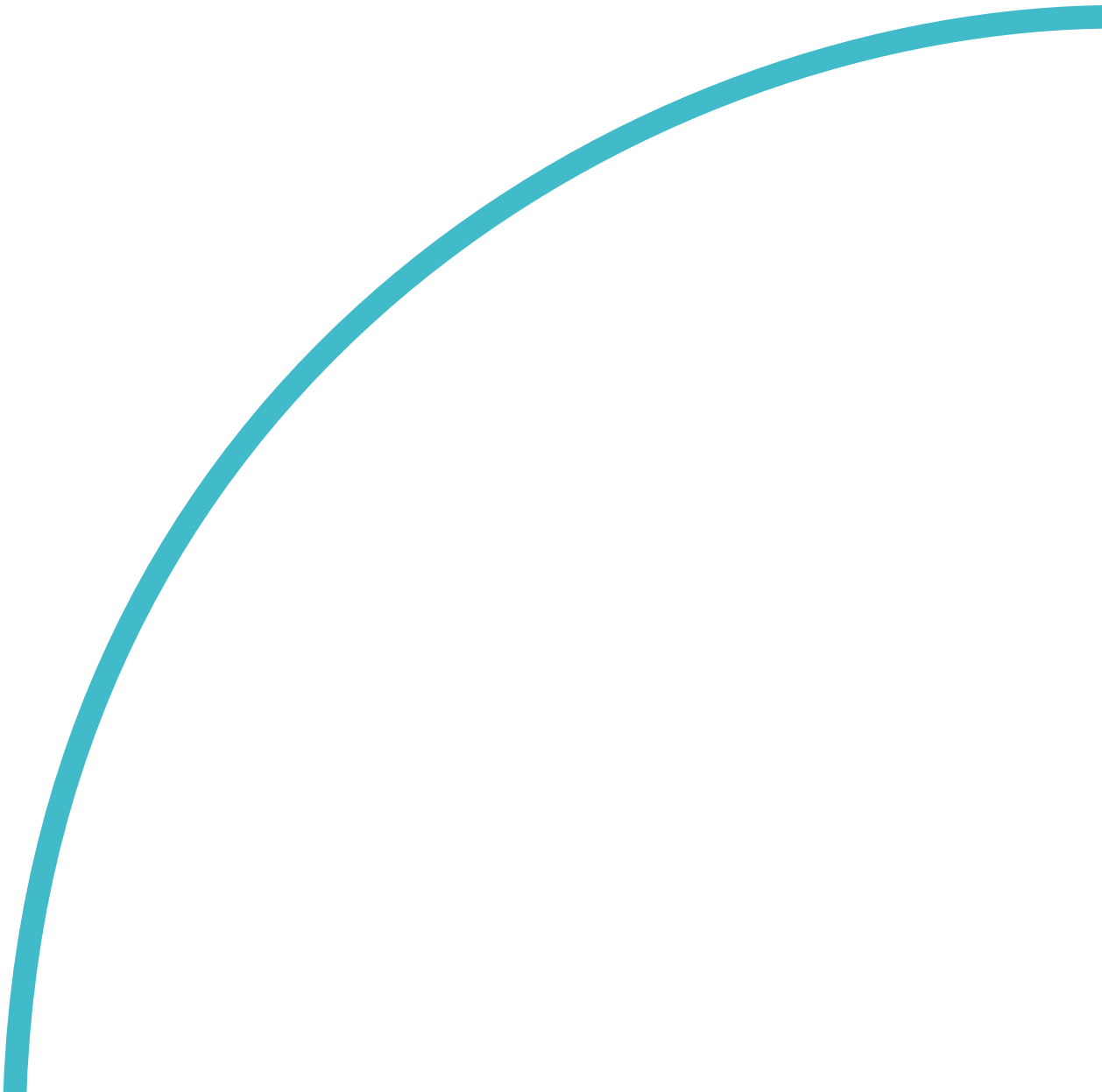
BiGGAR Economics

Economic Impact of the James Hutton Institute

A report to the James Hutton Institute
May 2025



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Executive Summary

The James Hutton Institute is a unique component of Scotland's research infrastructure that is tackling fundamental societal challenges and driving the success of key segments of Scotland's economy.

In 2023/24, the James Hutton Institute (the Hutton) contributed £358.9 million GVA to the UK economy and supported around 2,575 jobs. Of this:

- £61.8 million GVA and 740 jobs in the Aberdeen and Dundee city regions; and
- £210.7 million GVA and 1,525 jobs were in Scotland.

This implies every £1 funding from the Scottish Government, enabled the Institute to add more than £15 value to the UK economy, of which £9 was retained in Scotland.

In 2023/24 every £1 funding the Hutton received from the Scottish Government delivered more than £15 in economic value for the UK economy.

Tackling Global Challenges

The Hutton has wide socio-economic and environmental impact. Most of the Hutton's economic impact is readily quantified and arises through work the Institute does to support agriculture, food and drink production in the UK and further afield. This work includes the Hutton's plant breeding activity, research on crop genetics and work to control and mitigate the spread of plant pests and diseases.

The Hutton's work in this area stretches back to between the world wars in the 1920s and 1930s, when government and farmers realised what science could contribute to more efficient land use. Unprecedented population growth in the 1950s stimulated further investment when increasing agricultural productivity became a global priority.

The Hutton's work broadened over time to cover wider land uses, the environment and social dimensions of rural land and now encompasses not just food but water and energy security as well. The effects of this type of research, primary data gathering, information and knowledge sharing as well as capacity building through postgraduate training, are cumulative. This means much of the Hutton's current impact is underpinned by decades of institutional experience, globally important collections of genetic resources and specialist research and demonstration facilities that have taken years, if not decades to accumulate.

Today the Hutton remains focused on major global challenges, but priorities have evolved. Whilst food security remains important, responding to climate change, tackling biodiversity loss and improving public health and wellbeing have all grown in importance. The Hutton creates impact in all these areas.

The Hutton's work to better understand the natural environment, quantify potentially toxic elements and compounds, as well as breed crops with enhanced nutritional properties, is helping to protect and enhance public health in Scotland and beyond. Hutton is at the forefront of research and innovation aimed at fostering resilient communities, advancing social innovation, and implementing nature-based solutions to address environmental and societal challenges. Similarly, its work to develop more sustainable production systems, restore valued habitats and develop more effective approaches for responding to extreme climate events is making an important contribution to adaptation, resilience and the mitigation of climate change and biodiversity loss.

Driving Local Impact

Despite its focus on major global challenges, the Hutton is mindful of its role in the local economies of which it is a part and generates substantial economic value for both the Dundee and Aberdeen city regions. In 2023/24 it was estimated that the Hutton generated:

- £40 million GVA and supported 410 jobs in Dundee City Region; and
- £22 million GVA and supported 330 jobs in Aberdeen City Region.

A Distinctive Approach

The scale of the economic and societal contribution made by the Hutton is not accidental. It is enabled by the Institute's long-standing mission and ongoing focus on issues of strategic national (and international) importance. A focus that is reflected in the Institute's role as one of the Scottish Government's main strategic research partners.

In this role the Institute has added £9 in value to the Scottish economy for every £1 it received in strategic research funding in 2023/24. This impressive rate of return serves to underscore the status of the Hutton as a key component of Scotland's national research infrastructure.

An important factor underpinning the Hutton's ability to generate such substantial economic value is the distinctive approach adopted by the institute and those who work there. This approach is built on four important pillars:

- **Interdisciplinary –** the Hutton brings together experts from different disciplines to sustainably manage ecosystems, protect natural resources and enhance economic productivity. This enables synergies to be exploited

between research areas that might otherwise operate independently and means the impact of the Hutton's research is more than the sum of its parts.

- **Independence –** the Hutton is independent of industry and government enabling it to have academic freedom to conduct research without political or corporate influence. This allows it to run ahead of policy agendas, predict challenges to come and look to longer term solutions to societal challenges. Independence also nurtures scientific integrity.
- **Collaborative –** the Hutton is known for effective collaboration with industry and at the science-policy interface. The team understand who to work with, knows how to get things done and are effective at sharing information.
- **Quality -** By providing high-quality scientific evidence, the institute plays a critical role in shaping strategies that improve society, both in Scotland and via its international work.

Changes Since 2016

Since the last economic impact report was published in 2016 the total economic contribution of the Hutton has increased by £40.4 million across the UK, with the return on Scottish Government funding increasing from a little under £13 to a little over £15 across the UK. The return in Scotland on every £1 research funding provided by the Scottish Government has also increased, from £8.50 to £9, an increase of 6%. This has happened despite an absolute reduction in Scottish Government funding over this period of the same amount (6%).

One of the main reasons for this has been an increase in the value of commercial research contracts secured by the Hutton since 2016. Over this period income from commercial research contracts, consultancy and collaborative research, increased from under £1 million to £2.6 million. This is particularly noteworthy because this period also saw the UK's exit from the European Union, an event that had been widely expected to make securing research funding more difficult.

One of the main factors driving the increase in the Hutton's economic impact since 2016 has been a three fold increase in commercial research funding.

Another important change since the previous study has been the emergence of a thriving and effective innovation ecosystem, focused particularly on the Hutton's campus at Invergowrie. An important catalyst for this has been the creation of the International Barley Hub and the Advanced Plant Growth Centre on-site, both of which were made possible by major investment through the Tay Cities Region Deal.

Outlook for the Future

In the 1920s, when the foundations for the Hutton were laid, it would have been impossible to predict the scale of the institute's economic impact a century later. Today the scale and reach of that impact is probably far beyond what anyone working in the institute back then could have imagined.

While the focus of the Hutton's work has shifted since then, the global challenges being tackled are equally fundamental to the prosperity of humanity as food security was when the institute was first established. The Institute's work on water, energy security and protecting and restoring the environment add more than economic value. Although it is not currently possible to quantify what the future societal and economic benefits of this work may be, the lesson from the past is that this potential should not be underestimated.

1. Introduction

The James Hutton Institute is a world-leading research organisation specialising in land, crops, water, and the environment

1.1 Background

The James Hutton Institute (the Hutton) is a world-leading specialist research organisation based across two main sites in Craigiebuckler, Aberdeen and Invergowrie, Dundee. The Institute was formed in 2011 with the merger of the Macaulay Land Use Research Institute and Scottish Crop Research Institute (see Hutton family tree at Figure 1-1). Today, the Hutton is comprised of its research functions and a commercial subsidiary, James Hutton Limited, which is responsible for commercialising the Hutton's research. The Hutton's vision is:

"To be at the forefront of innovative and transformative science for the sustainable management of land, crop and natural resources that supports thriving communities."

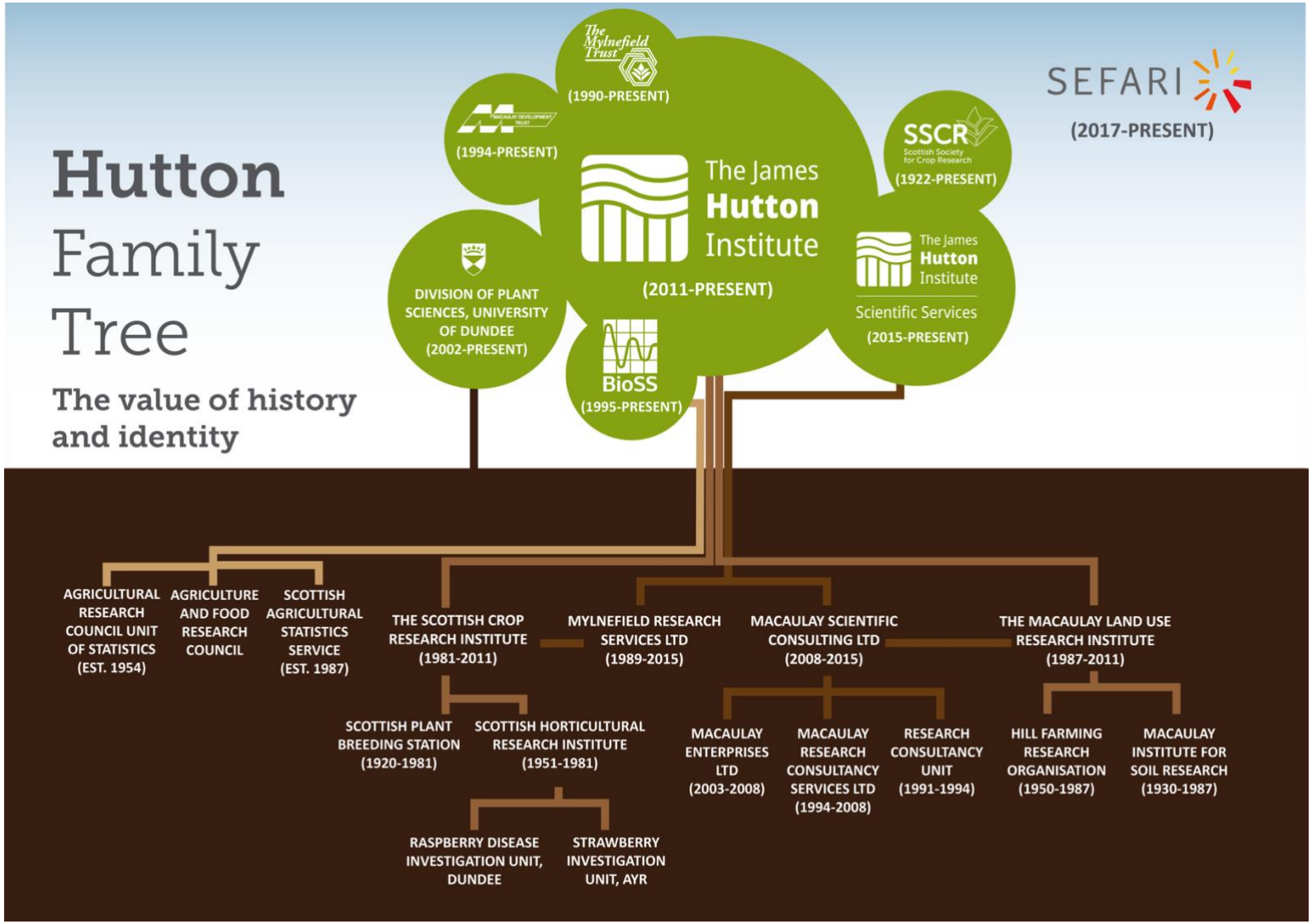
The Hutton combines strengths in genetics, genomics, biochemistry, crop breeding, plant pathology and epidemiology, soil sciences, economics, social sciences, water, land use, bio-informatics, bio-diversity and analytical chemistry. It uses these to increase understanding of global issues, like food, energy and environmental security, and delivering evidence-based solutions to these global challenges.

The Institute's work has international impacts, with research carried out for a range of clients including the Scottish and UK Governments, and the European Union as well as other organisations and companies worldwide.

The remainder of this report is structured as follows:

- section 2 outlines the approach taken to the study;
- section 3 describes the impact of the Hutton's knowledge transfer activity;
- section 4 discusses the Hutton's contribution to food and drink production;
- section 5 considers climate change mitigation and biodiversity loss;
- section 6 describes how the Hutton helps improve public health and wellbeing;
- section 7 outlines the operational impacts of the Hutton;
- section 8 describes the local impact of the Hutton; and
- section 9 summarises the Hutton's impacts and the conclusions of the report.

Figure 1-1 Hutton Family Tree



Source: James Hutton Institute

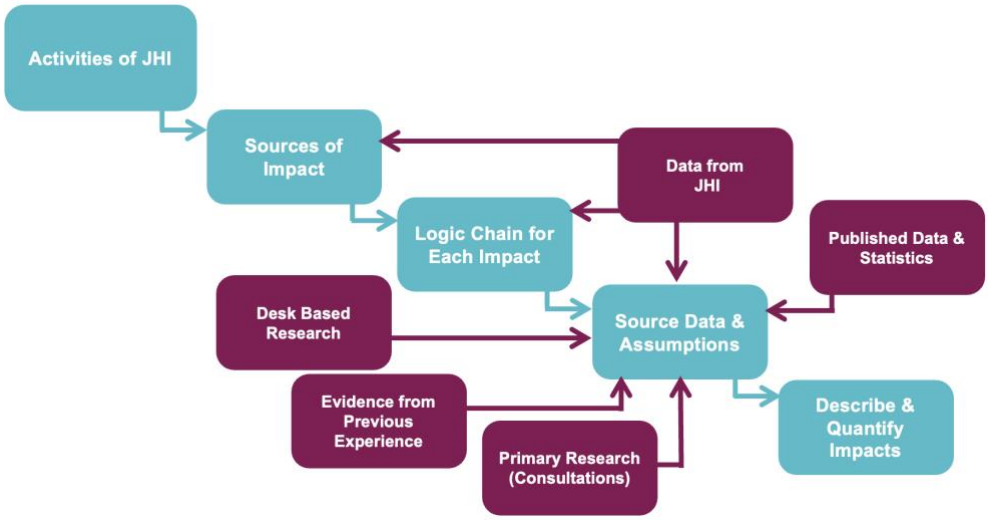
2. Framework for Impact

This section describes the approach taken in assessing The Hutton's economic impact.

2.1 Study Approach

The overarching objective of this study is to illustrate the scale and breadth of the Hutton 's economic and wider societal impact. The first step in assessing the economic benefits associated with the Hutton was to consider its activities and identify those likely to generate an economic impact. Logic chains were then developed to describe and provide evidence about how each activity leads to impact. The steps involved in this process are illustrated in Figure 2-1 below.

Figure 2-1 Study Approach



2.1.1 Sources of Impact

Following this process, these key sources of impact were identified:

- **Knowledge Transfer** – the economic value enabled by the Hutton's knowledge transfer activities including contract research, consultancy, collaborative research, analytical services and postgraduate training;
- **Food & Drink Production** – the economic value of Hutton plant varieties and contributions to agricultural productivity arising from the Hutton's research (e.g. improvements in crop yields, disease resistance or reduced reliance on fertiliser);
- **Social Value** – the contribution the Hutton makes to important local and national societal priorities such as addressing biodiversity loss, enabling the transition to net-zero, enhancing community resilience and public health and wellbeing;
- **Core Operations** – employment and economic activity directly supported by the Hutton's operations; and

- **Place-based Impacts** – the Hutton 's activities support economic impact locally at each of its sites. Its capital investment and business support activities in each area are creating the foundations for local innovation ecosystems.

2.1.2 Quantifying Economic Impact

As a world-leading research institute, the Hutton creates impact in numerous ways. This report focuses on the economic impacts the Hutton generates and attempts to quantify these wherever possible. Two commonly used measures of economic benefit are used to do this:

- **Gross Value Added (GVA)** – a measure of the monetary contribution an organisation adds to the economy through its operations; and
- **Employment** – measured in terms of headcount jobs supported.

The study assesses the economic impact of the Hutton in 2023/24 (latest year for which data is available) across the following geographic areas:

- Local Areas – encompassing Aberdeen and Dundee City Regions;
- Scotland; and
- UK.

Throughout the report, impacts are presented inclusively, for example, impacts in the UK include impacts in Scotland and the Local Areas.

The total GVA and employment impacts of an organisation are derived from three sources: the direct, indirect and induced effects. The direct impact captures the contribution to economic activity that an organisation can claim as being exclusively its own. This is estimated by dividing the turnover it generates by sector appropriate economic ratios for turnover/GVA and turnover/employee. These economic ratios were sourced from the Scottish and UK Annual Business Surveys[1].

Indirect and induced impacts (i.e. knock on effects further down the supply chain and increased consumer spending effects) were captured using sector appropriate economic multipliers and adjusting for the study area as appropriate. These multipliers were sourced from the Scottish and UK Government's Input-Output Tables[2]. The economic impacts presented throughout the report are the sum of these direct, indirect and induced effects.

The quantifiable outputs from this study have been rounded. GVA figures are reported to the nearest £1 million and employment figures are rounded to the nearest 10 (nearest 100 in the executive summary). As a result, some tables do not sum.

[1] Scottish Government (2024), Scottish Annual Business Statistics 2022; ONS (2024), Annual Business Survey 2022

[2] Scottish Government (2024), Scottish Input-Output Tables 2021; ONS (2024), UK Input-Output Tables 2021

2.1.3 Parameters of the Study

While every attempt has been made to measure the economic contribution of the Hutton as consistently and accurately as possible, there are certain parameters to the study that should be considered.

The report aims to quantify the economic contribution the Hutton makes using the two widely accepted economic measures of GVA and employment. However, using GVA and jobs as a basis for measuring economic impact gives equal weight to all types of economic activity regardless of their wider value to society. This means that they cannot reflect the fact that research activity may create different types of value including social, health and environmental value, as well as economic benefits.

In addition, it is not possible to quantify all the benefits of the Hutton due to a lack of available data. This includes the economic impact Hutton has at a global level. Hutton has many international projects, some of which are described in the report, and many international collaborators (see Figure 2-2). is important to note, therefore, that what *can* be counted is only part of the Hutton's overall economic impact, and as such, there will be significant unquantifiable economic contributions associated with the Hutton.

It is therefore essential that the economic contribution of the Hutton be understood as part of this wider context.

Figure 2-2 Hutton Global Collaborators

Source: James Hutton Institute

3. Knowledge Transfer

The Hutton supports the transfer of research and knowledge throughout the economy, through its research partnerships with businesses, the analytical services it provides and the training it offers postgraduates.

The world-leading research undertaken at the Hutton forms the basis of its knowledge transfer activities, which include:

- contract research and consultancy – research projects designed to meet the specific research needs of businesses;
- collaborative research – research in partnership with InnovateUK and businesses; and
- postgraduate training – equipping the next generation of researchers with the skills to transform future research.

By working with businesses and supporting the development of postgraduates in this way, the Hutton ensures its research and knowledge supports innovation and productivity, enabling the companies it works with to generate impact.

3.1 Commercial Research Services

The Hutton generates economic value by providing contract research, consultancy to businesses and collaborative research with industry.

The Hutton is one of Scottish Government's Main Research Providers on a wide range of topics including peatland restoration, biodiversity, climate change, water and plant health. The Hutton carries out research for the Scottish Government as part of its Strategic Research Programme that aims to ensure that Scotland maintains its position at the cutting edge of advances in land-use, agriculture, natural resources and the environment. Impacts contribute to both society and the economy, and help to enhance Scotland's global research reputation. This research programme has helped the Hutton expand its work with the private sector, enabling it to use public research funding to effectively leverage in private sector investment.

Research and development projects paid for by industry can have an impact on the economy when they lead to an increase in the productivity of staff employed by the company, enable the company to offer a new product or service that supports growth, or allow them to improve an existing product or service. For example, the Hutton's work with Diageo, a major whisky producer, has supported the company's

ability to reduce scope 3 emissions[3] by investigating how regenerative farming practices can improve soil structure, biological activity and water retention rate.

3.1.1 Quantifying the Impact of Commercial Research Services

To quantify the impact of the Hutton's research and consultancy, it was necessary to estimate what this value would be to a company based on typical returns from these types of collaborations.

BiGGAR Economics undertook an evaluation of Interface, the agency responsible for brokering relationships between business (and other organisations) and universities in Scotland.[4] The connections that Interface has made have covered a range of different types of engagement from small consultancy projects and access to university equipment and facilities through to company sponsored PhDs. BiGGAR Economics' evaluation found the costs to Interface's clients of participating was £12.9 million and the direct benefit to these organisations was £46.4 million GVA. Therefore, the direct return to investment was 360%, meaning that for every £1 invested by business, £3.60 GVA was generated in direct economic benefits.

This finding is similar to conclusions drawn by other studies in comparable areas. A study for the Department of Business, Enterprise and Regulatory Reform[5] considered the impact of Regional Development Agency spending. One aspect considered in this report was the GVA returns to business development and competitiveness investments between 2002 and 2007. It found that investments in Science, R&D and innovation infrastructure had achieved cumulative GVA equivalent to 340% of the cost of the projects and that this could increase to 870% if the long-term benefits were considered. This suggests that the 360% multiplier estimated by BiGGAR Economics could be conservative.

3.1.2 The Economic Impact of Commercial Research Services

In 2023/24, the base year for the analysis, Hutton received £2.6 million in income from commercial contract research and consultancy, nearly a three fold increase since the last study was completed in 2016. Of this, £2.2 million was received by the Invergowrie campus and £0.4 million was received by the Craigiebuckler campus. It also received £1.9 million through Innovate UK for collaborative research.

The GVA impact of business collaboration activities at the Hutton were therefore estimated by multiplying the amount spent by businesses on these services (i.e. the income to the Institute from contract research, consultancy and collaborative research) by the 360% multiplier. The geographic split of the companies that engage with the Hutton was estimated based on data provided by the Hutton. This indicated that 89% of clients were based in the UK, with 33% of clients located in Scotland.

[3] indirect greenhouse gas emissions that occur in a company's value chain.
[4] BiGGAR Economics (2013), Evaluation of Interface, the knowledge connection for industry.
[5] PriceWaterhouseCoopers, Impact of RDA spending – National report – Volume 1 – Main Report, March 2009, DBERR.

It was therefore estimated that the Hutton's research and consultancy generated £21.1 million GVA for the UK economy and supported 55 jobs, of which £5.0 million GVA and 10 jobs were in Scotland.

3.2 Product Development

As well as offering services to businesses, the Hutton has also been directly involved in the development of a small number of commercial products. One of these is the Theta probe, a device for measuring soil moisture that is used widely by the scientific community and various industrial users.

The probe has applications in several sectors. It can for example be used to improve the efficiency of irrigation systems as well as forecasting potential droughts and floods, allowing a harvest to be collected at the most efficient time possible. It is also used in sports and at major national and international sporting venues for football, cricket and golf to ensure the ground is soft enough and does not infringe safety limits for protecting sports men and women.

The Theta Probe is a niche product, so sales and direct economic impact are relatively small. However, the potential value of the device for individual users and preventative spend from not wasting water and ensuring safety could be substantial. By enabling users to predict floods or droughts more effectively for example the probe could potentially have enabled users to save a valuable crop or safeguard a much-prized sports people.

3.3 Analytical Services

The Hutton also provides a range of commercial services, supporting research, industry and environmental management. It delivers analytical services across a range of production systems and ecosystems including water testing, microbiology, isotope analysis and soil analysis. The impact of this work generates economic impact when the research is adopted and applied, enabling clients and partners to deliver their own projects or operate more effectively.

For example, the potato industry in Scotland is a vital part of the agricultural economy, employing over 2,000 people and generating approximately £250 million in value[6]. With 85kg consumed on average per person annually in the UK, potatoes are also the UK's most economically sustainable staple food crop in terms of both water usage and greenhouse gas emissions.

However, this industry faces a growing threat from potato cyst nematode (PCN), a pest that has already infested over 15% of land suitable for potato production. PCN is spreading at an estimated 5% per year and has the potential to render large areas

of land unsuitable for production. Without intervention, seed potato production in Scotland could become unviable by 2050[6].

The Hutton, alongside SASA (Science and Advice for Scottish Agriculture), performs all official soil testing in Scotland to determine whether land is suitable for seed potato production. Only land certified as PCN-free can be used to grow seed potatoes. As such, the Hutton's analytical work is not merely advisory, it is a necessary condition for any seed potato production to occur. The Hutton's work in soil analysis, mapping, and monitoring is critical to safeguarding the entire sector. The quantifiable impact of this work is estimated in Chapter 4.

The Hutton's analytical work is used to support a wide range of sectors and this diversity of activity makes it challenging to quantify the impact of this area of work. However, a sense of the types of impact it helps to generate can be gleaned from considering the Hutton's work on soil forensics.

3.3.1 Soil Forensics

The Hutton hosts the world-leading Centre for Forensic Soil Science, which specialises in the analysis of soils and various ecological and environmental materials. The centre's expertise is utilised across the criminal justice systems both civil, criminal, and environmental, offering support in investigations, advice and providing expert witness testimony in court. The forensic analysis plays a crucial role in providing information in intelligence-led investigations and in offering advice and evidence for civil, environmental, wildlife and criminal cases.

The economic value of this activity is difficult to quantify, but the wider societal benefits are likely to be substantial.

3.4 Capacity Building – Graduates

The skills and training that a student acquires at the Institute are applicable across many sectors and specialisms and are particularly relevant to the vulnerable skills and capabilities that have been identified by a recent review conducted by the Biotechnology and Biological Sciences Research Council[7]. The BBSRC found that there were significant skills shortages and sustainability issues across the life sciences sector. In particular, those needed to transform food systems and health such as genetic epidemiology, single cell genomics, agriculture and food security.

The postgraduate students of the Hutton gain skills during their time at the Institute and thus have a greater capability to increase the value and productivity of the organisations that they work in, both in academia and industry. For example, the Social Science Graduate Research Associate Scheme, a 6 month scheme matching graduates with applied research, helps graduates into employment, and the Hydro Nations Scholars Programme cultivates experts in the water industries.

[6] Plant Health Centre (2022). Potato Cyst Nematode (PCN) and the future of potato production in Scotland
[7] BBSRC (2017), BBSRC and MRC Review of Vulnerable Skills and Capabilities

Hydro Nation Scholars Programme

The Hydro Nation Scholars Programme (HNSP) has supported 50 PhD students, enabling students to work with industry and preparing students for future work post-graduation.

Founded in 2013, Hydro Nation International Centre is a virtual centre coordinating and amplifying the impact of a range of waters-related initiatives and groupings Operating under the direction of the Hutton, it plays a pivotal role in advancing Scotland's leadership in sustainable water management, both nationally and internationally. By bridging the gap between academic research, policy development, and industry practices, the programme has cultivated a generation of experts whose work continues to shape national and international water strategies.

Hydro Nation has supported 50 PhD students, giving alumni the experience of undertaking advanced cutting-edge water research, influencing policy reforms, improving institutional practices, and contributing to environmental stewardship.

PhD students gain experience in areas which are a growing concern for industry. This includes the resilience of water supplies for the whisky industry - with water scarcity and water temperature expected to increase with negative effects on the distilling process. PhD students directly contributed to the delivery of environmentally sustainable solutions at Chivas Brothers' Speyside distillery to address such issues, preventing the future closure of the distillery during dry periods and ultimately enabling the industry to meet international demand.

Similarly the Hutton's collaborative training partnership BARIToNE matches PhD students with research required by industry.

BARIToNE

A collaborative training partnership led by the Scotch Whisky Research Institute. It supports PhD researchers to carry out cutting-edge research driven by industry needs.

The principal focus is driving down the environmental footprint of primary production while maintaining a sustainable supply of high-quality barley. The research brings together overlapping themes of climate resilience, reducing inputs, and healthy soils.

The Hutton is one of the lead academic institutions in the Partnership which comprises 18 industrial and 7 academic collaborating partners. All participants endeavour for their products to be carbon neutral and support initiatives that reduce environmental impacts across all sectors of the supply and value chain. Its direct relevance to industry quickly transfers research into economic potential.

Now on its 4th cohort the partnership aims to support 42 PhD students over 7 years.

Impact

- Research delivered directly to commercial use;
- highly trained scientists with diverse skillsets and knowledge of the whole barley supply chain; and
- helps maintain barley value chain

3.4.1 Quantifying the Impact of Graduate Training

Graduate premium calculations typically consider the benefits to a prospective student from completing a degree, net of any additional taxes that they would pay and the real and opportunity costs of completing the degree. For postgraduate students, the opportunity costs of a year of full-time education are higher than that of an undergraduate student because they would be able to earn more in the labour market with an undergraduate degree, compared to someone with no University

education. As a result, the latest analysis for the returns to postgraduate education[8] estimate a very low individual benefit for prospective students. This analysis, while useful, does not capture the full benefit to the economy of postgraduate education at the Hutton.

The organisations who employ these graduates will benefit from their additional productivity regardless of who has invested in their education. This benefit will be expressed in the higher staff costs that are paid to those with postgraduate education and the additional profits that companies will be able to make through the application of their skills. The Hutton's graduates go on to work across the professional, scientific and technical services sectors, for example to the genomics industry.

A study by Paramount Recruitment[9] found that levels of pay in the industrial and academic elements of the genomics industry broadly paid similar levels. It also found that the starting salary for a graduate with a PhD was around £5,000 higher than an entry level graduate position. This would be equivalent to approximately £101,000 over the working lifetime of the PhD student.[10]

This assessment considers the impact of the graduates who were awarded their degrees in the 2023/24 academic year. Therefore, the graduate premium was applied to the 15 the Hutton's graduates in 2023/24. Data provided by the Hutton indicates that 100% of graduates remain in the UK after graduating, of whom around 60% remain in Scotland, with 33% of students working in the Aberdeen City Region and 13% working in the Dundee City Region. This was applied to the estimated graduate to attribute the impact by study area of the 2023/24 cohort of graduates.

It was therefore estimated that the skilled workforce that graduated from the Institute in 2023/24 will contribute £1.5 million to the UK economy, of which £0.9 million is likely to be retained in Scotland, and £0.7 million will be in the Local Areas of Aberdeen City Region and Dundee City Region.

3.5 Knowledge Transfer Summary

In 2023/24, the innovation support and knowledge transfer impacts of the Hutton contributed £22.6 million GVA and 55 jobs to the UK economy, of which £5.9 million GVA and 10 jobs were in Scotland.

[8] IFS (2020), The earnings returns to postgraduate degrees in the UK: Research Report
[9] Paramount Recruitment (2020) Genomics Salary and Workforce Insight Survey Report 2020
[10] This figure is discounted in line with Green book guidance and assumes that the PhD graduate works for an average of 35 years after graduating

Table 3-1 Summary of Innovation and Knowledge Transfer Impacts

	Local Areas	Scotland	UK
GVA (£m)			
Contract Research and Consultancy	-	£1.3	£5.5
Collaborative Research (through Innovate UK)	-	£3.7	£15.5
Graduate Premium	£0.7	£0.9	£1.5
Total GVA	**£0.7**	**£5.9**	**£22.6**
Employment			
Contract Research and Consultancy	-	5	15
Collaborative Research (through Innovate UK)	-	10	40
Total Employment	**-**	**10**	**55**

Source: BiGGAR Economics Analysis. Note: Totals may not sum due to rounding.

The Hutton is unusual in that its close associations with industry enable it to close the gap to impact particularly in the production of food and drink.

4. Food and Drink Production

The Hutton is a global leader in crop research, particularly in relation to barley, potatoes and soft fruit. Its work in these areas has global impact and underpins several important segments of the UK's agri-food economy. This chapter examines the economic impact of this.

Between 1950 and 1987, the space of just one generation, the human population of planet earth doubled from 2.5 to 5 billion people. This unprecedented population explosion created huge challenges around food security that demanded massive worldwide improvements in agricultural productivity. Research institutes like the Hutton were at the forefront of responding to this challenge and are responsible for many innovations that mean the world now produces enough food to feed everyone.

The roots of the Hutton's contribution to global agricultural productivity date back to the Scottish Plant Breeding Station, which was established near Edinburgh in the 1920s to help improve UK agricultural productivity and efficiency, and the Scottish Horticultural Research Institute, which was established near Dundee in the early 1950s to investigate horticultural production challenges. The two institutes merged in 1981 to become the Scottish Crop Research Institute and became part of the Hutton in 2011, following a merger with the Macaulay Land Use Research Institute (see Figure 1-1).

By the time of the merger the Scottish Crop Research Institute was a world leading authority on crop research and breeding, particularly in relation to soft fruit, potatoes and barley. Since the merger, the Hutton has continued to build on its historic strengths, while exploiting synergies with new areas of expertise in land use research. Today it remains a leading player in global agricultural productivity.

The Hutton contributes to agricultural productivity in multiple ways. This chapter quantifies the current economic impact of this contribution. However, it is important to emphasise that this contribution is underpinned by decades of institutional knowledge and experience, globally important collections of genetic resources and specialist research and demonstration facilities that could not easily be replicated elsewhere. This pedigree is reflected in the scale of the impacts considered.

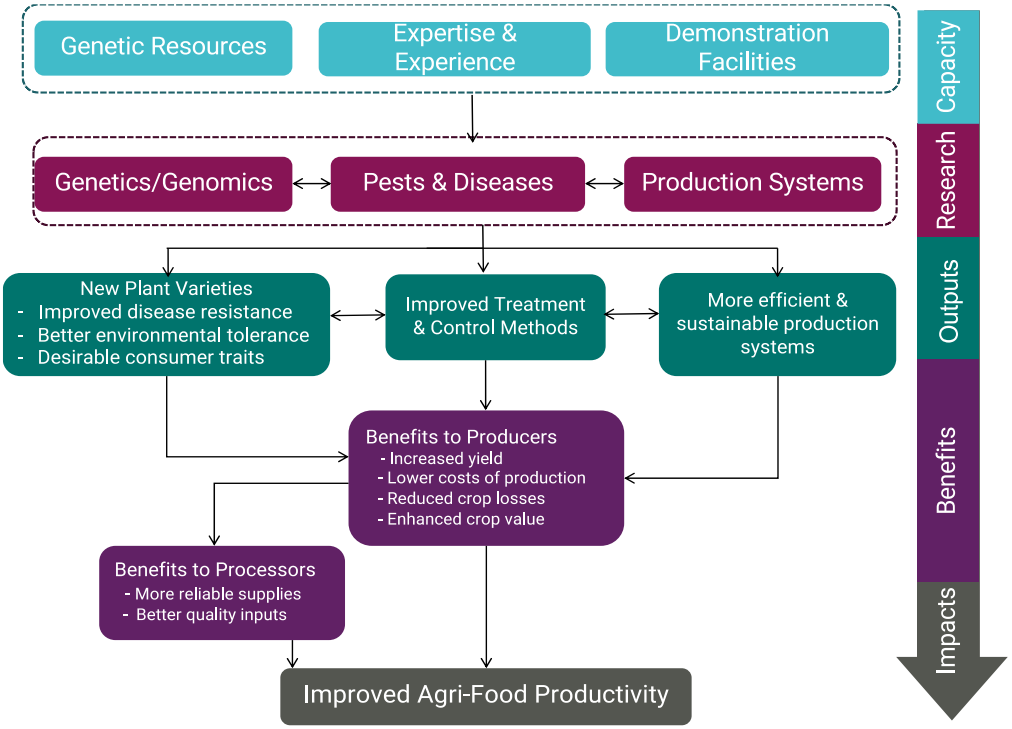
4.1 Pathways to Impact

There are three main pathways through which research undertaken at the Hutton has helped, and continues to help, improve agricultural productivity:

- **Genetic research** undertaken at the Hutton helps improve agricultural productivity by enabling new and/or improved plant varieties to be developed that produce greater or more reliable yields that are more resistant to disease or exhibit characteristics such as improved taste, texture nutritive values and appearance, which are desirable to consumers;
- Scientists at the Hutton also undertake a variety of research into **plant pests and diseases** that helps improve agricultural productivity by supporting the development of more effective treatment and control strategies; and
- Research into **production and storage systems**, which can help increase yield, make agriculture less resource intensive and more economically, socially and environmentally sustainable.

These areas of activity all help bring about improvements in agricultural productivity. The impact of this is felt first by primary producers - the farmers and growers who produce crops – who benefit from higher crop yield, reduced crop losses, enhanced crop value and/or lower production costs. Some of these benefits are then passed on to secondary food processors that rely on these crops as inputs to their own production processes, before being passed on to consumers in the form of lower prices, higher quality and greater availability.

Figure 4-1 Contributions to Agricultural Productivity



Source: BiGGAR Economics

The economic impact of the Hutton's work on plant breeding and genetics is manifested in two main ways. Firstly, by undertaking commercial research to help plant breeders and other research partners improve the crop varieties they use in their production process, and secondly by undertaking in-house research and

development to produce new plant varieties that can then be marketed and sold directly by the Hutton.

The impact of commercial research undertaken by the Hutton was considered in chapter 3.1, but this impact only included benefits to the businesses that funded the research and not the wider spill-over effects associated with this. To gain a full understanding of the impact of the Hutton it is important these wider spillover effects are captured. One of the most important examples of this is the Hutton's work on barley breeding.

4.2 Genetic Research: Barley

Scientists at the Hutton (and its predecessors) have been involved with barley breeding for decades, working closely with seed developers to develop new varieties of barley that have delivered significant improvement in yield and other economically important characteristics. These improvements have enabled farmers in the UK to increase the average yield of barley by around a third from 4.8 tonnes/hectare in the mid-1980s to 6.3 tonnes/hectare in 2023[11].

Improvements in genetics and genomic research are rapidly assimilated by breeders around the world and advances developed by scientists at the Hutton are now regularly used elsewhere in Europe and increasingly around the world. The effect of this is apparent in European barley yields, which increased by around 12% between 2000 and 2023[12]. Genetic research and plant breeding undertaken by the Hutton has played a major role in this.

4.2.1 Quantifying Improvements in Barley Yield

In 2024 1.1 million hectares of arable land in the UK were used to produce 6,963 million tonnes of barley worth £1,351 million[10]. Had the average yield of barley in 2023 been the same as it was in the mid-1980s then this land could have produced around 5.5 million tonnes, worth around £1,082 million in 2023 prices, £269 million less than the actual value realised.

More than 90% of the yield gains in major crops over the past 30 years have been due to plant breeding innovation[13]. These gains are largely the result of advances in genetic selection and agronomy, with around 90% attributable to genetic improvement and the remainder to advances in agronomy. The Hutton contributes to both.

[11] Department for Environment, Food and Rural Affairs (2025)
[12] Eurostat (2025) https://ec.europa.eu/eurostat/databrowser/view/APRO_CPSH1__custom_15580858/default/table?lang=en&page=time:2023
[13] BSPB (2014), Plant breeding matters: the business and science of crop improvement

It was estimated that around 11% of genetic improvements in barley since the mid-1980s can be attributed to the Hutton[14]. This assumption takes account of the role of genetic and agronomic research to improvements in productivity and the relative importance of the Hutton to the research base. It is based on both primary research (consultations) undertaken to inform this study and the previous study, and the wider agricultural productivity research literature. By applying this assumption to the total value of barley production, it was estimated that around £31.7 million of the value of the UK barley crop in 2023 could be attributed to the Hutton.

The value of this impact in Scotland and the UK was estimated based on the volume of barley produced in each of each study area in 2023 and is summarised in Table 4-1.

As this impact relates to the productivity of the agricultural sector it was assumed that any employment effect would be minimal.

Table 4-1 The Hutton's Contribution to Barley Yield

	Scotland	UK
GVA (£m)	8.9	31.7

Source: BiGGAR Economics Analysis.

4.2.2 International Contribution to Barley

The Hutton's barley research has also made an important contribution to yield improvements in European barley production. Between 2000 and 2023, average yields increased from 4.1 to 4.9 tonnes per hectare. In 2023, total European barley production was around 47.4 million tonnes. Had yields remained at 2000 levels, production on the same area would have amounted to just 42.5 million tonnes, indicating that around 4.9 million additional tonnes of barley were produced due to yield improvements.

Using the same approach described above, this suggests the Hutton research can be linked to approximately 0.6 million tonnes of this increase. By applying UK farm gate values of barley, it is possible to derive an indicative value of this production of around £112 million.

Research undertaken at the Hutton will also have helped increase the yield and resilience of other crops, particularly soft fruit and potatoes. The economic value of this work is reflected in the economic impacts quantified elsewhere in this chapter.

[14] Due to limitations in data availability this impact relates only to improvements realised since the 1980s, however the Hutton and its predecessors has been involved in barley breeding since at least the 1950s so this could be an underestimate.

4.2.3 The Importance of Landrace Varieties

Bere is an ancient barley landrace that was widely grown in northern Britain until 100 years ago. Its ability to grow on poor soils, under challenging climatic conditions made it a valuable staple in Scotland. There has been renewed interest it in recent years as a valuable heritage crop as well as a source of genetic diversity for breeding programmes aimed at sustainable production in a changing environment. Old varieties can be crossed with modern cultivars in breeding programs to produce new varieties that combine yield with enhanced resilience to climate extremes such as droughts, floods, or heatwaves.

Bere barley has very local value chains such as brewing and baking traditional bannocks. The Hutton is running a citizen science project with a network of approximately 20 people growing bere barley in trial sites Scotland, Ireland, England and also in Patagonia where climate and soils are like Scotland. Farmers who use traditional varieties often experience more stable yields because these crops have evolved over centuries to cope with local stresses. This local adaptation provides a critical asset for maintaining food security in vulnerable regions.

4.3 Crop Breeding: Hutton Varieties

The development of new crop varieties typically begins with researchers at the Hutton working in partnership with commercial seed developers. Their aim is to produce varieties that offer improved yield and meet specific performance needs. Once developed, these varieties are distributed by seed companies to growers, who use them to produce higher-value crops. These crops then enter the supply chain, either reaching consumers through retailers or being used as ingredients in processed food products.

Internationally the intellectual property rights of plant breeders are protected through a system called Plant Variety Rights (PVR). To qualify for PVR, a new variety must undergo official tests to determine whether it is distinct, uniform and stable. Once these rights have been established, the plant breeders can collect royalties on the production and sale of seed/plants of their protected varieties. PVR income therefore directly reflects the volume of protected varieties grown around the world and can be used to assess the value that the Hutton generates through protected varieties.

Data provided by the Hutton for this study suggests the total market value of the Hutton varieties in 2024 was around £37.4 million. This estimate is derived from the production value of plants sold across Scotland and elsewhere in the UK.

Table 4-2 Value of Hutton Varieties (£m)

	Scotland	UK
Raspberries	7.0	10.4
Blackberries	0.0	0.1
Blackcurrants	0.3	24.9
Swedes	0.1	0.2
Kale	0.1	0.1
Forage Rape	0.2	0.3
Turnip	0.0	0.0
Potatoes	1.4	1.4
Total	**9.0**	**37.4**

Source: James Hutton Institute

However, establishing the sales value of Hutton varieties is only the starting point for assessing the economic contribution of this area of activity. It would be unreasonable to attribute the full value to the Hutton alone, as this would overlook the investment and contributions of growers and others involved throughout the supply chain. It would also disregard the availability of alternative varieties that growers could select if the Hutton varieties did not exist.

Growers choose the Hutton varieties because they expect them to offer some form of advantage over other available options, for example, better suitability to local weather conditions, improved taste or texture, more consistent yields, greater disease resistance, or suitability for particular crop rotation strategies. In the absence of Hutton varieties, it is reasonable to expect that the economic performance of some growers would be lower than it otherwise might be.

Since the Hutton varieties are often bred specifically for Scottish and UK growing conditions, it is likely that, were they not available, a portion of the fresh market crop currently grown domestically would be replaced by varieties imported from overseas. While this would not reduce the size of the UK market it would reduce the economic contribution that the market makes to the UK economy.

An important component of the sales value of Hutton varieties outlined above relates to potatoes. These sales largely relate to seed potatoes, which are predominantly grown in Scotland. The Hutton's contribution to Scotland's seed potato industry is considered separately in Section 4.4.1 of this report so the impact arising from the sale of Hutton potato varieties is omitted here to avoid double counting. Likewise, almost all blackcurrants grown in the UK are used in the production of Ribena. The Hutton's contribution to Ribena is considered in section 4.5.1 so the impact of sales of the Hutton variety blackcurrants is also omitted to avoid double counting.

4.3.1 Quantifying the Impact of Hutton Varieties

To estimate the economic contribution of Hutton plant varieties, it was necessary to assess the extent to which each variety offers a distinctive Unique Selling Point (USP) compared to other available options. This was done using a scoring system, where each variety was rated on a scale from 1 to 5, where:

- a score of 5 indicated a variety with a completely unique market proposition
- a score of 1 indicated a variety for which a number of similar alternatives exist

Following this, an attribution rate was applied to reflect the proportion of each variety's market value that could reasonably be attributed to the Institute. The attribution rates ranged from 20% for varieties scoring 1, increasing incrementally up to 100% for varieties scoring 5.

By applying these attribution rates to the estimated market value of each Hutton variety, it was possible to estimate that the total sales value of crops attributable to the Hutton in 2024 was approximately £45.0 million.

On this basis, the Hutton's contribution to the Scottish economy in 2024 was estimated at £1.6 million in GVA, supporting around 35 jobs. This reflects the cumulative impact of the Hutton's ongoing and historic work in plant breeding. At the UK level, the estimated contribution was £2.4 million GVA, supporting up to 140 jobs.

Table 4-3 Impact of Hutton Varieties

	Scotland	UK
GVA (£m)	1.6	2.4
Employment	35	140

Source: BiGGAR Economics Analysis.

4.3.2 International Contribution

Although Hutton varieties are primarily developed for Scottish and UK growing conditions, they are also cultivated internationally.

Table 4-4 presents Hutton varieties that were sold internationally in 2024. To provide an indicative estimate of their value, UK prices were applied to the reported production volumes. On this basis, the value of Hutton varieties grown and sold across Europe and beyond in 2024 was estimated at £93.4 million. The main varieties contributing to this figure were raspberries (£42 million) and blackberries (£39.5 million). These figures highlight the international reach of the Hutton's research and breeding programmes, underscoring their role in supporting global food supply chains and enhancing food security.

Table 4-4 Value of Hutton Varieties sold Abroad

Hutton Varieties	Kg Sold	UK Value Per Kg (£)	Total (£m)
Raspberries	3,468,500	12	41.6
Blackberries	2,468,500	16	39.5
Blackcurrants	5,524,500	2	12.2
Swedes	400	56	0.0
Kale	1,100	14	0.0
Forage Rape	12,200	3	0.0
Turnip	400	9	0.0
Total	**-**	**-**	**93.4**

Source: James Hutton Institute

4.4 Pests and Diseases

Pests and diseases can cause major reductions in crop yields if uncontrolled and efforts to control potentially damaging pests and diseases through pesticides and other interventions can be both costly and environmentally harmful. By seeking to better understand such pests and diseases, researchers at the Hutton aim to develop novel and sustainable strategies to manage or counter these threats. Implementation of these strategies can help to reduce the economic costs of pests and diseases and improve agricultural productivity.

An important focus for the Hutton's work on pests and diseases is late blight, the disease that caused the infamous Irish potato famine in the 19th century. A case study of this work and the contribution it makes to UK agricultural productivity is provided below.

The Fight Against Blight

The Hutton coordinates UK wide surveillance to detect and respond to one of the most persistent and costly diseases affecting potato crops.

Late blight is one of the most persistent and costly threats to the potato sector. A major challenge in managing the disease is the organism's ability to evolve. Strains can vary over time and between regions, so there is a need for control strategies to

continually adapt to keep pace. This presents a constant risk to growers, who rely on timely, evidence-based guidance to manage outbreaks effectively.

To help industry manage this risk, the Hutton coordinates the UK wide late blight monitoring and surveillance programme. As part of this work, infected plant samples collected by field scouts are analysed by the Hutton researchers to identify the specific strain of blight present. This ongoing surveillance allows the industry to detect the emergence of new strains early and adapt its control strategies accordingly.

The information provided by the Hutton enables growers to make informed decisions about the timing and intensity of blight control measures. This may include starting fungicide programmes earlier, reducing intervals between applications, selecting more effective fungicides, or choosing potato varieties with greater resistance. In years when blight poses a serious threat, such guidance helps reduce crop losses. In years when the risk is lower, it allows growers to avoid unnecessary chemical use and reduce input costs.

Impact

- In 2023, the value of potato production in the UK was £1 billion[15].
- Without the Hutton's monitoring and advisory work, it is estimated losses to blight would have been at least 7% higher.
- This implies the Hutton helps industry avoid approximately £4.5 million in losses each year (including around £0.5 million in Scotland).

4.4.1 Safeguarding Scottish Agriculture

In 2018 the Hutton's reputation in crop pest and disease research was an important factor in the Scottish Government's decision to invite the institute to lead its new Plant Health Centre. The virtual centre of excellence was established to provide scientific evidence to support policy decisions about pests and pathogens that threaten Scottish forestry, horticulture, agriculture and the environment.

The stimulus for establishing the PHC was the publication of the UK plant health strategy. Although this strategy covered the whole of the UK it focused particularly on pests and pathogens considered a risk in England and Wales and there was concern risks that could be particularly important in Scotland could be overlooked. The Hutton's reputation and established capacity for undertaking impactful research in this area was therefore instrumental in ensuring the interests of Scottish agricultural producers, and the consumers who rely on them, are properly protected.

One of the most important threats identified by the centre to date is the growing threat of potato cyst nematodes.

[15] Department for Environment, Food and Rural Affairs (2025)

Seed Potatoes

The Hutton undertakes vital work that underpins the existence of Scotland's seed potato industry.

The potato cyst nematode (PCN), a species of tiny roundworms, is one of the most important threats currently facing the UK potato industry. When land infected by PCN is used for growing potatoes yield can be reduced by around 35%. Studies show that around 15% of land suitable for potato growing in the UK is already infested by PCN and it is estimated infestation is spreading at the rate of around 5%/year.

Ongoing research efforts, including those undertaken by the Hutton, play an important role in limiting the spread of PCN. Consultations undertaken to support this study suggest these collective efforts may be helping to slow the rate of increase in PCN infestation by up to 10% per year. As one of the most influential research institutes working in this area, a high proportion of this impact can be attributed to the Hutton.

It is likely the impact of PCN infestation on consumers would be mitigated through the substitution of PCN resistant potato varieties but because these would need to be imported, this would result in a loss to the UK economy. Using the figures presented above it was estimated this loss could around £1.2 million per year.

However, this impact overlooks the much larger impact that PCN could have on the seed potato industry, three quarters of which is based in Scotland.

4.4.2 Underpinning the Seed Potato Industry

It is estimated that seed potato production contributes around £26.2 million GVA/year to the Scottish economy and supports around 478 jobs[16]. The Scottish sector also accounts for around three quarters of UK seed potato production, making it critically important to UK potato production. Through its work the Hutton plays a vital role in underpinning the survival of the sector.

The success of Scotland's seed potato industry is wholly dependent on the country's reputation for producing high health plants.

Land infested by PCN is unsuitable for seed potato production. To maintain quality standards, Seed potato producers are therefore required to test their land regularly to

[16] Thomson S (2024), The Estimated Economic Contribution of Scotland's Seed and Ware Potato Sectors.

assure buyers it is free from infestation. This testing is undertaken by the Hutton, making the institute a vital part of the infrastructure needed to sustain the industry.

If left unchecked PCN could render large areas of land unsuitable for production such that seed potato production could become unviable in Scotland by 2050[3]. By leading the fight against the spread of PCN, the Hutton is therefore also playing a vital role in safeguarding the future of this distinctive part of Scottish agriculture.

In addition, a substantial proportion of the potatoes grown by the Scottish seed potato industry are Hutton varieties. If these varieties did not exist, potato growers in Scotland and most of the rest of the UK would be dependent on imported seed.

For these reasons it would not be an exaggeration to claim that Scotland's entire seed potato industry could not exist without the research and scientific services provided by the Hutton. However, to make such a claim would be to ignore the critical role of the advice provided by the Scottish Government agency, Science and Advice for Scottish Acricluture (SASA) and the important contribution of growers. To capture the important role the Institute plays in sustaining this sector, it is therefore reasonable to attribute (at least) 50% of the economic value of the sector to the institute. This amounts to a contribution of £13.1 million GVA/year to the Scottish economy and around 240 jobs.

4.5 Processor Benefits

The immediate results of the Hutton's work to support agricultural productivity are felt by primary producers, the farmers and growers who produce crops that embody research undertaken by the institute. However, these impacts are only first round effects in what can be a much longer supply chain.

Many of the crops the Hutton contributes to ultimately end up as ingredients in more complex consumer products. Regardless of what these products are, value is added at every step in the production process, which means their ultimate economic impact can be many times greater than the farm gate value of crops estimated above.

Some of these products are too distant from the research to enable meaningful quantification. However, there are two that are so closely and inextricably linked to the Hutton that omitting them would underestimate the full impact of the institute.

To avoid this, it is reasonable to include a proportion of the value generated by these products in this assessment. How big a proportion is necessarily a matter of judgement. The evidence underpinning these judgements is presented below.

4.5.1 Ribena

Fruit breeders at the Hutton have been supporting the development of Ribena for at least 35 years. As a result, around 90% of the blackcurrants grown in the UK now end up in Ribena and around three quarters of these are grown from Hutton varieties[17].

Ribena

The Hutton plays a key role in supporting the continued production of one of the UK's best known soft drinks.

Operating for 86 years, the Ribena range is a top 100 UK grocery brand worth £120 million in retail sales.

Maintaining the distinctive flavour and colour consumers associate with Ribena has required careful management of blackcurrant varieties. The original variety used in the soft drink, first developed in the 19th century, remains part of the recipe today alongside new varieties that match the flavour profile of the original but are more robust, higher-yielding, and better adapted to changing environmental conditions.

Brand owner Suntory and the Hutton's scientists collaborate across the entire blackcurrant supply chain to ensure that the blackcurrants contained in Ribena are bred and farmed in a sustainable way and can pass stringent taste tests. Breeding varieties that help farmers adapt to climate change is one of many breakthroughs achieved by Hutton scientists. Others include breeding varieties which produce a higher fruit yield, as well as varieties with improved resistance to common pests.

Despite facing increased competition, Ribena remains a staple in the UK soft drinks market. Suntory relies on a secure and reliable supply of high-quality British blackcurrants to make Ribena. The Hutton plays a critical role in helping farmers to develop a more sustainable livelihood and helping Suntory protect its supply chain.

Recent reports[18] indicate total sales of Ribena in 2023 were around £120 million.

[17] These assumptions are based on consultations undertaken for the previous impact assessment undertaken by BiGGAR Economics for the Hutton in 2016 and previous research on the contribution the institute makes to the production of Ribena undertaken by DTZ.

[18] Paul K (May 2024), https://www.asiantrader.biz/ribenas-bouncing-berries-set-to-return-to-screens

To estimate what proportion of these sales can reasonably be attributed to the Hutton it was first necessary to consider how the economic impact of these sales would change if Hutton varieties were no longer available.

Previous analysis undertaken by BiGGAR Economics[19] suggests that nearly all the blackcurrant varieties used to produce Ribena (95%) are Hutton varieties and that if these varieties were not available, around 44% of Ribena sales could be lost to imported alternatives. This suggests that in 2023, around £50 million of UK Ribena sales were sustained by Hutton variety blackcurrants.

GVA and employment effects associated with this turnover were estimated by applying turnover/GVA and turnover/employee ratios for the soft drinks sector and multiplier effects were captured by applying appropriate multipliers to the direct effect. On this basis, the Hutton's contribution was estimated at £34.0 million in GVA to the UK economy, supporting around 375 jobs.

4.5.2 Whisky[20]

Scotch whisky is an iconic product that makes a major contribution to the Scottish economy. In 2022, the sector generated £7.1 billion in gross value added (GVA) for the UK (including £5.3 billion in Scotland) and supported at least 66,000 jobs across the UK, of which around 41,000 were in Scotland[21].

At its most fundamental level, whisky consists of two basic ingredients: barley and water. Through its genetic research the Hutton makes a significant contribution to the value added by the former, whilst its research on water resource management (see case study below) is becoming increasingly important to the latter. Taken together these areas of work means the Hutton plays an important role in underpinning the continued, long-term productivity and resilience of the sector.

4.5.3 Barley Breeding and Whisky Provenance

One factor that is extremely important to consumers of Scotch whisky is provenance. This means the ability to produce whisky using grain grow in Scotland is an important priority for producers. To do this however, producers require a reliable and consistently high-quality supply of barley, which is challenging given the vagaries of the Scottish climate.

By enabling barley breeders to select cultivars that produce a higher alcohol yield, generate less waste during the production process and are more resilient to climate change, research undertaken at the Institute has therefore played an important role in underpinning the continued success of the sector.

[19] BiGGAR Economics (November 2016), Economic impact of the James Hutton Institute.
[20] The whisky-related economic impacts presented in this report refer solely to the direct GVA and employment generated by whisky production. Supply chain impacts, including those related to barley, were excluded to avoid double counting and overstating the Hutton's contribution to the sector.
[21] Scotch Whisky's Economic Impact 2022 (2024). Scotch Whisky Association.

Genetic research undertaken at the Hutton has also played an important role in safeguarding a substantial proportion of Scotch whisky exports through the work it has done on the development of non-glycosidic nitrile (GN) varieties of barley.

These varieties produce grain that is suitable for distilling but does not release harmful compounds during the process. These compounds have been identified as potentially carcinogenic, and regulations have been introduced in some parts of the world that would have prevented the export of whisky made using these varieties. This research has therefore played an important role in safeguarding sales to important export markets, including the USA, Canada, and Germany.

4.5.4 Water Resource Management

In addition to crop development, the Hutton has also contributed to the sustainability of the industry through work on water resource management. This includes supporting practical, nature-based solutions to help distilleries manage water supply risks during dry periods, ensuring production can be maintained despite changing environmental conditions.

An important focus for much of the research the Hutton undertakes with and for the whisky industry relates to the twin challenges of biodiversity loss and climate change, and how the industry can most effectively respond to this. All consumers, but particularly those of high-end lifestyle products like whisky, are becoming increasingly concerned about the environmental impact of their purchases. For producers, this means the ability to show meaningful steps have been taken to ensure products are produced in an environmentally sustainable way is becoming increasing important.

By working with industry to proactively respond to environmental challenges and ensure production is as sustainable as possible, the Hutton is therefore making an important contribution to safeguarding the ongoing success of one of Scotland's most iconic industries.

4.5.5 Quantifying the Hutton's Contribution to the Whisky Industry

According to HMRC export data, Scotch whisky exports totalled £5.4 billion in 2024. Based on the Hutton's contribution to barley development and industry resilience, it would be reasonable to attribute a small proportion of this impact to the institute. Convention dictates that a 'small' proportion might correspond to around 10%, however, it is likely that some of this contribution has already been captured as part of the barley yield impact described in section 4.2.1 so the more conservative assumption of 5% was adopted instead to avoid any potential double counting.

This assumption is based on the professional judgement and experience of BiGGAR Economics and is grounded in the evidence presented by Hutton researchers during this study. Given the fundamental nature of the work undertaken by the Hutton to support the industry, the institute's extensive experience within this field and the extent of engagement with the sector, this estimate may be conservative.

Applying this assumption to the total value of Scotch whisky exports implies the Hutton helped safeguard approximately £269.9 million in whisky sales in 2024.

Applying standard GVA and employment ratios from the UK input-output tables, this contribution equates to £97.8 million in GVA and around 310 jobs supported in Scotland, and £136.6 million in GVA and 435 jobs supported across the UK.

Table 4-5 Hutton Contribution to Whisky Sales

	Scotland	UK
GVA (£m)	97.8	136.6
Employment	310	435

Source: BiGGAR Economics Analysis.

4.6 Sustainable Production Systems

Another important contribution that the Hutton makes to agricultural productivity is by undertaking research into the factors that determine the productivity of agricultural production systems in Scotland, the UK and elsewhere in the world. This work covers a wide range of research interests ranging from pest management and soil conditions to cropping practice and the interactions between roots and soils. The implications of this work for agricultural productivity are significant.

Underpinning much of this work is the Hutton's expertise on soil. This expertise dates to the 1930's and what was then the Macaulay Institute. In the 1970s the Macaulay Institute developed a land use capability system that allowed soil maps and other landscape and climatic information to be collated into land classification maps. In the early 1980s the system was developed into the Macaulay Land Capability for Agriculture (LCA) classification and in the 1990s into a Land Capability for Forestry map.

The LCA system is now the official agricultural classification system used in Scotland by agriculturalists, planners, estate agents and others as a basis of land valuation. It provides the basis for farmers decisions about land management options, national policy on financial support to agriculture and provides a measure of the value of agricultural land for sale and insurance purposes. It therefore helps underpin the efficient operation of many if not all of Scotland's land-use sectors.

4.7 Summary

Adding together the benefits considered in this section suggests that in 2024 £221.3 million of the GVA and around 1,185 of the jobs supported within the UK food and drink sector could be attributed to the crop, soil, water and land related research undertaken at the Hutton. A breakdown of this impact is provided in Table 4-6 and Table 4-7.

Table 4-6 Summary GVA Contribution to Food Production

	Scotland	UK
GVA (£m)		
Plant Varieties	1.6	2.4
Barley	8.9	31.7
Seed Potatoes	13.1	13.1
Late Blight (Potatoes)	0.5	2.3
PCN (Potatoes)	1.2	1.2
Ribena	-	34.0
Whisky[22]	97.8	136.6
Total GVA	**123.2**	**221.3**

Source: BiGGAR Economics Analysis. Note: Totals may not sum due to rounding.

Table 4-7 Summary Employment Contribution to Food Production

	Scotland	UK
Employment		
Plant Varieties	35	140
Seed Potatoes	240	240
Ribena	-	375
Whisky	310	435
Total Employment	**585**	**1,185**

Source: BiGGAR Economics Analysis. Note: Totals may not sum due to rounding.

In addition to the UK impact presented above, the work discussed in this chapter also has substantial impact overseas. Much of this cannot be quantified but the global value of the Hutton's work to improve barley yield and the sales value of Hutton varieties were estimated at around £205.1 million. Similarly, the research Hutton contributes to the UK potato sector also has global benefits, with potatoes being the third most important global crop, feeding over a billion people worldwide.

This Chapter has discussed the impact the Hutton has on food and drink production and the contribution it makes to world-leading scientific solutions for agribusiness and the sustainable land management. It demonstrates how environmental and societal challenges are embedded in research and explains why the Hutton has been at the forefront of rural, agricultural and environmental science for 100 years.

[22] The whisky-related economic impacts presented in this report refer solely to the direct GVA and employment generated by whisky production. Supply chain impacts, including those related to barley, were excluded to avoid double counting and overstating the Hutton's contribution to the sector.

5. Climate and Biodiversity

Climate change and biodiversity loss threaten natural ecosystems. Adaptation and mitigation are important for the economy as well the overall resilience of communities.

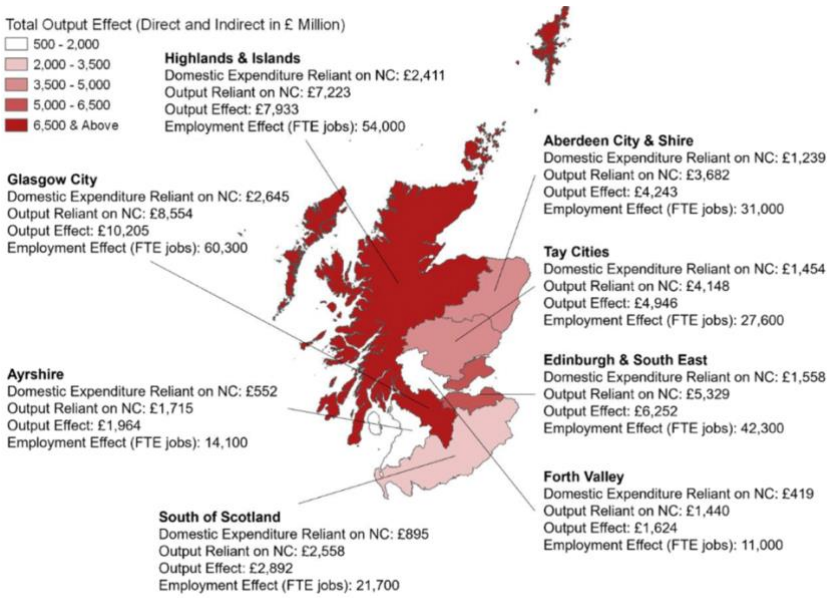
Natural capital and ecosystem services are increasingly viewed in terms of their economic value as they support many livelihoods including agriculture, forestry and fisheries, tourism activities and renewable energy. They also provide health and wellbeing benefits through access to nature. Natural capital refers to the planet's stock of natural resources, like land, water, air, and all living plants. It is the foundation upon which ecosystem services are built, which is all the benefits humans derive from these natural resources. Humans have a clear interest in understanding and managing ecosystems as it is vital for human development and plays a key role in underpinning the economy.

Some accounting systems for natural capital attempt to measure the value of natural capital in terms of its value to society, helping to understand its intrinsic value as an asset that underpins our economy and society. Scottish Government-commissioned research determined the industrial sectors in Scotland that rely on high quality natural capital and quantified the economic value of these nature-dependent sectors at a national and regional geographic level as shown in Figure 5-1.

It was estimated that at least 14.4% of Scotland's total economic output is reliant on natural capital: supporting £40.1 billion of Scotland's total economic output, with around 261,600 jobs estimated to be supported by natural capital[23].

[23] Scottish Government, 2024. Natural Capital – importance to the Scottish economy: research

Figure 5-1 Economic Reliance on Natural Capital



Source: Scottish Government, 2024. Natural Capital – importance to the Scottish economy: research

Climate change threatens natural capital by degrading ecosystems, reducing biodiversity and weakening the ability of the natural environment to provide the resources needed to underpin economic activity. A changing climate therefore alters, directly or indirectly, ecosystem characteristics and the sustainability of life-support services. Similarly, biodiversity loss causes ecosystems to fail, economies to suffer and climate change to worsen. There are important feedback loops between climate change and nature loss, prompting policy makers to refer to “twin crises.” Both result from human activities and both exacerbate the effects of the other.

Whilst much of the Hutton’s research is focused on maintaining natural capital, an important component of its economic impact are the effects it has on helping to mitigate the costs associated with biodiversity loss and climate change.

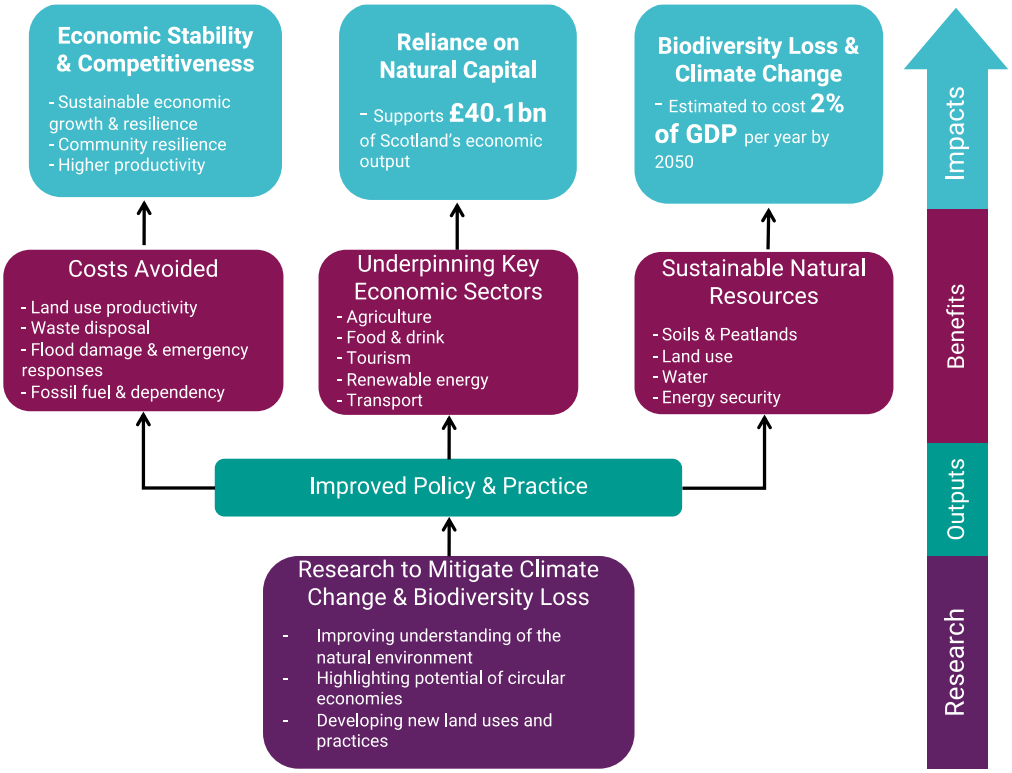
The Scottish Government’s Climate Change Committee estimates that impacts of climate change already cost the Scottish economy billions of pounds per year. Estimates for the economic costs of climate change projected to 2050, range from 1.2% to 1.6% of GDP per year[24] to 3.3% under current policies[25]. Another study estimates damage to the natural environment could lead to a 12% reduction to GDP in the years ahead – larger than the hit to GDP from Covid-19[26].

The Hutton’s intersection of scientific expertise is shaping resilient agricultural practices, preserving biodiversity, protecting and restoring natural habitats and enabling societies to thrive in the face of a changing climate. It is actively

[24] Scottish Government (2024). Climate change: Scottish national adaptation plan 2024-2029
[25] London School of Economics (2022). Grantham Research Institute on Climate Change and the Environment: Policy Brief – What will climate change cost the UK?
[26] Green Finance Institute (2024). Assessing the materiality of nature-related financial risks for the UK

contributing to the Scottish Government's sustainability, environment, biodiversity, climate change and net-zero agendas. The economic value of this is summarised in Figure 5-2 and examples are described in this chapter.

Figure 5-2 Impact of Research to Mitigate Climate Change and Biodiversity Loss



Source: BiGGAR Economics

5.1 Sustainable Production Systems

Agriculture contributes around 18% of Scotland's total greenhouse gas emissions27, making it a significant contributor to climate change. Conversely, it is also one of the sectors worst affected by climate change. Farming and crofting will need to adapt to cope with the consequences of flooding, drought, unseasonable weather, and increased pest and disease risks.

Chapter 4 described how the Hutton supports and enhances the productivity of the agri-food sector through genetic and agronomic improvements. Much of this research involves adapting crops to climate change or mitigating the impact of production on climate change by reducing greenhouse gas emissions and sequestering carbon. This includes developing crops and techniques that:

- improve drought tolerance;
- reduce tillage;

[27] Scottish Government (2024). Greenhouse gas emissions projections: phase 1 and phase 2 modelling results.

- reduce fertiliser requirements;
- reduce pesticide and herbicide applications;
- reduce nitrous oxide emissions; and
- improve soil carbon.

To meet agriculture's emission envelope under the updated Climate Change Plan, agriculture needs to, with urgency, reduce its emissions by around 30% from 2021 levels by 2032[28]. The Hutton's research is reducing the carbon footprint of agriculture and helping the industry contribute towards net zero ambitions. It also enables farmers to adapt and maintain viable agricultural systems benefiting both the rural and wider economy. It sustains value chains (including seed merchants, maltsters and animal production as well as crop production) in the UK and Scotland.

5.1.1 Reducing Carbon Dioxide Emissions

The International Barley Hub is a prime example of a Hutton innovation centre that through its research and application is improving the resilience and sustainability of crop production and mitigating the impacts of climate and environmental change. The International Barley Hub aims to reduce CO2 emissions in barley production by developing more resilient and sustainable barley varieties and growing systems.

In 2022, arable farming in Scotland contributed 20% (or 1.6 MtCO2e) to total agricultural emissions[29]. Around half of the carbon dioxide emissions from Scotland's arable area comes from cropping, which is predominantly spring barley.

The carbon footprint of barley grain is expressed as CO2 equivalent (CO2e) per kilogram of grain. The aim is to reduce CO2e by 10% in the next 10 years in Scotland, i.e. 1% per year. Using an average of 0.45 kg CO2e per kg of grain[30] this 1% reduction is estimated to save £2m in CO2e value across the UK barley agriculture per year.

5.1.2 Crop Mixtures

Maintaining crop production whilst addressing climate and nature crises is a significant area of research for the Hutton. The route to tackling farmland biodiversity loss is often seen as taking land out of cultivation or accepting assumed reductions in the level of productivity from more regenerative agricultural approaches. However the development of crop mixtures offers a potential win-win-win across food security, biodiversity and climate change challenges.

After many years of research in this sector the Hutton is delivering change in production systems through crop mixtures. As described in the case study below, their use has been recognised as important to the future of agriculture in Scotland and was included as a potential measure for agri-environment support. The reduced inputs of herbicides, pesticides and tillage requirements results in biodiversity gains,

[28] Scottish Government (?). Agriculture and climate change

[29] Scottish Government (2024). Scottish agriculture greenhouse gas emissions and nitrogen use: 2022-23

[30] Supply chain reports from zevero suggests 0.59kg CO2e per kg of grain. ADAS Yield Enhancement Network Zero reports 0.263 CO2e per kg in a very high yielding spring barley crop; and spring barley at 0.301 CO2e per kg.

(notably birds) compared with monocultures; and reduced GHG emissions, for farmers and supply chains and contributing to a societal move to net zero.

Crop Mixtures

Crop mixtures provide a potential solution to increasing biodiversity within cropped land, reducing GHG emissions, and maintaining yields.

Crop species mixtures, also known as intercrops, involve the growing together of more than one crop species at the same time and in the same area of land. Although a common practice globally, it fell out of favour in Scotland during the drive to highly mechanised and intensive farming.

Potential benefits from mixed crops include the maintenance of crop yields with reduced inputs such as fertiliser, herbicides and pesticides, and greater resilience to environmental variability such as summer droughts.

Farmers appreciate that it is a less impactful way of farming and its use is now underpinned by agri-environment support payments. A pull from the market is also expected as it helps supply chains reduce their scope 3 emissions - indirect greenhouse gas emissions that occur in a company's value chain. There is likely to be an increase in demand for mixed crops in barley brewing supply chains; farmers will grow more and the market will increase if there is a reliable supply.

Impacts will be realised via

- Biodiversity gains, notably improved bird use compared with monocultures;
- Reduced GHG emissions – for farmers and supply chains and in society's move to net zero; and
- Reduced cost of herbicides, pesticides and tillage requirements.

Another example of how crop production is influencing the carbon footprint of products is a spirit distilled from peas. The pea crop needs no synthetic nitrogen fertiliser to grow, and after five years of research supported by the Hutton, the world's first carbon neutral, climate positive gin Nàdar Gin was created. The benefits are not only in the carbon credentials of the product, the gin has a carbon footprint of -1.54 kg CO2e per 700ml bottle, but in soil quality improvements.

5.1.3 Carbon Capture in Upland Systems

Tree planting and natural regeneration of woodlands is advocated as an important tool in combating climate change. The case study described below explains how the Hutton is influencing land use policy to reduce GHG emissions by providing evidence in the policy debate on addressing climate change through optimum land use practices to sequester carbon.

Upland Land Use: Carbon Capture

Hutton research has found that tree planting and natural regeneration on heather moorlands, with large soil carbon stores, does not necessarily result in net carbon sequestration.

Tree growth sequesters carbon, and in recent years government policy has incentivised woodland expansion to help mitigate climate change and increase biodiversity. However the Hutton has found that planting trees, and even natural regeneration, in the uplands does not always result in net carbon capture compared with maintaining heather ground cover. Woodland expansion may be desirable for biodiversity reasons but this research brings in to question the impact on climate change mitigation. This has important implications for land use policy and the forestry industry as well as carbon credits and land markets.

The Hutton research found that carbon was captured in naturally regenerating trees, but it did not exceed the carbon lost from soils over a 25 year period. The 25-year timescale is significant, given that Scotland has pledged to achieve net zero carbon emissions by 2045, partly by increasing tree cover.

It was found that naturally regenerating trees influence soil processes. Tree litter provides soil organisms with more nutrients which speeds up their respiratory rate. The soil decomposes quicker releasing carbon to the atmosphere.

The Scottish Government has set legally binding targets to reach net zero emissions by 2045 and has policies to incentivise reduction in emissions and carbon capture. The Hutton is helping to ensure that land use aligns effectively with net zero targets, ensuring effective government funding of incentives and best use of natural capital investment.

5.1.4 Circular Economy

Working with Zero Waste Scotland and other stakeholders, the Hutton is simulating future societies and interventions to accelerate the circular economy for individuals, households and communities. The circular economy is not yet fully embedded in society and the Hutton is inspiring behaviour change in the re-use of products and extending the life of products to ultimately reduce waste.

The aim of the circular economy approach is to influence the amount of time products are retained as a productive part of the economy, retaining their value for longer. The approach includes items such as furniture, electronic goods, mattresses and is extending to an increasingly wide range of materials. The main impact is in reducing the volume of waste products and the cost savings in associated transport and landfill.

5.2 Bioinformatics

The Hutton hosts the UK's Crop Diversity HPC (High-Performance Computing) resource, a platform used by a large group of UK scientific institutions for creating better tools and methods for analysing a wide range of issues including crop genetics. It enables researchers and growers to process large amounts of data at once. For example, it can assess large populations of plants efficiently, and identify plants that exhibit stress or suboptimal growth conditions earlier in their development, allowing for timely interventions. The impact is that farmers can contribute to more sustainable agricultural practices and make better informed decisions regarding crop management or reducing inputs like water and fertilizer.

Similarly, the Hutton's BioSS (Biomathematics and Statistics in Scotland) specialises in the development and application of the quantitative methods needed to enhance scientific knowledge and impact. BioSS methodological research is driven by emerging technologies, growth in data and the desire to advance applied science across multiple disciplines including animal health and welfare, plant and crop science, ecology and environment, human health and nutrition. It is also addressing specific critical societal challenges such as analysis of wastewater for public health as explained at section 6.1 and the impact on offshore renewables on marine biodiversity as described in the case study below.

Deployment of Offshore Wind

Balancing the drive to decarbonise with protection of ecosystems - BioSS' offshore renewables group models how globally important populations of seabird and mammals are affected by renewables in the marine environment.

To meet the target for net-zero greenhouse gas emissions by 2050, the UK has a commitment of deliver 50GW of offshore wind by 2030. Each gigawatt of new offshore wind adds £2-3bn of value to the UK economy[31] and with only 14GW currently operational there is a focus on activities that enable rapid deployment. This ambition has been intensified in recent years by energy security concerns and the UK's Energy Act 2023.

BioSS works with ecologists to apply models to data and convert them into software tools that can be used by stakeholders (e.g. government agencies, industry, NGOs) to quantify the likely impacts of proposed wind farms. These models estimate impacts such as displacement of seabirds and population viability assessments for marine mammals. All the tools developed are open source and referenced in Statutory Nature Conservation Bodies guidance for Environmental Impact Assessments (EIAs) as the best tools available.

The tools and software are continually updated and improved based on new research and evidence. New software is currently being developed to help the Marine Directorate assess cumulative impacts.

The Hutton is making it possible to protect globally important seabirds and mammals whilst enabling the deployment of offshore wind to meet climate targets.

[31] Renewable UK 2024 Offshore Wind Industrial Growth Plan

5.3 Community Resilience

The Hutton helps communities adapt to environmental changes and economic uncertainties by developing resilient agricultural and natural systems. Building community resilience is a cross cutting theme across much of the Hutton's work.

5.3.1 Responding to Extreme Events

The threats to communities through climate change are wide ranging, from fire risks and drought as well as flooding. The risk of flooding to people, communities and buildings remains among the most severe risks for Scotland from climate change and is the costliest hazard to businesses. The Hutton's role in the Dynamic Coast project was pivotal in developing adaptive strategies in a changing climate and supported more informed decision-making for coastal management and community resilience. It will provide savings from potential damage to coastal communities and infrastructure; and ensure coastal residents, more vulnerable to the effects of climate change, can be provided with greater assistance.

The Hutton also worked with communities during covid and flooding events to develop appropriate community responses to extreme events. It has developed a Living Labs approach to building community resilience which involves real-life settings and working with communities to co-design, deliver and evaluate interventions. Based on the reputation of this work, the Hutton is influencing policy discussions on community responses to extreme events.

5.4 Summary

This chapter has described some of the ways in which the Hutton is helping to mitigate climate change and reduce biodiversity loss. Where available information has been provided to contextualise the potential scale of these impacts at a national/global level. At the time of writing there was not sufficient information available to enable the specific contribution the Hutton make to realising these impacts to be quantified, but this does not mean these areas of activity will not have economic impacts. The economic effects associated with the activities described in this chapter are likely to include:

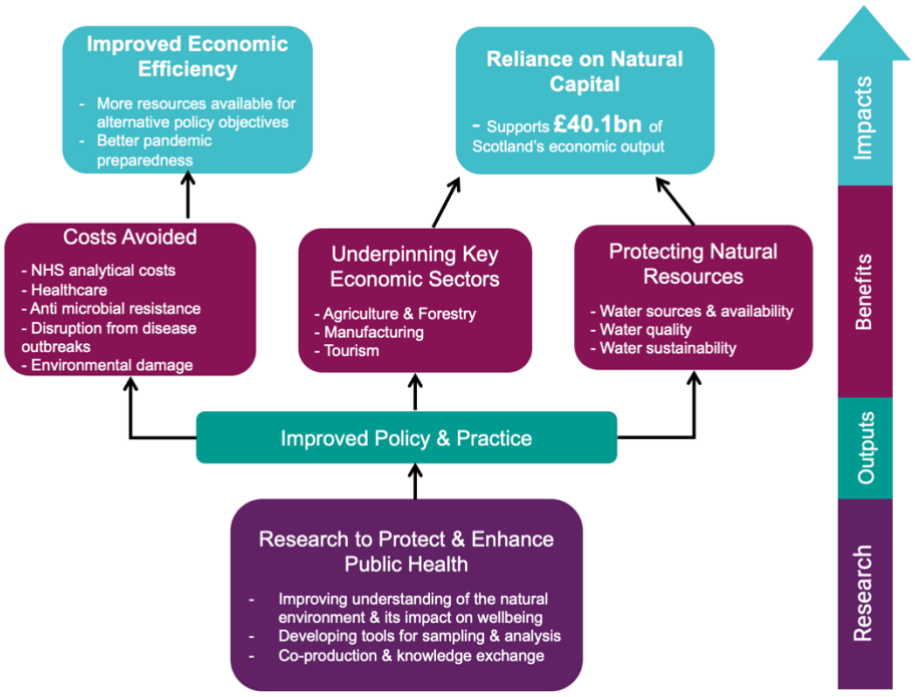
- cost savings to government, public bodies, public services through
  - sustainable management of natural resources,
  - protection from potential coastal damage due to climate change.
- costs savings to individuals and businesses to protection from climate change;
- sustainable production systems and commercial growing opportunities for land managers;
- cost savings throughout value chains due to reduction in GHG emissions/carbon footprint;
- cost savings due to mitigating potential biodiversity loss; and
- cost savings due to mitigating potential climate change.

6. Contributions to Public Health & Wellbeing

The Hutton leverages its scientific expertise and collaborative networks to deliver research that translates directly into a healthier society in Scotland.

Another important issue of increasing importance to the Hutton its contribution to protecting and enhancing public health and wellbeing. As with mitigating climate change and biodiversity loss, the economic impact is via contributing to maintaining natural capital and improving economic efficiency. The economic importance of this is summarised in Figure 6-1 and some examples follow in this chapter.

Figure 6-1: Economic Value of Research to Protect and Enhance Public Health



Source: BiGGAR Economics

6.1 Water Resources

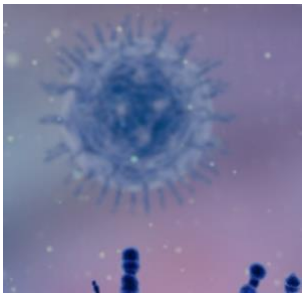
The Scottish Government has funded Centres of Expertise in areas of high policy importance to deliver evidence directly to policy. One of these has been formed by a partnership of the Hutton, Scottish Higher Education Institutes and Research Institutes to create the Centre of Expertise for Waters (CREW). CREW supports the Scottish Government, and delivery partners, by delivering objective and robust research and expert opinion to inform and steer water policy. Water is at the heart of Scottish life - socially, environmentally, and in economic terms as a critical resource in Scotland's manufacturing, agriculture, food and drink, tourism and energy sectors.

Based at the Hutton's Hydro Nation International Centre at Craigiebuckler, CREW provides evidence for implementing regulations on protecting and improving water quality. It coordinates and funds research and has developed an ethos for co-production and knowledge transfer to provide the best advice for informing policy. In 2016–2022, CREW developed and managed 105 projects[32] in key policy areas including flooding, coastal erosion, catchment management, rural sustainability, and water quality management.

6.1.1 Wastewater-based Epidemiology

CREW's science-policy interface involves multi- or interdisciplinary teams co-constructing projects and events, together with the stakeholder community. The Hutton's involvement enables trans-disciplinary working not only across stakeholders but within its own research community. For example, a team from the Hutton's BioSS (Biomathematics and Statistics Scotland) worked with CREW to develop a data modelling system related to wastewater-based epidemiology (WBE). WBE provides a means of detecting a virus and tracking its spread in the community, making it an important major real-time source of intelligence on public health. The case study described below shows how wastewater sampling is being used to identify the presence of viruses or other elements that could pose a serious public health risk.

[32] Dodd, N., Helliwell, R., Ferrier, B. (2022). Centre of Expertise for Waters Programme Report 2016–2022



Wastewater Analysis

Using systems developed during covid, wastewater has become a major real-time indicator of public health.

In 2020 the Scottish Government, Scottish Environment Protection Agency and Scottish Water had concerns about the potential impact of covid from untreated sewage. CREW was asked to analyse wastewater to see if precautions were needed. Wastewater markers were developed for coronavirus and it was found that there was no risk once the wastewater had been through treatment works. The monitoring and surveillance of covid levels was shared with Scottish Government and other public bodies and a dashboard was created that provided real time information on where covid was prevalent. SEPA continues to publish this data from wastewater treatment works across Scotland, representing 70-80% of the Scottish population.

Since the COVID-19 virus outbreak, wastewater based epidemiology has become increasingly recognised as an important public health surveillance tool. People infected by certain viruses shed small amounts of it in their faeces and that this can be detected in wastewater. Wastewater therefore contains a diverse amount of chemical and biological information[33] that can be used to investigate the prevalence of diseases, including adenovirus, polio, monkey pox, blood born viruses (hepatitis A & B, HIV). It can also be used to test for antimicrobial resistance and estimate community wide illicit drug usage or lifestyle chemical usage of substances such as alcohol, nicotine and caffeine.

The Hutton is currently leading a new project on wastewater surveillance to help detect and monitor emerging and re-emerging pathogens and endemic infections.

The economic impact is via:

- savings to NHS through reduced healthcare and analytical costs;
- preventative public health measures resulting in fewer ill people and less time off work – and subsequent improved wellbeing and productivity;
- cost savings in dealing with disease outbreaks and fewer deaths through improved public health policy and pandemic preparedness; and
- effective management of healthy water resources critical to health and the economy.

[33] Natalie Sims, Lisa Avery, Barbara Kasprzyk-Hordern (2021) Review of wastewater monitoring applications for public health and novel aspects of environmental quality (CD2020_07). Scotland's Centre of Expertise for Waters (CREW). Available online at: crew.ac.uk/publications

Similarly, the Hutton and partner universities are looking to reduce pharmaceutical pollution in freshwater through the One Health Breakthrough Partnership (OHBP). It is estimated that between 10%[34] and 40%[35] of prescriptions are not used. Whilst some of these will be returned to a pharmacy, many end up in wastewater and ultimately in our freshwater systems posing a serious risk to aquatic bodies. The Hutton is involved in developing technology to remove pharmaceuticals, such as endocrine disrupters and hormones, from wastewater. It is also contributing to the UK's National Action Plan for Antimicrobial Resistance (AMR). AMR is a significant burden on healthcare systems resulting in increased healthcare costs as treating infections caused by resistant bacteria is often more expensive and requires longer hospital stays. AMR is a global health challenge, and this research is also supporting Scotland's contribution to the UN 2030 Agenda for Sustainable Development.

Prolonged illnesses due to resistant infections can lead to individuals taking time off work, impacting productivity and the economy. In the EU healthcare costs and productivity losses due to AMR are estimated at €1.5billion annually[36]. Global deaths due to AMR are estimated at 700,000 per year at present, with predictions that this figure could rise to millions in the near future.

Source control is a big part of the solution to reducing pharmaceutical pollution. Shifting public health policy from taking "a pill for every ill" requires massive change toward a more sustainable and socially based approach to often referred to as "blue-green prescribing". This approach is designed to reduce pharmaceutical pollution by considering the environmental impact of medications and prescribing "green" nature-based health interventions (like visiting a park or forest) and/or "blue" activities (like swimming and kayaking). This approach is considered further in section 6.2.

6.1.2 Sustainable water management

Water is becoming a scare resource in Scotland, with increasing periods of summer drought and decreasing annual groundwater recharge[37]. The Hutton's work overseas has important implications for managing water systems in Scotland that impact, for example, high value supply chains such as whisky and human health.

International projects in both India and Malawi are focussed on providing clean drinking water and better use of water resources. Scottish Water is interested in the decentralised models the Hutton has developed overseas for harvesting rainfall, reusing water and replenishing ground water. Similar systems are applicable in rural Scotland and would enable Scottish Water to deliver drinking water more sustainably whilst reducing costs and their carbon footprint in the transportation in water.

[34] NHS Grampian (2024) Financial impact of unused medicines. The NHS in Scotland spends almost £1.4 billion per year on drugs, of which almost £1 billion (70%) is spent in general practice. https://audit.scot/docs/health/2013/nr_130124_gp_prescribing.pdf

[35] National Health Executive (2022). Four in 10 throw away NHS prescriptions survey finds

[36] Bridle, H. et al., (2022). Technologies for Monitoring and Treatment of Antimicrobial Resistance in Water: CREW Policy Brief.

[37] Glendell M et al. (2024). Future predictions of water scarcity in Scotland: impact on distilleries and agricultural abstractors. CRW2023_05. Centre of Expertise for Waters (CREW).

Decentralised Water Management

Sanitation and hygiene in rural areas of developing countries is challenging due to limited infrastructure and prohibitive costs. Decentralised solutions offer flexibility and cost-effectiveness, allowing for customisation to local needs.

The Hutton worked with academics from two Indian institutions to develop a modular decentralised wastewater treatment system at a government-run school in rural India[38]. It integrated technical and social science research to achieve sustainable long-term outcomes.

Teachers and pupils had days off with sickness due to contaminated water. By working with the school community the researchers found ways to provide safe drinking water from scare resources.

This involved treating wastewater so that it could be used (for flushing and cleaning), harvesting rain monsoons, using grey water (filtered and reused for watering plants), treating sewage in a low cost way (and once treated could be used to water non-food plants, biofuels and amenity spaces). All of this was done with very simple technology so if it broke down it could be fixed. The impact of this was:

- education equality as girls would attend school more often as there were adequate bathroom facilities;
- healthier students and staff, with greater attendance at school;
- reduction in the school's freshwater consumption by 50% annually.

[38] Reshmi Das P. S. Ganesh Subramanian Nazli Koseoglu, Stephanie Connelly, Matteo Tamburini, Rachel Helliwell, Durba Biswas, Priyanka Jamwal, Jagadeesh Yeluripati, Samia Richards, Rowan Ellis, Lakshminarayana Rao (2025). Design of decentralized water and wastewater management and reuse system for rural India: challenges and opportunities

The partnership between Malawi and Scotland is another powerful example of international collaboration aimed at addressing critical challenges such as access to clean water and climate resilience. Scotland can take learnings from hydrological extremes experienced in Malawi to understand potential future climatic conditions.

Bridging Continents for Clean Water

The Hutton helped establish a National Water Resilience Authority in Malawi, to help the country manage its water resources effectively.

Historic ties and formal agreements between Scotland and Malawi reflect a commitment of shared values and mutual support.

Prior to this project, ground waters were dry and engineers were paid by the number of boreholes they dug. Resources have been mapped and boreholes dug to specifications to enable best use of water and flood resistance. Good practice is being developed and a licence is now required to dig a borehole.

Ground water is one part of sustainable catchment management. The Hutton is now working with stakeholders in Malawi to see if there is an appetite for a centre of expertise like CREW. It aims to connect government ministries to enable sustainable water environment management. The impact of this project to date has been:

- clean reliable water;
- knowledge transferred to an effective regulator, fostering long-term resilience in environmental governance; and
- building institutional capacity.

6.2 Greenspace and Wellbeing

There is an increasing focus on the benefits of spending time in nature and near water for improving physical and mental health. The NHS is increasingly investing in nature-based social prescribing, including blue and green spaces, to improve health and well-being. The Social Economic and Geographical Sciences Department of the Hutton is building on a decade of research on the physiological and psychological impact of green/blue spaces.

The Hutton is developing reliable measures to understand the impact of green and blue spaces on wellbeing and the development of interventions that successfully engage people with nature. The research has inspired a multitude of initiatives looking at workplace interventions and wellbeing of staff, including plants in offices, access to blue skies, group outdoor walks and forest bathing. Facilitating engagement in nature is seen to be increasingly important e.g. gardening and foraging. The virtual landscape theatre, part of the £8.8 million investment in state of the art technology at the new Just Transition Hub at Craigiebuckler, will enable the Hutton to further its research on human reactions to different environments.

One of the biggest impacts of this research is in reducing long term sickness and improving wellbeing at a population level. The aim is to develop a tool that will guide healthcare providers in prescribing blue green interventions in routine healthcare practice. The emphasis of its impact is on Sustainable Development Goals (SDGs)[39] which the NHS has committed to pursuing to achieve a sustainable health service[40].

It will have the added impact of improving the circular economy by reducing plastic in packaging and transportation of drugs and reducing the pharmaceutical load in freshwater systems.

6.3 Summary

This chapter has described a few of the many ways the Hutton is contributing to population health. Where possible the potential scale of these impacts at a national/global level has been highlighted but at the time of writing there was not sufficient information to enable the specific contribution the Hutton may make to realising these impacts to be quantified. However this does not mean these areas of activity will not have economic impacts. The economic effects associated with the activities described in this chapter are likely to include:

- cost savings to health providers because of alternative prescribing, including blue/green prescribing;
- increased productivity due to improvements in population health;
- savings to NHS through reduced healthcare and analytical costs;
- preventative public health measures resulting in fewer ill people and less time off work and subsequent improved wellbeing and productivity;
- cost savings in dealing with disease outbreaks and fewer deaths through improved public health policy and pandemic preparedness;
- effective management of healthy water resources critical to health and the economy; and
- helping to develop new commercial opportunities for UK growers.

[39] Alejandre J, Irvine, K.N., Martin Chastin, S. F., Price, L. (2020). Investigating the viability of a blue green prescribing strategy in the Scottish health system

[40] Scottish Government (2022). NHS Scotland climate emergency and sustainability strategy: 2022 to 2026

7. Operational Impacts

This section summarises the economic impact created by the operational activities of the Hutton.

7.1 Income

In 2023/24, the Hutton had a total income of £51.1 million[41]. This income increased in real terms by 31% since 2015/16 when income was £39.0 million.

Table 7-1 provides a breakdown of the Hutton's income in 2023/24 by source.

Table 7-1 2023/24 Sources of Income

	Income 2023/24 (£ million)	Share of Total Income
Grants from RESAS	23.5	46%
Research grants and contracts	20.1	39%
Trading income from subsidiaries	5.5	11%
Other	2.0	4%
Total	**51.1**	**100%**

Source: James Hutton Institute (2024), Trustees' Report and Group Financial Statements for the Year Ended 31 March 2024

7.2 Direct Impact

The direct economic impact of an organisation is generally estimated as the value it adds to the economy in terms of GVA and the employment it supports. GVA is estimated by subtracting an organisation's expenditure on goods and services from its income.

In 2023/24, the Hutton had an income of £51.1 million. Almost half of this was in the form of Rural and Environment Science and Analytical Services (RESAS) grants from the Scottish Government and a further £20 million was from other research grants and contracts.

During 2023/24 the Hutton spent £15.5 million on purchasing supplies of goods and services and employed around 590 staff. This equated to a direct impact of £35.6 million GVA and supported 555 jobs in 2023/24.

[41] This excludes capital funding from the Tay City Region Deal. This was excluded to avoid double counting because the impact of this expenditure was quantified in section 8.

Table 7-2 Direct Impact, 2023/24

	Local Areas	Scotland	UK
Direct GVA (£m)	£35.6	£35.6	£35.6
Employment	590	590	590

Source: BiGGAR Economics Analysis

7.3 Supplier Spending Impact

The Hutton's expenditure on goods and services creates an economic impact by increasing turnover and employment of companies in its supply chain. The Hutton spent £15.5 million on goods and services in 2023/24.

Based on information provided by the Hutton on the location of its suppliers, it was estimated that 17% of the Institute's supplier expenditure was in the Local Areas. 36% was spent on supplies from the rest of Scotland and a further 45% was spent on supplies from the rest of the UK. The remaining 2% was spent on supplies from outside the UK.

To estimate the economic impact from the Hutton's total spending on supplies, each category of expenditure was assigned an industrial sector from the UK's Standard Industrial Classification (SIC) codes. Direct GVA and employment impacts were estimated by applying sector appropriate economic ratios. Sector appropriate multipliers were then applied to estimate indirect and induced impacts.

It was estimated that spending on supplies by the Hutton generated £15.5 million GVA and 245 jobs in the UK, including £6.0 million GVA and 75 jobs in Scotland and £1.4 million GVA and 20 jobs in the Local Areas.

Table 7-3 Supplier Spending Impact

	Local Areas	Scotland	UK
GVA (£m)	£1.4	£6.0	£15.5
Employment	20	75	245

Source: BiGGAR Economics Analysis

7.4 Staff and Student Spending Impact

The Hutton directly employs around 555 staff and 40 PhD students, who make an economic impact when they spend their stipends, wages and salaries. The Hutton also supports the activities of an additional 50 students based at other universities throughout the UK. Staff and student spending supports the businesses they buy

from, allowing these businesses to expand their operations and support their own workforces.

In 2023/24 total staff costs at the Hutton Institute amounted to £26.7 million. In addition, it was estimated that the PhD students at the Hutton term-time spending habits support turnover and employment in local businesses. Their spending is additional to the area as they may not otherwise have come to either Aberdeen or Dundee, were it not for the Hutton. To estimate the impact associated with student spending, it was necessary to determine:

- **where students live:** the type of accommodation students occupy during their studies is a key influence on their expenditure. For example, students living in rented accommodation spend significantly more on housing costs, food and household goods than those who live with their parents or guardians. It was assumed that 100% of Hutton students lived in rented or owned accommodation;
- **their spending patterns:** this can be estimated based on data from the Student Income and Expenditure Survey for 2014 to 2015 which was published by the Department for Education in 2018. It suggested that, on average, students spent £11,750 on housing and living costs in 2014/15. Adjusting for inflation, the annual spend per student in 2023/24 was estimated to be £15,751. For students undertaking their studies at other universities, 50% of this expenditure was attributed to the Hutton.

7.4.1 Staff Spending

The economic impact of this depends on where this money is spent, which in turn depends on where they live. Data from the Hutton suggests that most (92%) staff live in the Local Areas, with the remaining 8% living elsewhere in Scotland. This was applied to staff at the Hutton on the basis that where staff live is likely to be similar across the Institute.

Based on an analysis of the Input Output Tables and household spending patterns, it was assumed that members of staff living in the Local Areas spent 93% of their income within the UK, of which 74% would be spent in Scotland. Similar assumptions were made for all study areas and applying these shares to the expenditure arising in each study area enables an estimation of the total expenditure in each area, and its economic impact by applying economic ratios and multipliers

In this way, it was estimated that staff spending at the Hutton contributed £27.8 million GVA and 210 jobs in the UK. Of this, £13.6 million GVA and 100 jobs were in Scotland and £6.1 million GVA and 45 jobs were in the Local Areas.

Table 7-4 Staff Spending Impact

	Local Areas	Scotland	UK
GVA (£m)	£6.1	£13.6	£27.8
Employment	45	100	210

Source: BiGGAR Economics Analysis

7.4.2 Student Spending

In 2023/24, the Hutton had 91 students, of whom 50 were not based at the institute. It was assumed that 50% of the expenditure of these 50 students was attributable to the institute. Data from the institute suggested that most students were based in Scotland (96%), with 37% of all students based in the Local Areas.

Using the Department for Education analysis of student expenditure,[42] it was estimated that, collectively, the annual expenditure of Hutton PhD students amounted to £0.9 million. As with staff expenditure, relevant economic ratios and multipliers were then applied to this figure to estimate economic impact.

It was therefore estimated that student spending contributed £0.8 million GVA and 15 jobs in the UK. Of this, £0.6 million GVA and 10 jobs were in Scotland, and £0.2 million GVA and 5 jobs were in the Local Areas.

Table 7-5 Student Spending Impact

	Local Areas	Scotland	UK
GVA (£m)	£0.2	£0.6	£0.8
Employment	5	10	15

Source: BiGGAR Economics Analysis

7.5 Operational Impacts Summary

The operational impacts of the Hutton Institute contributed £79.6 million GVA and 1,055 jobs in the UK. Of this, £55.7 million GVA and 775 jobs were in Scotland and £43.3 million GVA and 660 jobs were in the Local Areas.

[42] Department for Education (2018), Student Income and Expenditure Survey 2014 to 2015

Table 7-6 Summary of Operational Impacts

	Local Areas	Scotland	UK
GVA (£m)			
Direct Impact	£35.6	£35.6	£35.6
Supplier Spending	£1.4	£6.0	£15.5
Staff & Student Spending	£6.3	£14.1	£28.6
Total GVA	**£43.3**	**£55.7**	**£79.6**
Employment			
Direct Impact	590	590	590
Supplier Spending	20	75	245
Staff & Student Spending	50	110	225
Total Employment	**660**	**775**	**1,055**

Source: BiGGAR Economics Analysis. Totals may not sum due to rounding.

8. Place-based Impacts

The Hutton supports local economic impact at its two sites in Aberdeen and Dundee. Its capital investment and business support activities in each area are creating the foundations for local innovation ecosystems.

8.1 Establishing an Innovation Ecosystem

The Hutton has an important role in supporting local development at each of the locations it is based at. Through its large-scale capital investment and support for businesses, the Hutton is creating the foundations for an innovation ecosystem in each location. This section discusses this in more detail.

8.1.1 Economic Impact of Capital Investment

The Hutton creates economic impact locally through the large-scale capital projects it undertakes, such as investing in new buildings or equipment. This capital investment benefits local construction firms, sub-contractors and service providers.

Investment in capital projects is likely to fluctuate significantly year-to-year. An average spend per year was estimated using data from the Hutton on capital spending over the past five years and expected spending over the next five years. On this basis, it was estimated the Hutton spends over £10 million annually on capital projects, 20% of which is on projects at Craigiebuckler and 80% at Invergowrie.

By applying economic ratios and multipliers for the construction and manufacturing sectors, it was possible to estimate the economic impact of this capital investment. It was estimated the Hutton supports £4.4 million GVA and 60 jobs in the Local Areas through its capital investment.

Table 8-1 Capital Spending Impact

	Local Areas	Scotland	UK
GVA (£m)	£4.4	£6.1	£9.2
Employment	60	85	155

Source: BiGGAR Economics Analysis

8.1.2 Establishing an Innovation Ecosystem

The effects of capital investment ripple far beyond this economic impact in the construction and manufacturing sectors. As a research institute, investing in research infrastructure, whether buildings or equipment, enhances the Hutton's

ability to be at the cutting edge of research. This creates a virtuous cycle, with high quality facilities helping to attract and retain staff in the local area, and improved research providing a platform to secure additional research funding. This can also help attract businesses to the area as large multinationals, SMEs and start-ups can all benefit from co-locating with a renowned research institute. All these factors combined, create the foundations for the development of an innovation ecosystem.

The types of capital projects the Hutton has invested in demonstrate this. The Hutton's base in Invergowrie, Dundee has had significant capital investment with two major capital investment projects at the site, the International Barley Hub (IBH) and the Advanced Plant Growth Centre (APGC). Both have been funded through the Tay Cities Deal.

The £40 million IBH is a partnership with other Scottish universities and research institutes and involves business stakeholders such as the Scotch Whisky Research Institute, Maltsters Association of Great Britain and the National Farmers Union Scotland. The International Barley Hub's vision is to be: “the world’s leading centre of excellence in barley research and innovation, and its translation into economic, social and environmental benefits.” By enhancing the scale and excellence of research along with a focus on increasing the translation and application of this research the IBH aims to drive impact in agriculture and end use sectors. The IBH will also support the development of a barley cluster, by providing companies access to facilities and equipment, collaborating with industry and supporting spin-in companies.

The Advanced Plant Growth Centre (APGC) is a £27 million project which aims to, "Deliver increased commercial, economic and environmental benefits to the agricultural, food and drink sectors in the UK and internationally by innovative use of precision-controlled environment technologies." One example of the APGC's impact is its research around vertical growth systems which has led to the development of a vertical farm in Orkney. As these vertical farms are established in areas where there is an energy supply in place already, such as wind, shorelines or derelict coal mines, they often coincide in supporting rural development in deprived areas. This research has also attracted international interest, with the APGC's technical knowledge and practical experience proving invaluable.

Both IBH and APGC provide collaborative research environments, with opportunities for networking with others and interactions with businesses and stakeholders. The establishment of the IBH and APGC has also freed up their previously used lab space for external companies to use at much lower cost. This helps businesses in the area by providing them access to quality facilities they would not normally be able to afford. By attracting more companies to the area, the wider network of scientists and researchers expands, and all of this together supports the further embedding of an innovation ecosystem, with the Hutton, the IBH and APGC at the centre of it.

The Hutton has also invested £1 million in the creation of Scotland's first purpose-built tower for directly measuring greenhouse gases. The tower was built on land at

The Hutton 's Balruddery Farm, in Angus near Dundee. The state-of-the-art 100-metre-tall facility will enable Scotland to monitor and thereby mitigate climate change by allowing scientists to measure the composition of greenhouse gases directly and then to model changes mathematically over the coming years.

HydroGlen is a £6.2 million green hydrogen powered farming community pilot project located at the Hutton's Glensaugh research farm. Funded by the Scottish Government's Just Transition Fund in 2022, it provides a scalable and replicable concept for hydrogen farms reducing their reliance on grid energy and increasing their resilience against volatile energy prices, or potential energy shortages. Similarly, the Just Transition Hub at the Hutton's Craigiebuckler campus is a virtual and physical facility to drive training and innovation round nature-based net-zero solutions in the northeast and across Scotland. The facility aims to bring together communities, scientists, agencies, spin-in and spin-out companies, and private finance in the northeast using cutting-edge collaborative tools.

The Hutton is ideally placed to develop its innovation ecosystem in years to come as it has established ways of working that maximise the impact of working with others:

- the Hutton is **independent** of industry and government enabling it to have academic freedom to conduct research without political or corporate influence. This allows it to run ahead of policy agendas, predict challenges to come and look to longer term solutions to societal challenges. Independence also brings scientific integrity; the Hutton has credibility across multiple stakeholder sectors which facilitates collaboration;
- the Hutton embodies effective **collaboration** at the science-policy interface - understanding who to work with, knowing how to get things done and sharing information. The Hutton works in partnership with government bodies, industry, business and local communities. This collaboration integrates high-quality scientific research with real-world applications ensuring that research findings are translated into practical solutions. The Hutton is agile in responding to both emerging policy areas, and urgent policy, regulatory or industry research needs;
- by providing **high-quality scientific evidence**, the Hutton plays a critical role in shaping strategies that improve society – both in Scotland and via its international work. Applied science and analysis is shared with public bodies to contributes to evidence-based policy making and regulation; and
- **Interdisciplinary research** brings together experts from different science disciplines to sustainably manage ecosystems, protect natural resources and enable economic productivity to thrive.

8.1.3 Supporting Businesses

A strong business base is a fundamental component of innovation ecosystems. The Hutton supports businesses in the local area in three main ways:

- research undertaken by the Hutton can be commercialised directly, through the creation of **spin-out companies** to bring a specific new product, service or technology to market;

- the Hutton can help attract companies to the area, **spin-ins**, who choose to locate there in order to partner and collaborate with the Hutton as part of their business approach and strategy; and
- attracts other companies to locate on the Hutton's campus.

In 2023/24, the Hutton had three spin-out companies. As all three companies were established on the basis of research undertaken at the Hutton, the impact of these companies is fully attributable to the Hutton. Two of these companies are pre-revenue and are not therefore currently creating economic impact. The impact of the remaining company was estimated based on employment data for 2023/24 provided by the Hutton. Sector appropriate economic ratios and multipliers were then applied to estimate the economic impact of the company.

There are also three spin-in companies associated with the Hutton. In each case, the companies have chosen to be based near the Hutton to partner and collaborate with the institute. Based on consultations with staff at the Hutton, it was possible to attribute a proportion of each company's turnover and employment to the Hutton.

Similarly, a further 14 companies are located on the Hutton 's campus. These companies interact more informally with the Hutton than the spin-ins and as a result could have chosen to locate elsewhere. Consequently, a lower proportion of their impact was attributed to the Hutton.

In this way it was estimated the Hutton contributes £13.4 million GVA and supports 20 jobs in the Local Areas, through its support for businesses. This impact could increase significantly in the future from the IBH and APGC developing further spin-out companies or helping attract additional companies to the area.

Table 8-2 Supporting Businesses Impact

	Local Areas	Scotland	UK
GVA (£m)	13.4	19.8	26.2
Employment	20	65	125

Source: BiGGAR Economics Analysis

Intelligent Growth Solutions is an example of a company that has collocated at the Hutton’s Invergowrie campus. Working together has provided benefits to both organisations, because each added value to the other’s core skill sets.

Intelligent Growth Solutions

IGS and the Hutton have collaborated closely to help advance the understanding of plant science for indoor growing. The collaboration has enabled IGS to become market leaders in vertical growing.

Founded in 2013 in Scotland, Intelligent Growth Solutions (IGS) manufactures world-leading vertical farming technology for Total Controlled Environment Agriculture (TCEA). TCEA allows for complete automation of the farm's environment, minimising labour requirement, and in turn the risk of pests and diseases. The company has grown from 1 employee in 2015 to employing 150 people.

IGS' Crop Research Centre is based at the Hutton's Invergowrie campus enabling them to demonstrate what they do for customers and work closely with plant scientists.

IGS is fundamentally a technology; without the Hutton they would have to outsource plant research to be able to advance their technology. They have made R&D advances via 2 R&D Knowledge Transfer Partnerships facilitated by the Hutton.

Colocation provides a huge boost to IGS' profile, it enhances their credibility and provides a pathway into global academia. The Hutton introduces new people to IGS, such as providers of new seeds, plant varieties and phenotypes. The benefits are not all one way - IGS also helps to expand the Hutton's knowledge and provides the Hutton with access to growing licenced plants for medicinal and pharmaceutical growing – enabling them to transfer their research into commercial application.

The relationship between IGS and the Hutton enables constant improvements in performance and development of new plant types and varieties for growing vertically.

8.2 Place-based Impacts Summary

With 250 employees at Craigiebuckler and 300 at Invergowrie, the Hutton has a sizeable footprint at each location. In 2023/24, these impacts amounted to:

- £39.6 million GVA and 410 jobs in Dundee City Region at its Invergowrie site; and
- £22.2 million GVA and 330 jobs in Aberdeen City Region at its Craigiebuckler site.

This is summarised in the table below.

Table 8-3 Local Economic Impact

	Craigiebuckler Campus Aberdeen City Region	Invergowrie Campus Dundee City Region
GVA (£m)		
Direct Impact	16	19
Supplier Spending	1	1
Staff & Student Spending	3	3
Graduates	1	<1
Capital Expenditure	2	3
Supporting Businesses	<1	13
Total GVA	**22.2**	**39.6**
Employment		
Direct Impact	270	320
Supplier Spending	10	10
Staff & Student Spending	20	30
Capital Expenditure	20	40
Supporting Businesses	<5	20
Total Employment	**330**	**410**

Source: BiGGAR Economics Analysis. Totals may not sum due to rounding.

9. Summary and Conclusions

In 2024 the Hutton added more than £15 value to the UK economy for every £1 of Scottish Government funding, a 20% increase since 2016. One of the most important factors behind this increase was a three-fold increase in commercial research income.

In 2023/24, the Hutton Institute contributed £358.9 million GVA to the UK economy and supported around 2,575 jobs. Of this:

- £61.8 million GVA and 740 jobs were in the Local Areas of Aberdeen City Region and Dundee City Region; and
- £210.7 million GVA and 1,525 jobs were in Scotland.

9.1 Summary Impact of the Hutton

By far the most significant source of this impact, accounting for around half of the total in Scotland, were the contributions the Hutton makes to food and drink production. A break-down of the total economic impact of the Hutton is provided in Table 9-1.

Table 9-1 Hutton Institute, Total GVA and Employment Impacts, 2023/24

	Local Areas	Scotland	UK
GVA (£m)			
Operational Impact	£43.3	£55.7	£79.6
Knowledge Transfer Impact	£0.7	£5.9	£22.6
Place Based Impacts	£17.8	£25.9	£35.5
Food and Drink	-	£123.2	£221.3
Total	**£61.8**	**£210.7**	**£358.9**
Employment			
Operational Impact	660	775	1,055
Knowledge Transfer Impact	-	10	555
Place Based Impacts	85	150	280
Food and Drink	-	585	1,185
Total	**740**	**1,525**	**2,575**

Source: BiGGAR Economics Analysis. Totals may not sum due to rounding.

9.1.1 International Impact

The Hutton also makes a substantial contribution to food production beyond the UK. In 2024, overseas sales of Hutton varieties were worth around £93.4 million (UK values). The Hutton's work on barley productivity means a sizeable volume of international barley production can be also attributed to the Institute. The value of this in 2024 was equivalent to around £112 million (based on UK farm gate values). Taken together this amounts to an international economic contribution of around £205.4 million.

9.1.2 Wider Societal Impact

However, what these numbers cannot capture is the wider contribution the Hutton makes to important societal outcomes. The Hutton's historic and ongoing work on agricultural productivity helps strengthen global food security while its work on land use is helping enhance public health and support resilient communities. Research to better understand the natural environment, and breed plants with enhanced nutritional properties, is making an important contribution to protecting and enhancing public health in Scotland and beyond. Similarly, through its work to develop more sustainable production systems and more effective approaches for responding to extreme climate events, the Hutton is also making a similarly important contribution to the mitigation of climate change and biodiversity loss.

Although these contributions cannot be quantified, their importance in underpinning future economic capacity should not be underestimated.

9.1.3 A Strategic National Asset

The scale of the economic and societal contribution made by the Hutton is not accidental. It is possible because of the Institute's long-standing and ongoing focus on issues of strategic national (and international) importance. This focus is reflected in and driven by the Institute's role as one of the Scottish Government's main strategic research partners, a role that enabled the Institute to add £9 in value to the Scottish economy for every £1 it received in strategic research funding in 2023/24. This is an impressive rate of return and serves to underscore the status of the Hutton as a key component of Scotland's national research infrastructure.

At the UK level, Hutton is serving a much larger need and creating opportunities especially for UK companies operating in the food and drink sector supply chain. This corresponding economic multiplier at the UK level is £15 for every £1 received from the Scottish Government.

Finally, whilst not quantified, this report has also illustrated the substantial contribution Hutton makes to European and International efforts to combat climate change, understand our earth and advance worldwide understanding.

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