strategy on research on virus biology and host responses, were consistently cited as essential to realising impact.

6.9 **The Institute continued to enhance its capability over the impact period**. This included the construction of the Brooksby Building – a high containment facility to allow research on high-consequence pathogens in large animals – and the initial development of CVIM. Delivered in collaboration with the BBSRC, FCDO, and Gates Foundation, CVIM will seek to exploit the Institute's vaccinology and scientific expertise to support the development and deployment of vaccine technologies to combat neglected and emerging diseases of livestock. This includes vaccine technology for zoonotic diseases that represent a threat to public health. CVIM will deepen and enhance the Institute's engagement with industry, with potential for significant socio-economic impact.

6.10 The development of the Brooksby Building and CVIM reflects a **commitment to delivering against the core purpose of the Institute to prevent and control viral disease of livestock through surveillance and research**. This continuity and clarity of purpose – both distinctive and unique in the UK – was identified as an important characteristic of 'how' Pirbright delivers impact in consultations for this study. The inter-connectedness of the Institute, and its open and collaborative organisational culture, were also important themes.

6.11 **The Institute has also evolved over the impact period**. This includes developments in the capacity and contribution of the Institute in relation to zoonotic disease – in part, catalysed and demonstrated through the important role of the Institute in the response to the COVID-19 pandemic. The Institute has also increasingly applied its fundamental understanding of animal biology and virology to deliver against wider agendas, including the 'One Health' agenda and net zero imperative. Both provide significant opportunity for socio-economic impact in the future.

6.12 Indeed, consultations suggest that **the Institute is recognised increasingly for its expertise and knowledge of how animal health can be applied in related domains.** This includes other health contexts – notably through the One Health agenda – but also wider societal challenges, opportunities, and imperatives including climate change, with links to food production, and resource availability. This is an important strand of activity that has the potential to increase the Institute's reach and impact going forward, exploiting its core expertise for wider societal benefit.

6.13 **The Institute has also further deepened and expanded its expertise and offer on underpinning technologies, scientific techniques, and biosafety and engineering over the impact period**. This includes drawing on the Institute's long-term experience developing and operating successfully low- and high-containment laboratories. Leveraging fully this applied experience of engineering and biosafety excellence may be increasingly important going forward. First, to support activity that responds to the need for enhanced pandemic preparedness following the experience of COVID-19. Second, reflecting wider national resilience and risk management challenges, related to both livestock and zoonotic disease specifically, and the increasingly challenging and uncertain international environment.

Annex A: Case examples

A.1 This Annex contains six case examples that showcase key areas of the Institute's economic and global impact in the animal health sector:

- African Swine Fever
- Foot-and-Mouth Disease
- Leadership in biosafety
- Contribution to the COVID-19 response
- Virus evolution and transmission
- One Health animal models

African Swine Fever Virus

African swine fever (ASF) is a fatal, contagious disease impacting pigs globally. An outbreak of ASF could cost the UK up to £100m in economic losses, including through restrictions on exports lasting up to nine months.[46] The Institute helps the UK to avoid outbreaks and enhances preparedness to mitigate impact should this occur. Pirbright also contributes to the prevention and control of ASFV internationally.

Pirbright provides ongoing **evidence and scientific advice** to Defra and devolved administrations on ASFV, including on potential response measures should an outbreak occur. It has also **enhanced the capacity and resilience of the UK's agricultural sector** by contributing to guidance to farmers and vets on how to respond in the case of an ASFV outbreak.

Policy advice and guidance draws on the **expertise of the Institute's globally-leading researchers**; fundamental and applied research on ASFV has been carried out at Pirbright since the 1960s. Pirbright is one of seven International WOAH Reference Laboratories for ASFV. The Reference Laboratory provides global advice and training, sample testing and reagents, including a **unique reference collection** of 500+ strains of ASFV, from multiple genotypes.

The Reference Laboratory works to improve tests to detect the virus, and to better understand virus pathogenesis and transmission and the stability of the virus in the environment. This has been used to **inform ASFV disinfection and inactivation procedures and plans,** both in the UK and internationally. The Laboratory also provides reagents, and diagnostics and testing services to countries internationally, and training, both in-person and online.

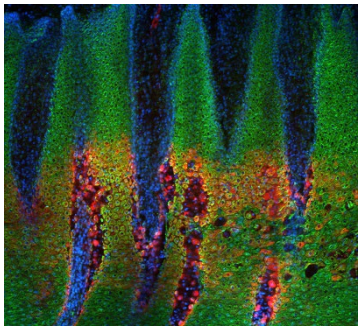
Through the work of the Reference Laboratory, the Institute has **enhanced international capability and resilience** through providing strategic advice to disease control agencies and governments and advising on best practices and procedures to deal with ASFV in various global contexts. This also enhances the **UK's reputation** in global animal health research and surveillance networks and communities.

The Institute has **contributed to the development of new candidate vaccines for ASFV**, with potential significant socio-economic impact. For example, recent research generated new knowledge of how the virus interacts with its host[47] and the Institute is part of a Horizon Europe project to study next-generation vaccines, seeking to find a means to control ASFV globally[48]; it is generally accepted that eradication would not be possible due to the wildlife reservoirs in Africa. Pirbright also **contributes to the prevention and control of ASFV internationally through** leading and collaborating in international research projects. For example, Pirbright co-ordinated DEFEND, an international partnership to tackle the emergence of ASFV in Europe.

[46] Immediate measures to step up safeguards against African swine fever from Europe - GOV.UK
National Risk Register - 2025 edition
[47] Reis A.L., Rathakrishnan A., Petrovan V., et. al. From structure prediction to function etc.
[48] Pirbright joins European African Swine Fever Project | News | The Pirbright Institute

Foot and mouth disease

FMD has the potential to cause huge economic losses: the 2001 outbreak in the UK resulted in the culling of over 6 million animals and cost £8bn, and the annual impact through visible production losses and vaccination in endemic regions are estimated to be up to US$1bn. The Institute enables the UK, and countries internationally, to prepare for and respond effectively to outbreaks.



FMD research and disease control has been carried out at Pirbright for 100+ years. Since 1958, Pirbright has been the FAO's World Reference Laboratory for FMD and holds the largest archive of FMD samples in the world. The Institute is at **the centre of national and international effort to prevent and respond rapidly to outbreaks when they do occur**.

In the UK, the Institute **provides ongoing evidence and expert advice** to Government agencies, serving as the National Reference Laboratory for Defra. This includes providing rapid evidence to inform control strategies and decisions on trade in animals and animal products to **help keep the UK free from FMD**. Pirbright also provides training to veterinarians or laboratory staff responsible for detecting FMD.

FMD is endemic in Africa, the Middle East, Asia and parts of South America. In these contexts, the **Institute works to mitigate and reduce the adverse impact of the disease**. This includes by: monitoring and surveillance activities including 'in-country reports'; providing diagnostic service to test samples from outbreaks; the development of new diagnostic tests and supply of reagents; monitoring the performance of vaccine. Pirbright scientists also lead 'in-country' research projects, to enhance capacity to prevent or control FMD,

Other impacts of the Institute's work on FMD include:

- **Novel vaccine development**. For example, the Institute developed a novel thermostable vaccine, with expectation of market entry through a commercial partner in the near future.
- **New and improved knowledge through fundamental and applied research**. Research groups study and disseminate findings on underpinning transmission mechanisms, molecular biology, immunology, and the efficacy of vaccination and control strategies.
- **New platforms, tools and evidence to support knowledge exchange.** For example, the Institute co-developed the 'openFMD' platform to promote information sharing and research collaborations and delivers 'regional roadmaps' to help coordinate responses and controls between countries across Africa and Asia.
- **Enhanced international partnerships and networks** to support disease control and preparedness capacity. For example, Pirbright has established a 'Laboratory Twinning' project with the African Union Panafrican Veterinary Vaccine Centre in Ethiopia, to establish capacity for independent evaluation of FMD vaccines in Africa.[49]

[49] FMD Vaccine Quality Control | World Reference Laboratory for Foot-and-Mouth Disease

Leadership in Biosafety

The Institute is a world-leader of biosafety practice. By sharing its knowledge with other UK and international institutions and contributing to the development and ongoing delivery of training for the Biorisk Professional Registration Scheme, Pirbright promotes improved biosafety practice and protection from biological hazards globally.

Owing to the nature of its work on viral pathogens, biosafety is of central importance to the Institute. Approximately 65% of Pirbright's resources are designated by the BBSRC to National Bioscience Research Infrastructure (NBRI) level 1, i.e. requiring National Capability high containment facilities, which can be used to research high consequence pathogens not endemic to the UK. Such facilities require significant expertise to operate and maintain.

Leveraging this position, the Institute has **advanced awareness and uptake of best practice in biorisk protection among UK and international institutions**. It has done so by:

- **Developing and delivering a series of training programmes** (both e-learning and instructor-led biosafety courses) for biosafety professionals
- **Coordinating and chairing the UK's Biorisk Strategic Leadership Group (BSLG)**, bringing together high-hazard biological facilities, from the public sector, industry and universities
- **Participating in and contributing to the UK's National Laboratories Alliance**, a network of recognised National Capability laboratories
- **Serving on the Steering Committee of BSL4Znet**, a collaboration of animal and public health organisations with high containment labs in Australia, Canada, Germany, the UK, and the USA
- **Engaging in informal exchanges with other high containment facilities**, e.g. Dstl and the APHA in the UK; as well as the NBAF in the US and VIDO in Canada.

Through BLSG, **the Institute was involved in identifying a gap for formal training and accreditation of biorisk professionals**. This led to the co-development of the Biorisk Professional Registration Scheme (BPRS): a Royal Society of Biology (RSB) approved scheme launched in 2024, which supports specialists who are involved in the management, control, and containment of biorisk to develop and evidence their skills.[50] Pirbright developed and will deliver RSB-accredited training for this scheme, **supporting the improvement of biorisk practice globally.**

[50] Royal Society of Biology, 2025, Biorisk Professional Registration Scheme. See here

Contribution to the UK COVID-19 response

The Institute contributed significantly to the UK and global response to the COVID-19 pandemic, capitalising on its longstanding expertise in animal coronaviruses and demonstrating its continued strength as a National Capability.

Vaccine testing and approval: As part of pre-clinical testing of the Oxford-AstraZeneca AZD1222 vaccine, Pirbright scientists demonstrated that two doses of the vaccine strengthened antibody responses in pigs.[51] This finding contributed to regulatory approval of the vaccine and shaped the Government's decision to administer two doses in the national vaccination roll-out. As the vaccine was shown to provide high levels of protection against hospitalisation and death,[52] the Institute contributed materially to the control and containment of COVID-19. The Executive Chair of the BBSRC commended the Institute's role and contribution to the Oxford-AZ vaccine, highlighting how the Institute's expertise allowed it to respond swiftly during national emergencies and contribute essential new knowledge.[53]

Supporting the NHS's diagnostic capacity: In early 2020, the Institute supplied the UK's National Coronavirus Testing Centre in Milton Keynes with thirteen high throughput instruments. Further, over sixty of the Institute's scientific staff volunteered to support PHE testing sites. This led to the Institute's involvement in the establishment of The Lighthouse Laboratory in Bracknell, a key testing lab hosted by the NHS BSPS. Pirbright staff provided induction and training to The Lighthouse Laboratory staff. These engagements ultimately helped to bolster the UK's capacity to test patients and NHS staff, supporting the Test and Trace service.

Ongoing management of the pandemic: As a core member of the 'G2P-UK' National Virology Consortium, the Institute worked alongside nine other organisations to study how mutations affect SARS-CoV-2 biology, and how this affects vaccine efficacy, viral spread and management of the pandemic.[54] This influenced Government containment policies, e.g. working with UKHSA, Pirbright provided evidence that a third vaccine dose provided sufficient immunity against the Omicron variant, influencing national lockdown decisions in late 2021.

Future pandemic preparedness: Pirbright was a founding member of the UK International Coronavirus Network (UK-ICN), funded by the BBSRC and Defra from 2021-2025. The Institute led the 'Countermeasures and interventions' theme within the network, one of the five themes to coordinate interactions between over 500 coronavirus researchers internationally.

[51] Graham et. al., 2020, Evaluation of the immunogenicity of prime-boost vaccination with the replication-deficient viral vectored COVID-19 vaccine candidate ChAdOx1 nCoV-19. Available here
[52] Chuenkitmongkol et. al., 2022, Expert review on global real-world vaccine effectiveness against SARS-CoV-2. Available here
[53] See here
[54] See here

Virus evolution and transmission

Pirbright tracks virus evolution and transmission patterns across multiple livestock diseases. This has informed control strategies and identified future risks to prevent the spread of disease.

Pirbright uses a variety of specialist techniques and tools to understand and trace how diseases develop and spread, leveraging the Institute's expertise in both virus and host biology. The tools and techniques have been used by the Institute to **help improve prevention, diagnosis, and treatment for high-impact livestock diseases**. Some examples include the following.

FMD and PPR: Pirbright scientists successfully used environmental samples to detect FMD in Cameroon[55] and Nigeria,[56] both LSD and PPR in Nigeria[57] and both FMD and PPR in Nepal.[58] This provides a low tech tool that can help surveillance efforts where resources are constrained.

BTV: Molecular epidemiology techniques were used by the Institute in studies of BTV in India, and in 2015 the Institute informed diagnostics as part of control strategies.[59]

LSD: Pirbright researchers used epidemiology techniques including mathematical modelling using EFSA data to understand how LSD was spreading after its emergence in mainland Europe in 2015.[60] The findings were used to advise on control, surveillance, and ongoing disease detection. Following this work, Pirbright researchers continued to study the LSD virus using molecular epidemiology techniques and identified a new viral subgroup of LSD in West and Central Africa,[61] informing further control strategies.

The Institute has **generated new understanding to enhance preparedness for zoonotic disease**. During the COVID-19 pandemic, Pirbright researchers examined how SARS-CoV-2 had transmitted from animals to humans and which other species may be at risk. This insight on the common traits that allow viruses to jump between animals and humans can be used to forewarn and help prepare for future threats to humans from zoonotic disease.[62]

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[55] Colenutt et. al (2025) Detection and genomic characterisation of foot-and-mouth disease virus serotypes circulating in Cameroon using environmental sampling
[56] Gubbins et. al (2025) Longitudinal study of foot-and-mouth disease virus in Northern Nigeria: implications for the roles of small ruminants and environmental contamination in endemic settings
[57] Brown et. al (2024) Environmental sampling for the detection of capripox viruses and peste des petits ruminants virus in households and livestock markets in Plateau State, Nigeria
[58] Colenutt et. al (2022) Environmental sampling for the detection of foot-and-mouth disease virus and peste des petits ruminants virus in a live goat market, Nepal
[59] Maan et. Al (2015) Full-Genome Sequencing as a Basis for Molecular Epidemiology Studies of Bluetongue Virus in India.
[60] See here for a summary of the research: Lumpy skin disease | EFSA
[61] Haga et. Al (2024) Sequencing and Analysis of Lumpy Skin Disease Virus Whole Genomes Reveals a New Viral Subgroup in West and Central Africa.
[62] Conceicao et. al (2020) The SARS-CoV-2 Spike protein has a broad tropism for mammalian ACE2 proteins.

One Health animal models

The 'One Health' agenda advocates that scientists consider the interrelationships between animal, human and plant health, and encourages a holistic approach to tackle infectious disease challenges. Drawing on their expertise in livestock and zoonotic disease, scientists at Pirbright have developed and used animal models – three of which are highlighted below – to unlock advances in both human and animal health.

Pig model: Pirbright was instrumental in establishing the pig as a model for human respiratory viruses, using it to study influenza. Influenza research traditionally used small-animal models, particularly ferrets. Pirbright research demonstrated the advantages of pigs, which are natural hosts for influenza viruses and are biologically/physiologically more similar to humans. Pigs have therefore been used by Pirbright scientists to study immune responses to human flu vaccines as well as to test COVID-19 vaccines.

Cow model: Institute research to develop a bovine respiratory syncytial virus (bRSV) vaccine to prevent pneumonia in calves, supported the development and approval of a human (h)RSV vaccine. HRSV is a major cause of severe respiratory disease in babies, young children and the elderly, leading to approximately 100,000 deaths globally in children under five years of age each year.[63] Pirbright research proved that a new bRSV vaccine was safe, immunogenic, and protected calves against bRSV infection.[64] This accelerated the approval of a similar vaccine for hRSV, which is now licensed for use in 75-79 year olds and pregnant women, and has the potential to prevent serious illness and death from hRSV.[65]

Poultry model: The Institute's Viral Oncogenesis research group studies viral pathogens which cause cancer in birds. The aim is to understand the function of the viral genes, their ability to cause tumours, and determine how the immune system responds to cancer cells. Although bird and human physiology differ, the study of how 'normal cells' turn into 'cancer cells' in poultry contributes to fundamental understanding of oncogenes (mutated genes).

The Institute **has contributed to the development of the 'One Health' agenda more widely**. For example, Pirbright established a long-term strategic partnership with the MRC-University of Glasgow Centre for Virus Research (CVR). It has also contributed to the One Health Vector-Borne Diseases Hub,[66] led by Imperial College London, focused on data sharing and promoting collaboration on vector-borne diseases both in the UK and globally.

[63] World Health Organisation (WHO), 2025, Respiratory syncytial virus (RSV). Available here
[64] Zhang et. al, 2017, Protection of calves by a prefusion-stabilized bovine RSV F vaccine. See here
[65] NHS, 2025, RSV vaccine. Available here
[66] VBD Hub

Annex B: Methodology details

Consultees to the Impact Study

B.1 Table B-1 contains a list of current and former staff of The Pirbright Institute, who participated in an interview with SQW.

Table B-1: List of internal consultees

Name	Position	Consultation
Dr Andrew Broadbent	Former Group Leader, Infectious bursal disease virus (IBDV)	Thematic
Dr Andrew White	Director of Risk and Assurance	Strategic
Prof Bryan Charleston MRCVS FRS	Director and CEO of The Pirbright Institute	Strategic
Dr Carrie Batten	Head of the Non-Vesicular Reference Laboratory	Thematic
Dr Chris Netherton	Group Leader, African Swine Fever Vaccinology	Thematic
Dr Chris Sanders	Group Leader, Entomology	Thematic
Dr Dalan Bailey	Group Leader, Viral Glycoproteins	Thematic
David Gillies	Energy Manager	Strategic
Dr Don King	Head of the Vesicular Reference Laboratory	Thematic
Prof Elma Tchilian	Group Leader, Mucosal Immunology	Thematic
Dr Erica Bickerton	Group Leader, Coronaviruses	Thematic
Gary Oldham	Engineering and Operations Manager	Strategic
Dr Georgina Limon-Vega	Group Leader, Applied Epidemiology	Thematic
Dr Geraldine Taylor	Former Group Leader, former Head of Vaccinology, and Honorary Fellow	Thematic
Dr Graham Freimanis	Scientist, Bioinformatics, Sequencing & Proteomics	Thematic
Helen Watts	Director of Finance and Company Secretary	Scoping
Dr Helena Maier	Group Leader, Coronavirus Cellular Biology	Thematic
Prof Ian Brown OBE	Group Leader, Avian Virology	Thematic
Prof John Hammond	Director of Research and Group Leader, Immunogenetics	Strategic
Lauren Cresser	Home Office Liaison Contact and Named Information Officer	Thematic
Dr Linda Dixon	Former Group Leader, African Swine Fever Virus	Strategic
Lizelle Gouverneur	Head of Business Development	Strategic
Dr Louise Barton	Head of Research and Innovation	Strategic
Dr Marion England	Institute Fellow, Vector Ecology	Thematic

Name	Position	Consultation
Dr Michael Johnson	Former Director of Capability	Strategic
Prof Munir Iqbal	Group Leader, Avian Influenza and Newcastle Disease	Thematic
Dr Ryan Waters	Named Veterinary Surgeon and Named Training and Competency Office	Thematic
Dr Simon Carpenter	Former Group Leader, Entomology and Director of Capability	Thematic
Prof Simon Graham	Group Leader, Porcine Reproductive and Respiratory Syndrome (PRRS) Immunology	Thematic
Dr Simon Gubbins	Group Leader, Transmission Biology	Thematic
Dr Toby Tuthill	Group Leader, Picornavirus Molecular Biology	Strategic
Prof Venugopal Nair OBE	Scientist Emeritus in Viral Oncogenesis and Vaccine Research	Thematic
Dr Yongxiu Yao	Group Leader, Viral Oncogenesis	Thematic

Source: SQW

6.14 The names, organisations, and position of external consultees are listed in Table B-2.

Table B-2: List of external consultees

Name	Organisation	Position	Consultation
Prof Sir Adrian Hill	The Jenner Institute	Director	Strategic
Prof Christine Middlemiss	UK Government	Chief Veterinary Officer	Strategic
Dr Danny Goovaerts	GDAVC Consulting BV	Founder	Strategic
Dr David Johnson	UKHSA	Deputy Director of Workplace, Health and Safety	Strategic
Dr Keith Sumption	Food and Agriculture Organisation of the UN	Secretary, EUFMD Commission	Strategic
Dr Nicholas Juleff	Bill and Melinda Gates Foundation	Senior Programme Officer	Strategic
Dr Phil Hudson	Berkshire and Surrey Pathology Service	Programme Director	Strategic
Dr Sadhana Sharma	BBSRC	Strategy and Policy Manager	Strategic
Prof Wendy Barclay CBE	Imperial College Lonon	Regius Professor of Infectious Disease	Strategic

Source: SQW

Further detail on Economic Impact Model

B.2 The paragraphs below provide further information about our approach to developing the economic impact model for this study, as well as the data sources that were used.

Approach

B.3 The economic impact model quantifies the impact of The Pirbright Institute's activities in two areas: operational impact and KEC impact. Operational impact, or the activities undertaken to enable science at the Institute, can be further broken down into two categories: expenditure on goods and services and employment of staff. The KEC impact area covers a number of activities, including licensing of proprietary technology; the sale of products, e.g. diagnostics and laboratory reagents; contract research undertaken for an industry partner on a commercial basis; and providing training courses.

B.4 The modelling approach and key assumptions underpinning it, by impact route, is summarised below.

Table B-1: Modelling approach by impact

Area	Route	Description	Key assumptions
Operational impacts	Operational expenditure	The impact of The Pirbright Institute's purchases on suppliers.	• Expenditure has an effect on the Institute's direct and indirect suppliers, across different industries (classified based on the category of spending). • Approximately 95% of the Institute's expenditure takes place in the UK.
	Employment of staff	The impact of employing staff at The Pirbright Institute.	• Institute staff spend their salaries in accordance with the Consumer Price Index basket of goods and services. • The Institute's National Insurance contributions generate impact through Government spending across the economy. • The Institute's pension contributions generate impact through pension fund spending across the economy. • All staff-related expenditure takes place in the UK.

Area	Route	Description	Key assumptions
KEC impacts	KEC activity	The impact of licensing, sale of proprietary products, and commercial contract research.	• Companies that license a technology, purchase products (diagnostics and reagents), or pay for training or research from the Institute receive a 1:1 base level of return, i.e. the GVA impact is the same as the cost of the purchase from the Institute. • 90% of licensing income comes from UK-based companies. • Income from the sale of diagnostic tests comes from international sources only. • 10% of income from the sale of reagents comes from UK-based companies. • 10% of commercial contract research income comes from UK-based companies. • Income from training comes from international sources only.

Source: SQW

B.5 The model quantifies impacts in terms of GVA and jobs supported, and we employed a 'GVA to jobs' approach.

- For operational impacts, i.e. expenditure-based modelling: the total GVA impacts (including the indirect effects) were estimated using industry-specific Type 1 multipliers from the UK Input-Output (IO) tables, which were recently updated based on 2019 data. The GVA impacts were then translated into the number of supported jobs based on ONS's sector-level labour productivity estimates. Employment effects also include the direct employment at The Pirbright Institute (the number of staff).[67]

- For KEC impacts, i.e. income-based modelling: the total GVA impacts were assumed to produce a 1:1 base level of return for the Institute's clients. In other words, the GVA impact is estimated to be the same as the cost of the purchase. This is underpinned by the market clearing condition: on average, the return on investment has to be attractive for clients.

[67] We note that ONS does not produce official estimates for induced effects – Type 2 multipliers which include the boost throughout the economy from growing expenditure by employees of indirect business beneficiaries. Therefore, our model does not reflect these effects.

B.6 The Table below lists the adjustments we applied to arrive at an accurate estimate of economic impact.

Table B-2: Technical components of impact estimates

Effect	Description
Multiplier effects	Reflects the increase in economic activity directly linked to Pirbright, which will induce more activity throughout the economy – based on Input Output tables.
Discounting	Applied to compare benefits and costs incurred at different points in time. The analysis was performed in 2023-24 financial year pounds; all past values were adjusted for inflation using the GDP deflator.
Substitution	Measures how KEC clients, i.e. commercial partners, substitute one type of input for another, but do not necessarily increase employment or output – considered to be zero given the specialist nature of The Pirbright Institute's offer.
Displacement	The extent to which the increase in economic activity is offset by reduction of activity in another area – based on discussion with the Institute, displacement was deemed to be low, below the margin of error for the quantitative model.

Source: SQW

Data sources

B.7 Financial information related to operations and KEC activity are available in the Institute's Annual Reports, which are publicly available via the Charity Commission for England and Wales. We used the expenditure (operational impact) and income (KEC impact) data contained in the Financial Statements at the end of each report as the basis of our model.

B.8 This and other key data sources are summarised in Table B-3: Data sourcesTable B-3.

Table B-3: Data sources

Data source	Description	Link
The Pirbright Institute Annual Reports, 2015-16 to 2023-24	Annual returns, accounts, and trustees' annual report (TAR).	Annual Reports 2015-16 to 2023-24
A breakdown of expenditure in 2022-23	Detailed Analysis of Expenditure for 2022-23.	N/a
UK input-output analytical tables, industry by industry	Industry-by-industry output tables, containing Type I effects (used to calculate total impact) and Type I multipliers (used to find direct-indirect impact split)	UK input-output analytical tables: industry by industry - Office for National Statistics

Data source	Description	Link
Output per job UK	Estimates for gross value added (GVA), jobs and output per job by SIC 2007 section-level industry	Output per job, UK - Office for National Statistics
Consumer price inflation basket of goods and services	The "shopping baskets" of items used in compiling the various measures of consumer price inflation are reviewed annually.	Consumer price inflation basket of goods and services - Office for National Statistics
GDP deflators at market prices, and money GDP	The latest gross domestic product (GDP) deflators, used to calculate real terms values	GDP_Deflators_Qtrly_National_Accounts_June_2024

Source: SQW

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