

# Rothamsted Research Limited

## ANNUAL REPORT AND FINANCIAL STATEMENTS

for the year ended

31 March 2018



Company Registration No. 2393175  
Charity No. 802038

# Rothamsted Research Limited

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# Rothamsted Research Limited

## LEGAL & ADMINISTRATIVE INFORMATION

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### DIRECTORS

Professor Sir John Beddington FRS (Chair)  
Professor Richard Bardgett<sup>+</sup>  
Professor Sir David Baulcombe<sup>+</sup> FRS  
Mr Russell Brooks\*  
Dr Oliver Doubleday  
Professor Sir Charles Godfray<sup>+</sup> FRS  
Dr Stuart Jarvis\*  
Dr Alastair Leake  
Mr Paul Leonard  
Ms Sally Smith\* (Deputy Chair)  
Professor Michael Winter<sup>+</sup>

\* - Member of Finance and Audit Committee

<sup>+</sup> - Member of the Science Advisory Group of the Board

CHARITY NUMBER: 802038

COMPANY NUMBER: 2393175, a company registered in England and Wales

### REGISTERED OFFICE

Rothamsted Research Limited  
Harpenden  
Hertfordshire AL5 2JQ

### AUDITOR

RSM UK Audit LLP  
St Philips Point  
Temple Row  
Birmingham B2 5AF

### PRINCIPAL BANKERS

Barclays Bank  
22-24 Upper Marlborough Road  
St Albans  
Hertfordshire AL1 3AL

### PRINCIPAL SOLICITORS

Mills and Reeve LLP  
Botanic House  
100 Hills Road  
Cambridge  
CB2 1PH

# Rothamsted Research Limited

## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

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The Directors submit their Annual Report together with the audited Financial Statements for the year ended 31 March 2018. Further information can be found at <http://www.rothamsted.ac.uk/>

### STRUCTURE, GOVERNANCE AND MANAGEMENT

#### Directors and Officer

The Directors, who are also the Trustees, the Institute Director and Officer of the Company, who served throughout the year, were as follows:

#### Directors

Professor Sir John Beddington FRS (Chairman)  
Professor Richard Bardgett  
Professor Sir David Baulcombe FRS  
Mr Russell Brooks  
Dr Oliver Doubleday  
Professor Sir Charles Godfray FRS  
Dr Stuart Jarvis  
Dr Alastair Leake  
Mr Paul Leonard  
Ms Sally Smith (Deputy Chair)  
Professor Michael Winter

#### Institute Director

Professor Achim Dobermann

#### Officer

Company Secretary: Louise Warren

#### Constitution

Rothamsted Research Limited (the Institute or the Company, Rothamsted Research or RRes) is a charitable company which is limited by the guarantees of its members to a maximum of £1 each and which is regulated by the terms of its Articles of Association. The company Registration Number is 2393175. The Company is also a registered charity, number 802038 and, as such, is not usually liable to taxation on income arising from and expended on its charitable activities.

#### Appointment of Trustees

Advertisements for Trustee-Directors are placed in relevant national press – including “Farmers’ Weekly”, “Nature” and “Sunday Times” as well as various online media, inviting the submission of letters of interest and curricula vitae. These are then considered by an appointments panel nominated by the Board and composed of two or three Trustees considering overall balance of skills and experience, vacancies and future needs or pressures on the Board. Potential appointees are invited to visit Rothamsted campus to meet the Institute Director and others as appropriate.

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## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

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### **Trustee Induction and Training**

New Trustee-Directors are offered training opportunities with good quality national providers identified by mutual agreement. This ensures that the Board are all fully aware of the latest position on relevant Company and Charity law, regulations and good practice especially in the context of Rothamsted Research Limited and the current decisions that it faces. Induction and training for new Trustee-Directors will be carefully tailored to the needs of the individuals concerned with special consideration of the issues that the group faces in the coming months.

### **Third Party Claims**

The group holds Directors and Officers insurance which will indemnify the Directors against claims from third parties.

### **Organisation**

The Board of Directors is responsible for the management of the Company in accordance with the Company's Articles of Association. There may be between 9 and 15 Trustee-Directors sitting on the Board of Directors, with Lawes Agricultural Trust ("LAT") and Biotechnology and Biological Sciences Research Council ("BBSRC"), part of UK Research & Innovation, each providing an Observer at Board meetings and each nominating one Director. The Chair of the Board is jointly nominated by LAT and the BBSRC. All directors are appointed to serve on an *ad hominem* and non-executive basis and, except for the Chair, do not receive any remuneration; consistent with this position the Board of Directors advises on the development of strategy and policy. The Institute Director reports to the Chair and Trustee-Directors of Rothamsted Research Limited. There is an appointments panel that is set up as required. The Board considers and is guided by the guidance issued from time to time by the Charity Commission.

The relationship of the Company with its major funding body, the Biotechnology and Biological Sciences Research Council, is defined by the terms and conditions of an Institute Grant Agreement. The Members of the Company are LAT and BBSRC plus the Chair of RRes being a single natural Member and they have signed a Members' Agreement. The role of these members is defined through a Members' Agreement that describes how this tripartite arrangement recognises the contribution in land (LAT) and funding (BBSRC) respectively to the well-being of Rothamsted Research Limited; this is achieved through an arm's length stance that does not seek to unduly influence the strategic direction of the Institute. To date, the Board has established three sub-committees for specific purposes, namely the Finance and Audit Committee, the Science Advisory Group of the Board, and the Remuneration Committee; the latter setting remuneration for key senior staff based on performance.

Until 2017 there was an agreement in place by which BBSRC employees (who were public sector employees and subject to those controls) were deployed to work at Rothamsted Research with the latter bearing all relevant costs. With effect from 1 April 2017 all BBSRC employees were transferred to Rothamsted Research Limited employment under TUPE regulations. Pension arrangements protected by TUPE remain the same, and are administered by the Research Councils' Pension Scheme. All new members of staff appointed are employees of the Company under terms and conditions defined by the Company. They pay into a defined contribution Pension Scheme (started on 1 April 2012) provided and administered by Aviva PLC.

### **Employee Consultation**

The Company recognises all appropriate Trade Unions representing staff employed. The Institute Negotiating Consultative Committee meets at least twice a year. It provides an avenue for provision of information, consultation and discussion of a wide range of matters affecting staff. At a national level, there is a Joint Negotiating Consultative Committee representing all staff within the institutions supported by the BBSRC. Information is also provided at a national and local level through the Annual Report, the Strategic Plan and other publications. The Employee Forum gives an employee voice within Rothamsted and represents all staff across the whole of the organisation. It provides the opportunity for representatives and

# Rothamsted Research Limited

## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

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senior management to share key information, have discussions about the issues, interests and ideas that are important to all, and provides a platform to ensure participation in constructive discussions on how best to grow and develop the Institute. The Forum complements and is additional to existing methods of internal communication. It proactively seeks views and feedback and acts as a communication and consultative body in areas such as: Institute strategy & performance, the political environment and its impact on RRes, organisational development and changes, employment terms and arrangements, employee engagement, health, safety and well-being, training & people development as well as work life balance and equality and diversity.

### **Disabled Persons**

The Company complies with all relevant legislation relating to disabled persons and continually strives to follow best practice in these matters for an employee with a disability to remain in employment or to successfully employ a disabled preferred candidate within a safe working environment.

Our staff code requires that we will not reject a disabled job applicant for a reason which relates to his/her disability; person specifications will always be used and selection criteria monitored to ensure that discrimination does not unwittingly occur; recruitment and selection procedures will be adapted where possible to ensure that they do not disadvantage disabled job applicants.

We will take steps to try to enable an employee who becomes disabled to remain in employment. In consultation with the employee, adjustments to facilitate their retention will be considered. Employees with disabilities will be provided with opportunities to develop full and rewarding careers on an equivalent basis to other employees with similar skills and abilities and, as described above, we will support any such applicants for vacancies across the Institute.

### **Athena SWAN Charter**

The Athena SWAN Charter recognises advancement of gender equality: representation, progression and success for all, and Rothamsted Research Limited is committed to achieving this. Rothamsted Research Limited gained the Athena SWAN Bronze award in 2014 – originally established to encourage and recognise commitment to advancing the careers of women in science, technology, engineering, maths and medicine (STEMM). The charter now recognises work undertaken to address gender equality more broadly, and not just barriers to progression that affect women.

### **Connected Charity and Companies**

The freehold interest in the land and buildings at the Company's main operating site, (Rothamsted, Harpenden, Hertfordshire) is held by Lawes Agricultural Trust (LAT), a charity with similar objects to Rothamsted Research. There is no written agreement for the occupation of this site and no rent is charged to the Company by LAT. Land and buildings at North Wyke, Devon are owned by the Biotechnology and Biological Sciences Research Council and occupied by the Company under a formal lease and a peppercorn rent.

Rothamsted Manor Limited (RML) is a wholly owned subsidiary of the Company having been transferred with all accumulated losses at 1 April 2010 from LAT. RML provides property and events management services for LAT owned properties occupied by Rothamsted students and staff. Conferencing, catering and some management agent services were transferred from RML to Rothamsted Centre for Research and Enterprise (RoCRE) on 1 April 2015. Together RML and RoCRE have established a business plan for hosting external events, such as weddings, at The Manor. No other material subsidiary undertakings conducted any trading activities during the year. RoCRE, which was formerly Rothamsted Research Centres Limited, now operates and provides catering, conferencing and some management agent services for the Conference Centre, Lawes Open Innovation Hub and, on behalf of LAT, The Daniel Hall Building. RoCRE is a unique hub focused on promoting collaboration and innovation by partnering with commercial agricultural technology businesses and opening the research process. With access to Rothamsted's world class facilities and researchers, RoCRE offers flexible laboratory space, offices and informal meeting hubs,

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as well as an extended Conference Centre. It is a joint venture of Rothamsted Research, Lawes Agricultural Trust and BBSRC.

The Charity has a 15.87% shareholding in VSN International Limited, the principal activity of which is research into, and development and distribution of, data analysis software, mainly targeted at the international life science sector. The company continues to consolidate through steady growth. The 2017/18 gross profit was £1,095k (16/17: £914k, 15/16: £1,088k, 14/15: £1,206k, 13/14: £1,143k) with an operating profit of £320k (16/17: £175k, 15/16: £200k, 14/15: £277k, 13/14: £285k), with a turnover of £2.1m (16/17: £1.9m, 15/16: £1.7M, 14/15: £1.8m, 13/14: £1.7m) achieved across all territories of the globe. The company is expected to continue to provide modest share dividends in 18/19.

### Fund Raising

The Company does not actively fund raise, and no professional fund-raisers are engaged.

### OBJECTIVES AND ACTIVITIES

The objects of RRes are:

- For the benefit of the public to advance the science of agriculture by the initiation, protection, development and continuance of investigations and experiments;
- To ensure that research undertaken is complementary to related studies elsewhere whilst providing for regional diversity in the environment and in agricultural practice, and to collaborate in joint programmes where appropriate;
- To promote the dissemination and extension of research findings alone or in association with other charitable organisations having objects similar to the objects of the Company and to actively facilitate the uptake of research results by industry;
- To extend these activities through external funding to provide support to developing countries.

Rothamsted Research remains dedicated to providing scientific research that contributes to the sustainability of agricultural land management systems both in the UK and throughout the world. This includes improving yield and quality of crops produced for a variety of purposes and enhancing the sustainability of agricultural systems worldwide. Rothamsted Research Limited is also using its scientific expertise to understand climate change and taking this further by demonstrating how plants and appropriately managed agriculture can help to mitigate anthropogenic effects on climate change.

Agriculture provides one of the most spectacular illustrations of how the benefits from good science can provide improved well-being for mankind; from the precarious food security that was found throughout the globe only a few generations ago to a sufficient, predictable supply of good quality food that much of the world enjoys today. However, that situation is not true for a large number of people, nor is it assured without constant scientific development and global food security is a significant political issue for all countries. This situation is not likely to change in the medium term and the unique combination of skills and experience across Rothamsted Research Limited is increasingly relevant for that and the growing bioeconomy.

The mission of Rothamsted Research Limited is to perform world-class research to deliver knowledge, innovation and new practices to increase crop and animal productivity and to develop environmentally sustainable solutions for food and energy production. Rothamsted Research's purpose is to bring together global science, fresh thinking and innovation for lasting benefits worldwide.

Throughout the year Rothamsted Research Limited focused on five inter-connected ISPs and numerous other grants linked to them. The five new ISPs are:

- **ISP 1: Designing Future Wheat** a UK wheat research programme to improve resource use efficiency, resilience and value of wheat
- **ISP 2: Tailoring Plant Metabolism** a programme aimed at delivering novel traits in bespoke crops for the bioeconomy

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- **ISP 3: Smart Crop Protection** a programme on novel, systems-based solutions for managing insect pests, crop disease and weeds
- **ISP 4: Soil to Nutrition** a programme that applies a mechanistic approach to optimising nutrient use efficiency across food production systems
- **ISP 5: Achieving Sustainable Agricultural Systems** a programme to evaluate and understand the performance of sustainable intensification options at farming scale

Two special initiatives or Flagship Projects are also at different stages of development:

- Growing fish oils in fields (Omega-3 *Camelina sativa*)
- Integrated Solutions Laboratory

Three National Capabilities, the Long-Term Experiments, the Rothamsted Insect Survey and the North Wyke Farm Platform continue to serve as a key resource for our strategic research as well as research conducted by national and international partners.

A restructuring of the Institute major functions has been completed, including the appointment in January 2017 of a Director of Science, Innovation, Engagement and Partnerships (SIEP), bringing together the key areas of innovation, partnerships, events & visitors, Knowledge Exchange through Commercialisation, communications & public engagement, Library Information Services, Grants & International, and Marketing.

There are now three members of the Executive; The Institute Director and Chief Executive, The Director of SIEP, as above, and the Director of Operations who oversees Accounting and Finance, Human Resources, Legal and Contracts, Facilities, Procurement, the Project Management Office, Information Technology, the Experimental and Commercial Farms (all sites), Projects Finance, Horticultural and Controlled Environments, and Property Management in the UK.

Rothamsted Research continued the important work carried out through National Capabilities, supported by BBSRC and open to scientists everywhere (pages 14-16):

- Long-Term Experiments
- North Wyke Farm Platform
- Rothamsted Insect Survey

The Company's main objectives for the year were to:

- Systematically and smoothly implement the new ISP's;
- Pursue new approaches for accelerating innovation, knowledge exchange, commercialisation and communication;
- Create new strategic partnerships, initiatives and enterprises;
- Expand its international collaboration;
- Continue a process of organisational change towards developing a new vision and strategy, to position Rothamsted Research for the future.

To help achieve this the Company has a highly skilled workforce of scientists of international quality who have access to state-of-the-art facilities alongside unrivalled time-series of data and sample archives, including those derived from the world-renowned and unique "classical" field experiments started over 170 years ago. The major areas of activity are scientific research, postgraduate education and public engagement. Rothamsted is committed to ensuring that all its research is published in widely available media of various types appropriate for the target audience.



# Rothamsted Research Limited

## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

### STRATEGIC REPORT

#### Risk Management

The Company has a formal risk management strategy which has been in place throughout the period covered by this report and is reviewed by the Board and the Finance and Audit Committee. The Board has overall responsibility for establishing key procedures designed to achieve systems of internal control and for reviewing and evaluating their effectiveness.

The risk management strategy comprises:

- An annual review of the key risks the Company may face;
- The establishment of systems and procedures to mitigate those risks identified within the risk register;
- The implementation of procedures designed to minimise any potential impact on the Company should those risks materialise;
- Financial processes are carefully controlled and monitored through active and regular review of policies and procedures to ensure segregation of duty, appropriate signing authority is monitored, and any concerns personally addressed by the Director of Operations.

A risk register is maintained which sets out the key organisational risks. Risks are considered by reference to the probability of occurrence and impact on the Company.

The principal risks identified, their associated exposures and management strategies are as follows:

Risk Identified	Institute Goal at Risk	Control Mitigation
Failure to attract sufficient and diversified competitive grant income.	Excellent, outcome-driven, and well-resourced science.	Actively manage application process for new grants. Specialist team created to drive new grant submissions. Revenue targets set for scientists. Improved reporting that provides trend data for both applications and awards.
Insufficient appropriately skilled staff employed to achieve Institute's key strategic objectives.	Highly motivated, skilled, well-performing workforce. Ensure appropriate skills hired and retained.	Operate flexible but clear recruitment procedures that result in the recruitment of high quality staff at all levels. Use allowable flexibility in pay and other rewards to retain and incentivise high quality staff.
Compliance failure or failure of the regulatory process, leading to accident, legal issues or prohibitions.	Maintain robust risk management processes.	Consolidation of Health & Safety, Biosafety and Quality Assurance, has enabled the Nagoya Protocol to be implemented. New risk management tool, 4Risk, being implemented to engage more employees in actively managing risks. A review of the internal audit resources will result in a refreshed targeted plan.

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The day to day responsibility for implementation of risk management procedures and ongoing monitoring of risk and the effectiveness of controls rests with the Management Committee. This Committee examines existing and emerging corporate risks, reviews the Institute risk register and explores corporate risks in detail based upon an agreed timetable. It is also overseen by the Finance and Audit Committee, to which significant risks may be escalated for action or monitoring, as well as high level oversight by the Board.

The Finance and Audit Committee is empowered by the Board of Trustee-Directors and has responsibility for advising on the effectiveness of the systems of internal control, including risk management. To fulfil this requirement, the risk profile is reviewed by the Finance and Audit Committee twice a year with special attention to the progress towards mitigation measures and the identification of new risks. The Finance and Audit Committee comprises four members of the Board of Trustee-Directors and meets at least three times a year.

In terms of financial risks, the Group has no borrowings and limited exposure to financial instruments, such as trade debtors and trade creditors. Cash is held in deposit accounts and treasury deposits with major UK clearing banks. The Group's exposure to trade debtors and the associated risk of default is limited to only £3.9m at 31 March 2018. Only 7.5% of trade debtors are over 90 days due and the risk of default is not considered significant.

### **ACHIEVEMENTS AND PERFORMANCE - Research Activities and benefits**

Throughout 2017/18 the Institute has continued refocusing its research, developing a new strategy that has been widely disseminated and discussed. This new strategy is based around the delivery of the objectives that were described within the "Institute Strategic Programme Grants" (ISPG) that are the larger part of BBSRC's grant to Rothamsted Research and were formally implemented with effect from April 2018 playing the most critical part of the way ahead. Progress in the various elements in 2017/18 is as follows:

#### **"Designing Future Wheat"**

The 5 year BBSRC Strategic Programme in Designing Future Wheat (DFW) programme fully integrates wheat research at RRES, EI and JIC, with research contributions from 5 other UK organisations. DFW research is organised into four separate work packages (WP), WP1 and 2 focusing on trait dissection and characterisation, WP3 on germplasm development for trait dissection, and WP4 on data access and analysis. Rothamsted contributes to all 4 WPs and leads one traits WP (WP1). All partners contribute to all WPs and there is considerable coordination of activities.

Traits identified for dissection and characterisation by WP1 and WP2 were agreed by the wider private and public international research communities, highlighted in the G20 Wheat Initiative Strategic Research Agenda and the BBSRC 5 year Wheat Research Strategy 2013. There is also substantial effort in the development of high throughput phenotyping technologies, particularly at Rothamsted as part of WP1. The germplasm work package (WP3) is developing near isogenic lines carrying chromosome segments derived from landraces or wild relatives and associated markers to facilitate trait dissection. The germplasm developed also forms the basis of breeders' toolkits, which will be refined and expanded during the programme, and provided to the breeders together with associated genotyping and trait data. The information and germplasm generated within the programme will also allow breeders to provide wheat processors, food manufacturers and retailers with sources of grain with enhanced health benefits. WP4 will organise the data and resources developed in a readily accessible form, allowing analysis and full integration with that more widely available. This will also facilitate the translation of research information into non- wheat systems, and vice versa.

The core of the programme exploits novel germplasm successfully developed within a previous ISPG, WISP, which funded pre-breeding activities. This germplasm is now being used to characterise a range of key wheat traits, identify novel alleles and associated markers, follow the alleles in breeding programmes and dissect biological pathways. As indicated in the original proposal, DFW includes activities requiring long term support, rather those more suited to response mode funding.

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Within the current reporting period, DFW researchers have exploited these resources, publishing more than 130 papers, producing more 30 data access-analysis outputs, and dispatched over 30 germplasm toolkits. Researchers have given over 200 conferences presentations and undertaken close to 150 public engagement events. We have provided BBSRC-Swindon office with a google.doc site which is continuously updated with DFW outputs.

### **“Tailoring Plant Metabolism”**

#### **Work package 1: High value lipids for health and industry**

**WP1.1 Understanding and manipulating the regulation of metabolism** Substantial progress has been made in generating high-resolution visual lipid maps of mature seed from wild-type and *Camelina* lines engineered for omega-3 production. Transcript profiling is under way to understand the seed oil assembly network during development and comparative lipidomic analysis has been completed. Transcriptomic and lipidomic datasets are being integrated using a specialised bioinformatics workflow, to identify tissue-specific oil assembly candidate genes. Transgenic plants in which components of the TREX-2 RNA export have been disrupted are being evaluated for their contribution to the turnover of transgene-derived transcripts, focussing on the contribution of non-native 3-UTRs. Significant progress has been made in developing tandem fluorescent protein timers as tools for measuring relative protein lifetime in plants.

**WP1.2 Optimising crop traits for product delivery** The introduction of multigene constructs in *Camelina* has demonstrated an impact on yield parameters. An in-depth developmental, transcriptional and analytical study to determine the underlying cause is at an early stage. Progress has been in the dissection of seed yield traits, including investigation of candidate genes that may play a role in regulating seed number. Work is under way to enhance oil content by multigene engineering. Homozygous T3 seed is being recovered.

**WP1.3 Novel Products** Significant progress has been made in generating transgenic *Camelina* plants accumulating non-native sciadonic acid (SA) or structured triacylglycerol with enriched palmitic acid content at the *sn*-2 position. A new transgenic field trial application approved by DEFRA (jointly with the *Camelina* Flagship Programme) includes *Camelina* lines producing non-native fatty acids and wax esters plus lines with a photorespiration bypass already shown to improve biomass and seed production in the glass house.

#### **Work package 2: Designer willows: high value phenolic glycosides for health and industry**

**WP2.1. Defining chemical diversity** A comprehensive chemical map that spans the National Willow Collection and a number of genetic mapping populations has been constructed. Visualisation of data in a “star-map” network format allows rapid selection of future breeding material for specific chemicals. Many novel structures have been determined by isolation of pure components and full NMR and MS characterisation. Field trials have commenced to optimise production of compounds of interest. These include the anti-cancer salicinoid discovered in the previous ISP as well as novel chemicals with neuro-protective properties.

**WP2.2. Defining biosynthetic pathways & their regulation.** A large-scale, combined-metabolomic-transcriptomics time-course for six key lines expressing different branches of a putative biosynthetic grid has been completed. The data has been mined for associations between metabolites and genes and a list of candidate pathway genes has been passed into our poplar transformation pipeline for determination of gene function. Mapping of metabolites across populations F (n=394) and G (n=593) has commenced to inform on potential regulatory genes that will be important in engineering higher yield varieties.

**WP2.3. Novel designer willows and products** Chemotype data has been used to predict the composition of existing hybrids (produced to enhance biomass) where new substrates are brought together with alternate genes to form 'designer molecules'. Novel structural variants have been obtained in the hybrid progeny serving as a proof of concept. Stock for the breeding of new hybrids with enhanced chemical composition) has been entered into the breeding programme. Lines for the determination of the genetic factors influencing metabolism in hybridised *Salix* genomes have been selected from the chemistry and genetic profile data.

**WP2.4. Prototypes and scale-up for exploitation** Field demonstration trials have been established in order to provide a demonstration and quantitation of chemical product versus biomass in a conventional coppicing regime. Scale-up of chromatographic isolation from chipped material has allowed us to obtain a relatively large quantity (>100mg) of a lead anti-cancer compound for onward testing.

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**Academic outputs:** At least 11 peer-reviewed publications to date.

**Public engagement:** Video entitled 'Willow: Then and Now' which tells the history of the use of willow for the past 100 years. Numerous radio and newspaper interviews on the omega-3 project.

**Policy:** Contribution to the on-going debate on regulation of GM and genome edited crops in Europe and post-Brexit Europe. This involves discussions with DEFRA representatives close to the Minister responsible.

### **“Soil to Nutrition”**

The Soil to Nutrition (Optimising Nutrient Flow) ISPG programme (S2N) is predicated on the premise that identification of the key processes determining nutrient use efficiency, productivity and resilience (defined as effective nutrient use, ENU) across food production systems, from soil to landscape, will provide the key mechanistic indicators necessary to direct interventions for sustainable intensification of future farming systems at the field (WP1), farm (WP2) and landscape scales (WP3).

Within **WP1** we have combined X-ray Computed Tomography with metagenomics to study the effects of perennial and annual plants on soil physical structure. Phylogenetic differences between microbiomes were driven by pH and nutrient gradients. Diffusion of solutes and oxygen through the soil pore network decreased by two-thirds in bare fallowed soil compared to grassland soil and an increased abundance of microbial genes associated with extracellular enzyme secretion and cell motility. We have also developed models to quantify changes in rhizosphere physical properties due to root growth, especially those affecting water flow and nutrient uptake. Metagenomic datasets have been generated for contrasting soil types with a range of agronomic treatments. These datasets will act as references for the follow-on studies on temporal legacy and metatranscriptomic sequences. A rhizosphere culture collection from a range of UK relevant crops is currently being tested for plant growth promoting properties. To validate indicators of nutrient composition of crops and grassland, and product quality we are testing a high-throughput pot-based geophenomic screening system to link the crop ‘phenotype’ to soil physical and chemical properties, including texture, pH and organic carbon content. We established a dry spectral laboratory and begun the establishment of calibration functions for soils from Africa and Europe, for inorganic and organic fertilizers, and for plant materials. Within **WP2** metrics of sustainability to be used at a field scale are currently being developed for arable systems using data from long term experiments (LTE) in the UK and Uruguay. Metrics for grassland systems are being developed using data from the North Wyke Farm Platform (NWFP) and Global Farm Platform network. We have established a new Large Scale Rotation Experiment (LSRE) at Broom’s Barn site based on a multidisciplinary approach, focussed on the whole production system. We are also using the “Fosters LTE”, where we are establishing an on-farm tool to measure residual N and using NO<sub>3</sub><sup>-</sup> specific electrodes to measure N mineralization during the season. We investigated the effect of grazing on nutrient cycling by taking urine and dung from cows grazing on the three treatments of the NWFP. Changes in soil nutrients and micronutrients, and emissions of GHGs were measured after the application of these treatments. We found that there are differences between the micronutrient concentrations as well as the water extractable reactive P across the three systems. We showed that implications of livestock farming on climate change should not be drawn from aggregate statistics, based on a new method of carbon footprinting for pasture-based cattle production systems that can assess the impacts of individual animals. Within **WP3** we have focussed on collating the conceptual frameworks underpinning the four models currently used internally at Rothamsted Research. This provides a means of understanding the fundamental mechanisms and processes relevant to interactions between soils, plants and microbes currently parameterised and thereby the gaps that can potentially be infilled with new experimental data from WP1 and 2. In addition, we have developed algorithms to extract information on crop development and productivity from high frequency remote sensing data (Synthetic Aperture Radar). We are currently testing this information to define early vigour and senescence in terms of their contribution to yield formation. As a test case for the Hierarchical Model Framework (HMF) and whilst we wait for the results of experiments (WP1, 2) delivering new mechanistic understanding, we have established a number of test landscape patches covering areas dominated by cereal, lowland livestock grazing, dairy and mixed farming in England.

### **“Smart Crop Protection”**

#### **Work Package 1. Smart Surveillance of Pests, Weeds and Diseases**

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For insects attempts to develop a particle light scattering sensor for automatic counting showed that other airborne particles give false results, so a new approach using RGB lasers is being developed. For discriminating between insect species by detecting wing beat frequencies, signatures for 20 species (2,000 observations each) are being collected. New visualisations indicating change in insect population dynamics are being developed by CEH for our moth data, to better estimate the rate of decline with generalised abundance index. The design of a prototype millimetre wave radar that will detect small insects at high altitudes (up to 200 m) is underway. Generating genomic data to help with the identification of aphid pest species has involved sequencing mitochondrial genomes which are being assembled (target is 20 genomes). This will lead to a direct sequencing protocol for the identification of aphid pests reported by the RIS. A new mobile suction trap for aphids is being tested. Investigation of the migration patterns of *Rhopalosiphum padi* in the UK has been done, knowing how far these vectors can move will help to understand how to develop better recommendations and policies for management and control.

For plant pathogens, prototypes of devices for the collection of rain samples to detect spores (for integration with DNA-based analysis) have been developed. A spring spore trap network in East Anglia is being used to generate information on potato and sugar beet fungal threats and data from previous projects is helping to understand the spatial variability of different pathogens to help optimise future sampling. Testing of a new high-volume cyclone spore trap has shown that it can double the sample volume.

Modelling approaches have been used to formulate and validate the next generation of models on spore dispersal in the vertical plane and work on horizontal plane is underway. This will allow spore and insect-based forecasts at the post code level. Modelling simulations to inform design of monitoring networks to establish the absence of disease in an area has also been completed. Population genetics/genomics modelling approaches to inform population structure and evolutionary dynamics of black-grass is also complete.

### **Work Package 2. Resisting resistance**

Monitoring of UK populations of pest insects has shown that for the aphid *Myzus persicae* resistance to carbamates and pyrethroids is widespread and this has informed current management guidelines. For the aphid *Sitobion avenae*, resistance to pyrethroids is widespread but is relatively weak and farmers have been advised that pyrethroids are still effective at full field rate. For cabbage stem flea beetle (CSFB) resistance to pyrethroids is increasing, with most populations being moderately/strongly resistant, probably due to a combination of target site and metabolic mechanisms and candidate P450s are being evaluated. New resistance has been found in onion thrips and willow-carrot aphids. Virus diagnostics for TuYV in *M. persicae*, and BYDV in *S. avenae* and *R. padi* have been developed and validated and monitoring shows high infection levels of TuYV but much lower levels of BYDV. Experiments have been done to look at fitness costs of insecticide resistance including the response of aphids to synthetic alarm pheromone, the settling of aphids on insecticide sprayed and unsprayed barley and the ability of UK insecticide 'super-clones' to produce sexual forms under low temperature and short-day length conditions.

A set of *Drosophila* strains, engineered to incorporate different resistance mechanisms is being prepared and will allow the direct linkage of genotype to phenotype. Development of germ line transformation and genome editing tools in pest insects is also underway and is working in *P. xylostella*, the next candidate species is soybean looper. A new 'Global Pest Genomics' platform has been set up with Bayer and Syngenta, to expand access to genomic/transcriptomic resources for key pest species.

For fungicide resistance new Sdh and CYP51 variants have been found in *Z. tritici* and the data communicated to AHDB and FRAG-UK. Studies on NTSR for azoles and SDHs using RNAseq have started with the identification and characterisation of suitable isolates. Development of in-field diagnostics and lab-based assays for fungicide resistance monitoring has progressed using LAMP-based assays. The construction of a haplotype network with functional fitness studies in vitro and in planta for key mutations is underway with primers developed for sequencing CYP51 gene and surrounding chromosome region.

For herbicide resistance in black grass, phenotyping and tissue sampling of segregating F2 families is complete and will be used to explore the co-segregation of NTSR phenotype and genotypic markers in diverse populations. Preliminary metabolite extractions have been done for the integration of phenotypic and genotypic data sets to explore the evolution of NTSR resistance mechanisms. Seeds from sensitive and

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NTSR populations have been harvested for Gamma vs X-ray tests and radio-sensitivity test for dosing prior to mutagenesis to allow forward genetics screens to explore the loss/gain of function (resistance) in mutagenized seed populations. The first year of a trans-generational drought experiment to explore the fitness impacts of interacting herbicide resistance mechanisms in relation to wider tolerance to abiotic stress, is complete.

Modelling of the evolutionary dynamics of azole resistance/fitness landscapes is underway with the necessary existing and new data identified. A model of the effect and genetics of metabolic/detoxifying resistance has been developed and a program that models the development of resistance in a population under different fungicide inputs has been built and analysis of the model is underway.

### **Work Package 3: Next Generation Crop Protection**

Volatile defence signalling compounds have been isolated by air entrainment from OSR and turnip rape (TR) damaged by CSFB and from maize leaves during root damage by wireworms. Next will be from OSR damaged by aphids and OSR infected with *Pyrenopeziza brassicae* and *Sclerotinia sclerotiorum*. The samples from the OSR and TR with CSFB have been analysed by GC and GC-MS. For the extracts from maize plants, the samples are currently being analysed on the GC to see if there is any aboveground induction of volatile signalling after herbivore damage belowground. Several projects are underway (or planned) to test proof of concept of detecting differences in volatile defence signalling between healthy and biotic-stressed plants for different kinds of sensor technologies (e-nose, mass spectrometry and fluorescence Spectroscopy).

Methods for the isolation of belowground insect-induced rhizosphere signalling have been developed using PDMS tubing and preliminary identification of compounds need to be confirmed by GC peak enhancement with authentic compounds. For the isolation of rhizosphere signalling, involved in allelopathic control of weeds, experiments have commenced to develop systems to capture root exudates from black-grass and wheat by optimising a hydroponic system with plans to assay bioactivity of crude extracts in hydroponic and Petri dish systems. The analyses of root exudates from black-grass and wheat have been completed, showing a range of chemistry being exuded and contrasting profiles between black-grass and wheat.

To screen and select aphid populations with enhanced response to minor pheromone components, methods to optimise the collection of alarm pheromone have been developed. Cornicle extracts from a *M. persicae* clone have been prepared to confirm preliminary results on their alarm pheromone composition and samples are undergoing GC-MS analysis. CSFB have been collected from the field for behavioural experiments and field trials using various traps will be set up in the coming months. Pheromone extracts have been collected and are awaiting analysis.

### **Flagship Projects**

#### *Omega-3 Camelina*

The Omega-3 Flagship was launched in April 2017, to build on the significant advances made in the development of a plant-based (*Camelina sativa*) sourced of omega-3 fish oils. Previous work within the Designing Seeds ISPG (2012-17) had validated prototype forms of such plants. Similarly, a number of aquafeed studies were carried out with the novel camelina "fish oil" to demonstrate its efficacy in fish farming. The aim of the Omega-3 Flagship is to capture these research outputs and convert them into a viable innovation, ultimately leading to the commercialisation of this technology. To that end, work has focussed on generating a new suite of unique DNA parts which have then been introduced into Camelina to reconstruct the omega-3 fish oil trait. This has involved both gene discovery and functional characterisation, along with plant transformation and analysis. In addition, a number of pre-existing lines have been subject to "real world" evaluation, undergoing field trials in the UK, USA and Canada – such data provides critical information as to the performance of GM O3 camelina in different agricultural environments, and provides useful information to the geographical areas most suitable for commercial growing.

The Omega-3 Flagship also works collaboratively with the Tailoring Plant Metabolism (TPM) ISPG (2017-22), providing expertise in obtaining regulatory approval to carry out GM field trials in the UK. Earlier this year, DEFRA approved a large environmental release (18/R8/01) of 14 different GM camelina lines, the

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majority of which were for the Flagship omega-3 fish oils trait, but also included ISPG-supported traits such as plant architecture and photosynthesis. This joint experiment not only allows collective early field validation of novel traits, but also maintains Rothamsted's profile as the UK's centre of excellence for GM agricultural research. The work of the Omega-3 Flagship continues to have a very high profile in the media, and the Flagship leader (Professor Johnathan Napier) is well-known as an expert communicator on the topic of GM and genetic technologies such as genome editing. In this reporting period he has been interviewed on R4's "Today" programme, appeared on the front page of the Daily Telegraph, and played a central role in the Royal Society's public dialogue exercise on genetic technologies.

### *Integrated Solutions Laboratory*

Activity in the first year of the Integrated Solutions Laboratory ("ISL") focussed on building strategic partnerships with other research organisations and alliances with industry, increasing the volume of agricultural systems science at the institute and undertaking activities to help build a culture of systems thinking and science in the organisation. Highlights include:

- The establishment of a new joint graduate school in food systems science with Reading University including the launch of 4 joint PhD projects;
- A formal relationship established with IBM and the Hartree centre to build capacity in high performance computing and systems science;
- Two new joint programmes in smart crop protection and metagenomics initiated with IBM/Hartree, and a proof-of-concept integrated stress management platform delivered;
- An analysable systems map that integrates the SCP, ASSIST and S2N strategic programmes has been prototyped;
- 4 new PhD scholarships have been secured with BASF in soils systems science;
- Formal involvement as Academic Champion in the development of the ISCF Transforming Food Production programme;
- Securing £4M funding from the UKSA for a technology-driven systems approach to deliver SDG2 in Colombia;
- Secured new collaborations with GSMA and China Mobile and initiated the design and implementation of a proof of concept IoT demonstration platform in China;
- Undertook 2 industry-facing workshops advocating the role of data- and technology-driven innovation in delivering integrated solutions.

The ISL initiated and implemented an event to develop an institutional point of view on the future of agriculture in the UK. The main outcome of the event was the recognition of 4 potential scenarios ranging in the extent of deployment of technology and data-driven on-farm innovation, and that considered two extremes of self-sufficiency. Although it was recognised that these scenarios could simultaneously play out at a regional scale across the UK, there was a strong consensus that UK agriculture will widely adopt technology.

In advance of the launch of the Industry Strategy Challenge Fund Transforming Food Production programme, the ISL has led the formation of industry consortia to develop funding bids. To date, there are 3 bids in preparation involving Agrimetrics, IBM, Syngenta, BASF, Bayer, Microsoft and Airbus. In addition, the ISL is leading two parallel public-private partnership projects in China to create technology platforms that support integrated crop management using IoT, AI and Big Data approaches. These projects involve a number of global industry partners including BASF, China Mobile, and GSMA as well as a cluster of SMEs. Collaboration with Agrimetrics will develop and deliver a supporting data platform in China.

### **National Capabilities:**

#### *Long-Term Experiments*

In Spring 2017 the new BBSRC five-year programme (2017-2022) of work on the Long-term Experiments National Capability began at Rothamsted.

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In Autumn 2017 the five-course rotation on Broadbalk changed from winter wheat, winter wheat, winter wheat, winter oats, maize (W, W, W, O, M), to winter wheat, winter wheat, winter oats, winter wheat, winter beans (W, W, O, W, Be). In February 2018, a meeting was convened to discuss the wheat variety grown on Broadbalk. It was agreed to change the wheat variety from Crusoe to Zyatt, a potentially higher yielding variety, in Autumn 2018.

Data held within the electronic Rothamsted Archive (e-RA) was updated to include the 2017 yield data from Park Grass. New data for Broadbalk and Hoosfield are currently being added. In addition, figures summarizing grain yields for winter wheat and spring barley on selected treatments of the Broadbalk (1852-2016) and Hoosfield (1852-2015) experiments were updated for inclusion in a paper submitted to the AAB Sustainable Intensification Conference held at Rothamsted in November 2017. Posters and papers giving details of the experiments and e-RA were also presented. The yield figures were also made available via e-RA as open access datasets (<http://www.era.rothamsted.ac.uk>).

About 20 papers relating to the Long-term Experiments were published in 2017-18, as listed in the e-RA Bibliography. In addition, a press release to publicize the findings of a paper published by Poulton et al (2018; DOI: [10.1111/gcb.14066](https://doi.org/10.1111/gcb.14066)) was produced. The paper was based on an analysis of the rates of soil organic carbon (SOC) increase in treatments from 16 long-term experiments in south-east UK. This work indicated that whilst in some cases a C increase of "4 per 1000" is possible for a limited period there are severe constraints to achieving this in practical agriculture over large areas. In addition, a paper summarising the electronic Rothamsted Archive (e-RA) as a resource for data from the Rothamsted Long-term Experiments (Perryman et al; DOI: [10.1038/sdata.2018.72](https://doi.org/10.1038/sdata.2018.72)) was accepted for publication.

Visitors to the long-term experiments were hosted throughout 2017-18. Lord John de Ramsey visited the long-term experiments as part of a tour of Rothamsted on June 26<sup>th</sup>. He was accompanied by groups from Abbots Ripton Farming Co and Strutt & Parker Farms. In addition, nine groups visited the LTE National Capability between January and March 2018. These included a group of 60 who attended the STFC Food Network meeting at Rothamsted on February 26<sup>th</sup> and a group of 65 people who attended the International Plant Resistance to Insects Symposium at Rothamsted, 7-9 March.

Work began in Autumn 2017 to revise the long-term experiments guide book and include new findings. It will be made available at the 175<sup>th</sup> Anniversary Conference (May 21-23, 2018) to celebrate the start of the Long-term Experiments (LTEs) at Rothamsted. Andy Macdonald contributed to a new research proposal on soil carbon dynamics in collaboration with colleagues at the universities of Exeter and Bristol. The proposal is based on the analyses of soils from several of the Rothamsted LTEs. The outcome of the proposal is due in Autumn 2018. Plans to install soil moisture probes on selected plots on Park Grass are currently being discussed.

### *North Wyke Farm Platform*

The Farm platform's recognition as the leading sustainable grazing systems research facility continues to grow both nationally and internationally, with nearly 100 research projects and experiments carried out on the facility. Core data continues to be made freely available from the farm platform data portal (<https://nwfp.rothamsted.ac.uk/>), and investment from the Centre for Innovation Excellence in Livestock (CIEL) continues to help develop the farm platform capability in landscape emissions and animal housing facilities. The five-year Soils to Nutrition ISP (started April 2017) continues to use core data from the farm platform and the ISP dovetails with the facility for many of its campaign-style experiments. International recognition continues through the Global Farm Platform initiative (<http://www.globalfarmplatform.org/>) and joint centres in China (Newton funded) has seen the development of similar global capabilities. Initial links with Canada, US and France have been set for the "Living Labs" concept, which acts as an alternative to ANAEE (which the UK and the farm platform has withdrawn from). Journal publications using the farm platform data or facility currently stand at 22 with more in review. A nature scientific data paper (<https://www.nature.com/sdata/>) describing the farm platform's data generation, quality control and hypotheses is still planned as a key output.



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### *Rothamsted Insect Survey ("RIS")*

James Bell, quantitative ecologist, continues as Head of the Rothamsted Insect Survey (RIS) and leads the National Capability under BBSRC's CCG mechanism (2017-2022). James manages a growing group that includes 7 staff, 2 zero-hours seasonal fieldworkers, 4 PhDs and 3 Visiting Workers. James has secured synergistic funding as work package leader in Smart Crop Protection (6.9 m). This science program will see sensors introduced to automatically count and identify insects as part of the RIS infrastructure. James has also been successful at securing the next round of BBRO funding for the group. Ramiro Morales-Hojas, molecular ecologist in the RIS, has developed genomic tools using the MinION, a hand-held sequencer. In one genomic sweep, the major vector of the BYDV virus in wheat can be detected alongside the virus and the aphid's endosymbionts. Acquisition of comparable genomic data for ten of the most pernicious aphid pests is now underway. Ramiro is leading a one year collaborative project between the Institute of Plant Protection, Chinese Academy of Agricultural Sciences, and the RIS to evaluate the genetic diversity of cereal aphid populations in China and the UK. The project will provide genetic information to understand the migration patterns of these pests, a growing concern to Chinese agriculture; Alex Greenslade, entomologist, has taken over the production of the RIS' Bulletin, Aphid News and RIS Remarks and is achieving widespread industrial impact in this regard. Mike Hall, entomologist and engineer, has created pop-up trap prototypes and four of these units have been sold to as part of a wider need by AgChem companies to conduct surveillance and monitoring of insect pests and beneficials. Dion Garrett, a PhD student started in 2017 under the Waitrose-BBSRC CTP mechanism. Dion is researching aphid pest *Nasonovia ribisnigri* in commercial lettuce crops, supported by horticultural partners Gs. Two PhDs have progressed to their second year of studies (SW DTP: spider diets Jordan Cuff and Envision DTP: moth declines Dan Blumgart). Jordan is discovering the nutritional content of aphids in the diet of generalist predators and Dan is testing whether manipulation of field margins promotes moth biodiversity. Chris Shortall (Reading-Lawes DTP: pollen beetles, part-time third year) continues to extract beetles from the archive and now has 35 years' worth of data from the Broom's Barn and Rothamsted suction traps. Chris is developing time series models to understand the mechanisms that promote pollen beetle migration. Richard Ostler, Rothamsted's data manager, is leading a strategic database post for the RIS that will be advertised shortly. In time, this will replace Paul Verrier a Lawes Trust Fellow who currently manages data for the RIS. The new website has been less successful than had been hoped because simple tasks, such as posting our Bulletins and Alerts is proving problematic. Despite this, forecasts of aphid phenology and abundance in addition to weekly bulletins (34) on population levels of key pest species continued to be provided to growers, crop consultants and levy boards (AHDB, PGRO, BBRO). Our new publications which began in 2016 are proving their worth: *RIS Remarks* is a weekly summary of the migration of non-aphid pest threats which provides qualitative changes in abundance to a readership that includes crop consultants, levy boards and industry. Its main achievement to date has been the discovery that *Drosophila suzukii*, a major pest of soft fruit, is migrating during winter. *Light Trap of the Month*, is a timely publication to better engage with our volunteers who are committed to delivering important changes in moth populations across the UK. Its main achievement to date has been the communication with trap operators of the changes in moth populations as selected sites and also the new technology that is being installed across the trap network (dosing pumps, dusk-dawn sensor). Data on moth abundances and phenology were distributed to researchers and volunteers, notably CEH who will provide summary visualisations for RIS applications. Using UKBMS's Generalised Abundance Index, CEH have analysed 804 species of moth that will be communicated to the public later in 2018. Bespoke data extractions were performed for a range of external researchers (more than 30 data requests). RIS staff presented at several important events including *Royal Entomological Society Annual National Science Meeting*, *Butterfly Conservation's Winter Meeting* and *Ento 17*. A major paper examining the rate of insect declines across the globe has been submitted to a world-leading journal. This piece of work quantifies the rates of decline, if any, across continents, presenting an authoritative account of insect population trends.

### **Science Innovation Engagement and Partnerships (SIEP)**

SIEP, replacing our Department of External Relations, was formed in January 2017, with the appointment of Angela Karp as Director. The immediate priorities for the new Director of SIEP were restructuring and development of an improved integrated strategy that better serves the Institute's science and impact.

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Recruitment of a new Head of Communications was given priority and successfully achieved, with Susan Watts taking up the post in October 2017. In addition, a professional writer (Bill O' Neill) was appointed as copy editor and content manager to support the development of the web content, script press releases and write copy for the Strategic Plan. During the first few months, major focus was given to overseeing the delivery of the new website, working with an external Project Manager and preparing for the launch of the web site and new strategy (ISPGs) on May 9<sup>th</sup>. The new Strategy Plan was initiated during this period.

Reports for individual SIEP functions for 2017-18 follow:

### **Innovation**

Rothamsted secured £150K funding from BBSRC via the Seeding Catalyst Fund which was used to support 5 short (2-3 months) internal innovation projects, a market review and entrepreneurial training for two postdoctoral researchers. A £2.7M ERDF AgRIA project, led by Rothamsted Research, was approved for funding, enabling support for 25 "short leap" collaborative innovation projects with SMEs over the next three years. The project is collaborative with UCL, University of Herts and Cranfield University and is supported by the Herts LEP and Green Triangle. Researchers at the North Wyke site secured £796K from the ERDF funded Cornwall Agri-tech project to work on 6 collaborative R&D projects with Cornish based SMEs working in the agri-tech sector. A third ERDF project, led by Exeter and in which NW is a partner, is also underway. The SIEP Director was appointed onto the BBSRC Bioscience for Business Panel, and Entrepreneurship sub group and gave evidence to the House of Lords Science and Technology Committee on behalf of the institute for its inquiry into the Life Sciences and the Industrial.

### **Business Development and Commercialisation**

To replace staff who had left to take up new posts, a new head of KEC and an IP Admin Support were appointed at the start of the year. Outputs from the alliance on wheat innovation with Syngenta, which involves 10 collaborative projects with over 70 scientists from both sides, were reviewed and a discussion was opened on a future strategic relationship with them. The alliance with Bayer on smart crop protection continued to grow last year, with 2 new projects signed off. We also opened a dialogue with BASF on a potential alliance and over 15 potential projects have been identified so far and are being developed into proposals for consideration. Numerous networking events and 1:1 meetings were also hosted with smaller businesses to develop a more diverse portfolio of interactions with industry and we now have a growing number of projects with SMEs. 29 patent families are currently under management and 1 trademark at present; of 115 granted patents from the patent portfolio, 3 were granted during this period, and 5 new filings made. We have 5 licences to present. Heads of Terms was agreed with a potential investor for one spin-out company and investors were sought for a second spin out. Introductory meetings were held with RoCRE tenants, including Agriltix, Agrix Advisors, Timac Agro.

### **Knowledge Exchange**

Rothamsted presented research displays at several key events including Grasslands & Muck 2017, Cereals 2017, 2017 LEAF conference, Agri-Tech East REAP and participated in InnovativeFarmers and YEN meetings. attendance at Agricolgy meetings which has resulted in some blog posts and workshop speaker slots for scientists (at Agricolgy's OFC event) and we presented in a speaker slot at CropTec 2017 event. RRA was terminated with the view to establishing a new stakeholder interaction group. Rothamsted hosted a number of discussions and workshops with farmers at both sites. This included facilitating discussion by farmers to identify a "consensus" list of best practice that could be recommended across diverse farming system, followed by an on-line survey to broaden participation. The FarmInn initiative was launched (under joint funding with AHDB farmer. KEC staff also supported interactions organised as part of the ISPGs, especially ASSIST and S2N and the ISCF SCP project.

### **Communications and Public Engagement**

The section reached its full complement of staff in Oct/Nov 2017, with the arrival of a new Head of Communications and a Digital Communications Manager. A "Ripple Effect" strategy has been pursued, aiming activities to reach stakeholder audiences at multiple levels: local, national and international. Local

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relations were improved, for example through chairing the Sustainable St Albans launch event and re-connecting with the Herts 10K event. The team provided strategic advice and engaged with policymakers such as the local MP, Bim Afolami (fact-finding and industrial strategy de-brief) and DEFRA (on innovation and GM Camelina trial). During the year, 68 press releases and 9 blogs were produced with successful reach in mainstream and specialist media. The team also helped to shape institute documents such as the Gender Pay Gap report and for Government initiatives such as the Transforming Food Production challenge. Close relations with LAT and the RoCRE teams were renewed, following new appointments, in keeping with our joint goal of creating "one campus". Since January 2018, much of the team's energy was been directed towards the activities associated with our 175<sup>th</sup> celebratory year.

### **Library and Information Systems (LIS)**

LIS staff delivered or contributed to a number of significant projects during this reporting period to improve efficiency of core operations and deliver new services and systems in support of science and research administration. These included:

Closure of the North Wyke site library on 11 September 2017 and transport of the book and journal stock in 250 crates to the Harpenden site for deduplication and integration into existing shelving runs once space had been created. In addition, further book stock was recovered from the old Broom's Barn site library in Suffolk before refurbishment works started.

In parallel with the above, LIS implemented stock-barcoding for the main book and thesis collections for the first time to improve asset-tracking whilst offering faster lending for scientists via a special self-service PC with a barcode reader. A temporary member of staff was employed full-time from September to December to assist in delivery of both projects.

A new online system (christened HARVESTIRR) was launched in November 2017 to replace a manual form-based process for recording details of staff publications and associated metadata. A cost-effective, customised workflow solution was developed in collaboration with Soutron (library management system provider) and Haplo (a provider of repository software). This was designed to support a more comprehensive collation of Rothamsted publications using a "one input, multiple outputs" design philosophy. Outputs include automatic population of the LIS staff publications database; automatic delivery of staff publication lists to the new Rothamsted website; email alerts to the Communications and ERA teams of new publications; mediated uploads to the ResearchFish grant reporting system used by the UK Research Councils and various internal reports. Further adjustments and enhancements have been made since go-live to reflect actual scientist use.

A substantive review of LIS subscriptions (worth c. £320,000 annually) was undertaken in Summer 2017 making use of e-resource usage data from the JISC service JUSP (<http://jusp.jisc.ac.uk>) for the first time, alongside cost per use and staff publishing data. This resulted in a mixture of short-term and longer-term cancellations being recommended to Management Committee.

Finally, 2 members of the LIS team also received formal commendations for their contributions as part of the Rothamsted new website project team in the 2017 Team of the Year Awards.

### **ACHIEVEMENTS AND PERFORMANCE**

#### **Papers published in high impact journals during 2017 (calendar year)**

The Institute published 312 papers in peer-reviewed journals in 2017 (346 in 2016; 277 in 2015; 299 in 2014; 271 in 2013; 315 in 2012).

76% of peer-reviewed papers published in 2017 were from Harpenden-based staff and 21% from North Wyke-based staff. 2% had authors from both sites.

70 papers were published in journals with an impact factor of 5 or more (66 in 2016; 56 in 2015; 58 in 2014; 45 in 2013; 66 in 2012) and 15 in higher impact journals (defined as those with impact factors >9) such as Proceedings of the National Academy of Sciences of the United States of America, Nature and Science (22 in 2016; 14 in 2015; 16 in 2014; 11 in 2013; 14 in 2012).

The range of impact factors relating to our papers was 0.055 (International Sugar Journal) to 41.667 (Nature Biotechnology). The median staff publication impact factor declined slightly from 3.84 in 2016 to 3.76 in 2017 (3.69 in 2015; 3.36 in 2014; 3.35 in 2013 and 3.19 in 2012) as did the average impact factor (4.38 in

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2017 compared to 4.72 in 2016, 4.57 in 2015, 4.51 in 2014, 4.1 in 2014 and 4.18 in 2012). This was mainly due to the decrease in number of peer-reviewed papers published.

### Citations to Rothamsted papers

The Web of Science database (published by Clarivate Analytics) was searched on 4 June 2018 for citation data for individual papers with a Rothamsted Research affiliation published in 2017. There were 22 papers found with 10 or more citations. 6 of these 'highly cited' papers were published in journals with an impact factor greater than 9.

As the census date has varied in previous year's reports, the comparable figures for the previous 5 calendar years have been restated to provide a common reference point whilst better reflecting the normal lag in citations accruing to past papers: 2016 (79 outputs with 10 or more citations); 2015 (120); 2014 (143); 2013(159) and 2012 (213).

### Open access publishing

Rothamsted Research continued to receive separate funding for open access publishing from the Biotechnology and Biological Sciences Research Council and UK Research & Innovation (formerly Research Councils UK (RCUK)). This is to support delivery of the RCUK Open Access Policy with its requirement that publications resulting from Research Council funded research should be available either as immediate open access publications on the publisher's site or as full-text deposits in a repository within six months of publication. Institutions are expected to achieve 75% compliance by the end of the 5-year transition period (2017-18). The grant funding covers the costs of article processing charges (APCs) which publishers levy on authors writing for their "gold open access" publications in return for granting free access. Annual reporting on compliance with UKRI/RCUK policy is required as a condition of the grant award. For the reporting year 1 April 2017 to 31 March 2018, Rothamsted achieved 73% compliance with 204 of 285 qualifying outputs published via some form of open access (71% in 2017). APCs for 77 papers (49 in 2017), were paid from the two Rothamsted open access grants at an average cost of £1,650/paper. Spend per publisher ranged from £44,180 (Elsevier) to £1,323 (American Society of Plant Biologists).

## ACHIEVEMENTS AND PERFORMANCE: Grants and contracts won

Just as the publications from Rothamsted Research are a measure of achievements made by previous research, the quality and magnitude of grants won from major grant giving bodies available to UK researchers is an indicator of the high reputé and esteem in which Rothamsted's proposals are held. It holds great promise for the strength of future work. As an indicator of success in this area, the table below summarises the successes in drawing on a variety of sponsors and covering the broad range of scientific activities to be found at the Institute.

<u>Funder*</u>	Average annual total value of all grants won over 5 years £'000
BBSRC	5,828
DEFRA	671
EU	782
Industry	3,494
Other Government Departments and Public Sector	3,118
Trusts, Foundations, Charities	2,003
	<hr/> 15,896 <hr/>

\* Note that the values are at approved Full Economic Costs (FEC); BBSRC and other research council awards are provided at 80% of the amount shown. All others are at the full value

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<b>BBSRC STRATEGIC GRANT TYPE</b>	<b>Total 2017/18 to 2021/22* £'000</b>
Tailoring Plant Metabolism	6,940
Soil to Nutrition	8,500
Designing Future Wheat	9,665
ASSIST	2,955
<b>Total ISPG's</b>	<b>28,060</b>
<b>Core Capability Grants (including national capabilities)</b>	<b>18,495</b>
<b>Open Access Grant</b>	<b>425</b>
<b>Knowledge Exchange and Commercialisation Grant</b>	<b>3,890</b>
<b>Total Resource Grants for 5 years</b>	<b>50,871</b>
<b>*Provisional allocation for 2020/21 to 2021/22</b>	

These ISPG and strategic grants are of strategic importance to Rothamsted Research reflecting the commitment to the Institute by the BBSRC to this area of scientific endeavour and the potential beneficial impact for the UK economy and the global food and energy security agenda.

### ACHIEVEMENTS AND PERFORMANCE – Other

#### *Management*

Professor Achim Dobermann is supported in his role as Institute Director and Chief Executive by Louise O'Brien, Director of Operations, and Angela Karp, Director of Science, Innovation, Engagement & Partnership (SIEP). The Management Committee focuses on the overall Institute strategy and management, including accountability for implementation. Members include the Institute Director, the Director of Operations, the Director of SIEP, and the five Heads of the Science Departments. The Research Strategy Committee focuses on science strategy and resource mobilisation. Members include the Institute Director, Director of SIEP, the five Heads of the Science Departments, the ISPG Leaders, the Integrated Solutions Laboratory Flagship Leader, the Chair of the SIFT panel and the Head of Grants & International.

#### *Board*

Professor Sir John Beddington FRS is the Chair of the Rothamsted Research Limited Board of Trustee-Directors. In addition to numerous high profile publications Sir John was from 2008 until 2013 the Government Chief Scientific Adviser (GCSA) reporting directly to the Prime Minister.

#### *Campus development*

A Campus Development Committee has been formed, comprising representatives from Rothamsted Research, RoCRE and LAT to consider the site holistically and determine the best and most effective use and development of the land and facilities. A new accommodation block funded by LAT, replacing the former Fisher Building, has been completed and is now occupied. Students and Visiting Workers are given priority access to the accommodation, enhancing their experience at, and the reputation of, Rothamsted Research.

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Rothamsted has renewed its commitment at the Brooms Barn site. A new Large Scale Rotational Experiment (LSRE) is being established, and this flagship trial will reinvigorate other work at the site by Rothamsted and others. We are also looking to refurbish part of the buildings to house field sample processing facilities for our visiting scientists.

### **PUBLIC BENEFIT**

Rothamsted Research Limited traces its primary Object back to that of the Lawes Agricultural Trust (LAT – still extant and owner of the land and building assets at Rothamsted and Brooms Barn) from which it was created in 1986; this Object can be summarised as the advancement of the science of agriculture. By virtue of the means and routes by which this is carried out, it is clearly aimed at public benefit and so falls within the charitable purpose of “the advancement of the arts, culture, heritage or science”. There are inevitable ancillary benefits from the primary activities as a result of meeting the primary object that would fall into the categories of advancement of education, the advancement of environmental protection or improvement and, perhaps to a more limited extent, the advancement of health. The Charity Commission guidance lists “scientific research” as one of the approved categories and specifically mentions scientific research projects under the heading of the advancement of science. The Trustee-Directors have complied with section 17 of the Charities Act 2011 to have due regard to public benefit guidance published by the Charity Commission.

In the preceding sections of this report we detail how the objectives and achievements of Rothamsted Research have been successfully pursued. We aim to reach the highest level in the quality of our scientific research; we ensure that this is fully and widely distributed to a global audience and so achieve international recognition. This will continue to be via the refereed scientific literature, through contributions to research conferences as speakers and poster providers and via popular press articles for farmers and those engaged in land management. For the wider public we both initiate debates on important scientific issues relating to food production and security and proactively engage in discussions and consultations involving these topics.

We are convinced of the necessity to help ensure that our scientific advances can enhance the countryside and environment at both a national and a global level taking as many steps as we can to ensure this is achieved.

The benefits of our work reach and influence, directly or indirectly, all sectors of society: the broad aim of optimising the use of resources, maintaining crop production, while minimising potentially damaging environmental impacts is of benefit to all of humanity. There are some sectors of society who hold views that would limit the introduction of some of the technologies that arise from, or are an inherent part of, our scientific investigations; genetic modification of crop plants might fall into this category. Equally, much of our work is of direct benefit to the practices that are supported by the very same groups; improvement of biological control strategies may be highlighted in this context. Thus, we cover a wide number of sectors and interests and philosophical positions without favouring any one.

The scientific strategy is highly outcome-focussed. Rothamsted Research Limited is continuing to monitor and understand the benefits that the research work has brought to a broad cross section of the community and more details can be seen on the web site at <http://www.rothamsted.ac.uk/our-science>. This covers a range of scientific disciplines but examples include improvement of fertiliser recommendations to reduce waste and pollution, improved monitoring of aphids, tracking and controlling potato diseases, enhancing disease resistance in oilseeds used in the Indian sub-continent and controlling insect vectors of human/animal disease for use in both the developed and developing world. Also, Rothamsted data has informed regulations for heavy metal levels in grains, glucosinolate levels in rape seed oil and opportunities for monitoring and improving soil health.

Indirect benefit may arise from a commercial company identifying new opportunities within our research findings or during a collaboration; this is incidental to our work so in our dealings with commercial companies we do not accept any blanket inhibition on freedom to publish. We do accept that, in some examples, the best way that scientific discoveries may be introduced and achieve the most widespread use

# Rothamsted Research Limited

## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

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is through protection of our intellectual property and therefore fully accept that such an approach can be a legitimate form of comprehensive dissemination and actively pursue this where appropriate. Any financial benefit captured by RRes in this or any other way will be used to further pursue its Objects.

### FINANCIAL REVIEW

#### Income

Total incoming resources for the year for the year were £36.4m (2017: £39.7m). This included capital grants of £6.6m (2017: £1.0m). Rothamsted's principal funder is the UK Biotechnology and Biological Sciences Research Council (BBSRC) which contributed 71% of total income (2017: 63%). The Institute's largest funding stream from the BBSRC is the Institute Strategic Programme Grant which has reduced by 8% in the year from £12.7m to £11.7m.

#### Expenditure

Recurrent expenditure for the year amounted to £35.6m (2017: £38.7m) with staff costs accounting for £19.0m (53%) of expenditure (2017: £19.7m or 51%). Non recurrent redundancy costs were £1.6m (2017: nil).

#### Net movement in reserves and reserves position

The net movement in reserves for the year was a decrease of £0.9m. Unrestricted reserves fell by £1.6m to £24.3m, and restricted reserves increased by £0.7m to £45.2m.

The Institute is very carefully monitoring its cost base and is striving for efficiency savings where possible in order to prevent future deterioration of its unrestricted reserves. The Institute is operating on a tight financial budget for the remainder of the current Institute Strategic Programme funding cycle (to March 2022) and is putting in place the tools to improve the quality and success rates of grant applications and secure additional income streams.

#### Subsidiaries and joint ventures

One subsidiary company (Rothamsted Manor Ltd) contributed a loss of £108k which was fully provided for in the charity's financial statements and one joint venture (Rothamsted Centre for Research and Enterprise Limited) made a loss of £188k of which Rothamsted's 40% share was £75k. Both the companies are primarily engaged in property and event management with their results impacting on the unrestricted reserves of the group. Together RML and RoCRE have established a business plan for hosting external events, such as weddings, at The Manor with the appropriate consents and permissions having been granted and it is anticipated that such activities should enable both companies to eliminate their deficits.

#### Capital expenditure

Capital expenditure for the year was £9.3m. This was part funded by £3.2m of funds released from the restricted Estate Rebuild Fund to fund the purchase of assets to support our Institute Strategic Programmes (ISP's). It also includes capital spend which was supported by a capital grant from BBSRC.

#### Cash

Cash at 31 March 2018 was £23.2m (2017: £29.3m). The reduction is in part down to capital expenditure made in the year. Rothamsted deposits its cash with major UK clearing banks. Income from cash deposits in the year was £112k (2017: £240k).

# Rothamsted Research Limited

## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

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### Investment policy

The Group's investments are held to:

- Provide operational liquidity
- Plan for scientific research and
- Support intellectual property

Investments are held as fixed term deposits with major UK clearing banks. Cash is drawn down in line with a planned expenditure schedule within the budget and in conjunction with the reserves policy and forecasting. Maturities of the deposits match these timelines.

In addition there are a small number of investments held to achieve a longer term return on intellectual property to provide funding for future research programmes and a model for commercialization of research and innovation in to the market place.

### Reserves policy

The Group's reserves are held to support financial solvency, manage uncertainty and fund future activities. The level of reserves required by the group is therefore determined by reference to:

- Future operational and capital expenditure requirements for the ISP funding cycle
- Potential financial risks identified in the risk register
- Potential funding required for strategic investments not included in the operating budget
- Working capital/liquidity requirements

Unrestricted reserves that have been designated for specific purposes are shown in a separate designated reserve. £1.5m is designated for ensuring the long term sustainability of the Institute's estate facilities.

The Institute has set itself a target level of reserves of £10.8m and defines its current free reserves as £12.6m.

### Key performance indicators

During the year a number of key performance indicators (KPI's) have been implemented in order for the executive team and trustee board to monitor financial performance and sustainability of the Institute. Each KPI is Specific, Measurable, Achievable, Realistic and Time-bound (SMART) and is reported on at least once a quarter.

For external reporting the following four KPI's have been chosen.

KPI 1 is concerned with the submitting and winning of new grants in order to generate additional income. A grant will typically span several years.

KPI 2 measures the commerciality of active grants to ensure that the additional income generated is profitable and contributes to the overheads of the Institute.

KPI 3 measures the financial performance of our unrestricted reserves in the year and targets modest movements in the region of £1m either way.

KPI 4 measures the overall value of unrestricted reserves and is used in conjunction with the reserves policy.

Targets were set for the financial year based on performance in the previous year and the overall performance is highlighted in the table below.



# Rothamsted Research Limited

## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

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	2016/17	2017/18	Target for 2017/18
KPI 1: Grants awarded (£)	6,339	13,123	8,000
KPI 2: Net income from grants	15,122	10,890	15,000
KPI 3: Unrestricted net surplus/deficit	1,377	(1,511)	(1,000)
KPI 4: Unrestricted reserves	26,121	24,610	25,121

The total value of grants awarded has increased significantly on the previous year (KPI 1). This is positive news for the future periods which the new awards will cover but the impact has been too late for this financial year ended 31<sup>st</sup> March 2018 where overall income and therefore net income is significantly down (KPI 2).

The adverse movement in unrestricted reserves was greater than targeted and last year (KPI 3) which in turn has led to the overall value of unrestricted reserves being below target also (KPI 4).

### FUTURE DEVELOPMENTS

Within the overall UK research landscape, Rothamsted's key strength lies in conducting **strategic, problem-oriented, integrated agricultural science with wide impact**. Embedding a systems approach and working in an excellence- and outcome-driven manner, we develop novel solutions for the sustainable intensification, smart protection and diversification of arable and grassland-livestock systems in the UK and globally. This approach is firmly embedded in the new Science Strategy for 2017-2022, which we are implementing since April 2017. Strategic funding from BBSRC supports our Institute Strategic Programmes, National and other Core Capabilities of the institute. Our primary strategy is to systematically build up portfolios of focused research around these strategic programmes, including strong partnerships with public and private sector partners in the UK, with industry, and internationally.

Our priorities for 2018/19 are to (i) diversify and increase grants income from public, philanthropic and industry sources, (ii) implement novel innovation mechanisms to accelerate our strategic research and its impact, (iii) expand our commercialisation efforts through new spinouts, (iv) continue our path of significant culture changes throughout the whole organisation, and (v) improve the financial sustainability of the institute through a variety of business management measures.

While pursuing a strategy of wide benefits for consumers, a stronger connection with the UK farming and farming business community will be a high priority for us. We will also engage with the government on developing innovative policies for future farming in the UK. Rothamsted Research Limited will further expand its international activities, including engaging more in research that is highly relevant for low- and middle-income countries. We strive to become a vibrant hub in agricultural sciences that is internationally renowned for achieving excellence in both science and innovation and, thereby, more social and economic impact from agricultural science.

# Rothamsted Research Limited

## TRUSTEES' REPORT (INCORPORATING THE STRATEGIC REPORT)

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### AUDITOR

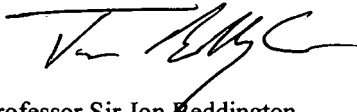
RSM UK Audit LLP has indicated its willingness to continue in office.

### STATEMENT AS TO DISCLOSURE OF INFORMATION TO THE AUDITOR

The Directors who were in office at the date of approval of these financial statements have confirmed, as far as they are aware, that there is no relevant audit information of which the auditor is unaware. The Directors have confirmed that they have taken all the steps that they ought to have taken as Directors to make themselves aware of any relevant audit information and to establish that it has been communicated to the auditor.

The Trustees' Report (incorporating the Strategic Report) was approved by the Board and signed

### On Behalf of the Board



Professor Sir Jon Beddington  
Trustee  
Rothamsted Research Limited  
Harpenden  
Hertfordshire  
AL5 2JQ

Dated: 11 September 2018

# Rothamsted Research Limited

## STATEMENT OF TRUSTEES' RESPONSIBILITIES

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### STATEMENT OF TRUSTEES' RESPONSIBILITIES

The trustees (who are also directors of Rothamsted Research Limited for the purposes of company law) are responsible for preparing the Trustees' Report (and the incorporated Strategic Report) and the financial statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

Company law requires the trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charitable company and the group and of the incoming resources and application of resources, including the income and expenditure, of the charitable company and group for that period.

In preparing these financial statements, the trustees are required to:

- select suitable accounting policies and then apply them consistently;
- observe the methods and principles in the Charities SORP;
- make judgments and estimates that are reasonable and prudent;
- state whether applicable United Kingdom Accounting Standards have been followed, subject to any material departures disclosed and explained in the financial statements; and
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charitable company will continue in business.

The trustees are responsible for keeping proper accounting records that disclose with reasonable accuracy at any time the financial position of the charitable company and the group and enable them to ensure that the Financial Statements comply with the Companies Act 2006. They are also responsible for safeguarding the assets of the charitable company and group and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

The trustees are responsible for the maintenance and integrity of the corporate and financial information included on the charitable company's website. Legislation in the United Kingdom governing the preparation and dissemination of financial statements may differ from legislation in other jurisdictions.

# Rothamsted Research Limited

## INDEPENDENT AUDITOR'S REPORT TO THE MEMBERS OF ROTHAMSTED RESEARCH LIMITED

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### Opinion

We have audited the financial statements of Rothamsted Research Limited (the 'parent charitable company') and its subsidiaries (the 'group') for the year ended 31 March 2018 which comprise the Consolidated Statement of Financial Activities, the Charity Statement of Financial Activities, the Consolidated and parent charitable company Balance Sheets, the Consolidated and Charity Cash Flow Statements and notes to the financial statements, including a summary of significant accounting policies. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards, including FRS 102 "The Financial Reporting Standard applicable in the UK and Republic of Ireland" (United Kingdom Generally Accepted Accounting Practice).

In our opinion the financial statements:

- give a true and fair view of the state of the group's and the parent charitable company's affairs as at 31 March 2018 and of the group's and the parent charitable company's incoming resources and application of resources, including their income and expenditure, for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Companies Act 2006.

### Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) (ISAs (UK)) and applicable law. Our responsibilities under those standards are further described in the Auditor's responsibilities for the audit of the financial statements section of our report. We are independent of the group and parent charitable company in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, including the FRC's Ethical Standard and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

### Conclusions relating to going concern

We have nothing to report in respect of the following matters in relation to which the ISAs (UK) require us to report to you where:

- the trustees' use of the going concern basis of accounting in the preparation of the financial statements is not appropriate; or
- the trustees have not disclosed in the financial statements any identified material uncertainties that may cast significant doubt about the group's or parent charitable company's ability to continue to adopt the going concern basis of accounting for a period of at least twelve months from the date when the financial statements are authorised for issue.

### Other information

The trustees are responsible for the other information. The other information comprises the information included in the Trustees' Report (incorporating the Strategic Report) other than the financial statements and our auditor's report thereon. Our opinion on the financial statements does not cover the other information and, except to the extent otherwise explicitly stated in our report, we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If we identify such material inconsistencies or apparent material misstatements, we are required to determine whether there is a material misstatement in the financial statements or a material misstatement of the other

# Rothamsted Research Limited

## INDEPENDENT AUDITOR'S REPORT TO THE MEMBERS OF ROTHAMSTED RESEARCH LIMITED

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information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

### **Opinions on other matters prescribed by the Companies Act 2006**

In our opinion, based on the work undertaken in the course of the audit:

- the information given in the Trustees' Report (incorporating the Strategic Report) prepared for the purpose of company law for the financial year for which the financial statements are prepared is consistent with the financial statements; and
- the Trustees' Report (incorporating the Strategic Report) has been prepared in accordance with applicable legal requirements.

### **Matters on which we are required to report by exception**

In the light of the knowledge and understanding of the group and the parent charitable company and their environment obtained in the course of the audit, we have not identified material misstatements in the Trustees' Report (incorporating the Strategic Report).

We have nothing to report in respect of the following matters where the Companies Act 2006 requires us to report to you if, in our opinion:

- adequate accounting records have not been kept by the parent charitable company, or returns adequate for our audit have not been received from branches not visited by us; or
- the parent charitable company financial statements are not in agreement with the accounting records and returns; or
- certain disclosures of trustees' remuneration specified by law are not made; or
- we have not received all the information and explanations we require for our audit.

### **Responsibilities of trustees**

As explained more fully in the Statement of Trustees' Responsibilities set out on page 26, the trustees (who are also the directors of the charitable company for the purposes of company law) are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view, and for such internal control as the trustees determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the trustees are responsible for assessing the group's and parent charitable company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the trustees either intend to liquidate the group or parent charitable company or to cease operations, or have no realistic alternative but to do so.

### **Auditor's responsibilities for the audit of the financial statements**

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

A further description of our responsibilities for the audit of the financial statements is provided on the Financial Reporting Council's website at <http://www.frc.org.uk/auditorsresponsibilities>. This description forms part of our auditor's report.

# Rothamsted Research Limited

## INDEPENDENT AUDITOR'S REPORT TO THE MEMBERS OF ROTHAMSTED RESEARCH LIMITED

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### Use of our report

This report is made solely to the charitable company's members, as a body, in accordance with Chapter 3 of Part 16 of the Companies Act 2006. Our audit work has been undertaken so that we might state to the charitable company's members those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charitable company and the charitable company's members as a body, for our audit work, for this report, or for the opinions we have formed.

*RSM UK Audit LLP*

Stephanie Warboys (Senior Statutory Auditor)

For and on behalf of RSM UK AUDIT LLP, Statutory Auditor  
Chartered Accountants  
St Philips Point  
Temple Row  
Birmingham  
B2 5AF

Date *20th September 2018*

**Rothamsted Research Limited**  
**CONSOLIDATED STATEMENT OF FINANCIAL ACTIVITIES**  
**for the year ended 31 March 2018**

	Notes	Unrestricted funds £'000	Restricted funds £'000	Total funds 2018 £'000	Total funds 2017 £'000
<b>INCOME</b>					
Income from:					
- trading	1	857	-	857	548
- investments	2	126	-	126	263
- donations		-	87	87	-
Income from charitable activities:					
- scientific research	3	14,566	13,496	28,062	36,923
- capital grants	3	-	6,604	6,604	988
- postgraduate education and training	3	653	-	653	1,002
		<u>15,219</u>	<u>20,100</u>	<u>35,319</u>	<u>38,913</u>
<b>TOTAL INCOME</b>		<u>16,202</u>	<u>20,187</u>	<u>36,389</u>	<u>39,724</u>
<b>EXPENDITURE ON:</b>					
Raising funds	5	238	-	238	213
Charitable activities	6a	20,673	16,303	36,976	38,372
Net interest in results of joint venture	11	75	-	75	119
		<u>20,986</u>	<u>16,303</u>	<u>37,289</u>	<u>38,704</u>
<b>TOTAL EXPENDITURE</b>		<u>20,986</u>	<u>16,303</u>	<u>37,289</u>	<u>38,704</u>
<b>NET INCOME / (EXPENDITURE) FOR THE YEAR BEFORE TRANSFERS</b>		<u>(4,784)</u>	<u>3,884</u>	<u>(900)</u>	<u>1,020</u>
Transfer between funds	17	3,200	(3,200)	-	-
<b>NET MOVEMENT IN FUNDS IN YEAR</b>		<u>(1,584)</u>	<u>684</u>	<u>(900)</u>	<u>1,020</u>
<b>RECONCILIATION OF FUNDS</b>					
Fund balances at 1 April 2017		<u>25,896</u>	<u>44,468</u>	<u>70,364</u>	<u>69,344</u>
Fund balances at 31 March 2018		<u>24,312</u>	<u>45,152</u>	<u>69,464</u>	<u>70,364</u>

All income and expenditure derives from continuing activities

**Rothamsted Research Limited**  
**CHARITY STATEMENT OF FINANCIAL ACTIVITIES**  
for the year ended 31 March 2018

	Notes	Unrestricted funds £'000	Restricted funds £'000	Total funds 2018 £'000	Total funds 2017 £'000
<b>INCOME</b>					
Income from:					
- trading	1	742	-	742	354
- investments	2	126	-	126	263
- donations		-	87	87	-
Income from charitable activities:					
- scientific research	3	14,566	13,496	28,062	36,923
- capital grants	3	-	6,604	6,604	988
- postgraduate education and training	3	653	-	653	1,002
		<u>15,219</u>	<u>20,100</u>	<u>35,319</u>	<u>38,913</u>
<b>TOTAL INCOME</b>		<u>16,087</u>	<u>20,187</u>	<u>36,274</u>	<u>39,530</u>
<b>EXPENDITURE ON:</b>					
Raising funds	5	16	-	16	16
Charitable activities	6a	20,782	16,303	37,085	38,373
		<u>20,798</u>	<u>16,303</u>	<u>37,101</u>	<u>38,389</u>
<b>TOTAL EXPENDITURE</b>		<u>20,798</u>	<u>16,303</u>	<u>37,101</u>	<u>38,389</u>
<b>NET INCOME / (EXPENDITURE) FOR THE YEAR BEFORE TRANSFERS</b>		<u>(4,711)</u>	<u>3,884</u>	<u>(827)</u>	<u>1,141</u>
Transfer between funds	17	3,200	(3,200)	-	-
		<u>(1,511)</u>	<u>684</u>	<u>(827)</u>	<u>1,141</u>
<b>NET MOVEMENT IN FUNDS IN YEAR</b>		<u>(1,511)</u>	<u>684</u>	<u>(827)</u>	<u>1,141</u>
<b>RECONCILIATION OF FUNDS</b>					
Fund balances at 1 April 2017		26,121	44,468	70,589	69,448
		<u>24,610</u>	<u>45,152</u>	<u>69,762</u>	<u>70,589</u>
Fund balances at 31 March 2018		<u>24,610</u>	<u>45,152</u>	<u>69,762</u>	<u>70,589</u>



# Rothamsted Research Limited

## BALANCE SHEETS

31 March 2018

Company Registration Number 2393175

	Notes	Group 2018 £'000	Charity 2018 £'000	Group 2017 £'000	Charity 2017 £'000
<b>FIXED ASSETS</b>					
Tangible assets	10	49,022	49,017	42,127	42,108
Investments	11	153	153	153	153
Joint venture	11	(295)	-	(220)	-
		<u>48,880</u>	<u>49,170</u>	<u>42,060</u>	<u>42,261</u>
<b>CURRENT ASSETS</b>					
Stock		710	710	444	444
Debtors	12	8,512	8,745	6,862	7,084
Cash at bank and in hand		23,209	22,961	29,260	29,090
		<u>32,431</u>	<u>32,416</u>	<u>36,566</u>	<u>36,618</u>
<b>CREDITORS: Amounts falling due within one year</b>	13	<u>(11,847)</u>	<u>(11,824)</u>	<u>(8,262)</u>	<u>(8,290)</u>
<b>NET CURRENT ASSETS</b>		<u>20,584</u>	<u>20,592</u>	<u>28,304</u>	<u>28,328</u>
<b>TOTAL ASSETS LESS CURRENT LIABILITIES</b>		<u>69,464</u>	<u>69,762</u>	<u>70,364</u>	<u>70,589</u>
<b>NET ASSETS</b>	17	<u>69,464</u>	<u>69,762</u>	<u>70,364</u>	<u>70,589</u>
<b>FUNDS</b>					
Restricted funds	17	45,152	45,152	44,468	44,468
Unrestricted funds:					
General funds		22,812	23,110	24,396	24,621
Designated funds		1,500	1,500	1,500	1,500
	17	<u>24,312</u>	<u>24,610</u>	<u>25,896</u>	<u>26,121</u>
<b>TOTAL FUNDS</b>		<u>69,464</u>	<u>69,762</u>	<u>70,364</u>	<u>70,589</u>

The financial statements set out on pages 30 to 58 were approved by the Board and authorised for issue on 11 September 2018 and signed on its behalf by:



Stuart Jarvis  
Director

**Rothamsted Research Limited**  
**CONSOLIDATED CASH FLOW STATEMENT**  
**for the year ended 31 March 2018**

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	<i>Notes</i>	2018 £'000	2017 £'000
Cash (used by)/generated from operations	18	(3,444)	884
 Cash flows from investing activities			
Dividends, interest and rent from investments		126	263
Purchase of property, plant and equipment		(9,337)	(3,418)
Capital grants received		6,604	988
Capital grants expended		-	(988)
Proceeds on sale of fixed assets		-	5
Decrease in money market deposits greater than 90 days		2,370	1,036
 Net cash used in investing activities		<u>(237)</u>	<u>(2,114)</u>
 Change in cash and cash equivalents in reporting period		(3,682)	(1,230)
Cash and cash equivalents at beginning of reporting period		17,390	18,620
 Cash and cash equivalents at the end of the reporting period	18	<u><u>13,709</u></u>	<u><u>17,390</u></u>

**Rothamsted Research Limited**  
**CHARITY CASH FLOW STATEMENT**  
for the year ended 31 March 2018

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	<i>Notes</i>	2018 £'000	2017 £'000
Cash (used by)/generated from operations	19	(3,528)	902
 Cash flows from investing activities			
Dividends, interest and rent from investments		126	263
Purchase of property, plant and equipment		(9,332)	(3,418)
Capital grants received		6,604	988
Capital grants expended		-	(988)
Proceeds on sale of fixed assets		-	5
Decrease in money market deposits greater than 90 days		2,370	1,036
 Net cash used in investing activities		<u>(232)</u>	<u>(2,114)</u>
 Change in cash and cash equivalents in reporting period		(3,760)	(1,212)
Cash and cash equivalents at beginning of reporting period		17,220	18,432
 Cash and cash equivalents at the end of the reporting period	19	<u><u>13,460</u></u>	<u><u>17,220</u></u>

# Rothamsted Research Limited

## ACCOUNTING POLICIES

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These financial statements have been prepared in accordance with FRS102 (The Financial Reporting Standard applicable in the UK and the Republic of Ireland (FRS102)). The financial statements have been prepared under the historical cost convention as modified by carrying investments at fair value. The financial statements meet the requirements of the Companies Act 2006, the Statement of Recommended Practice - Accounting and Reporting by Charities (Charities SORP (FRS102)) and applicable accounting standards so far as these requirements are appropriate. Rothamsted Research Limited is a private company limited by guarantee and a registered charity. It is registered, domiciled and incorporated in England. The charity is a public benefit entity as defined by FRS102. Monetary amounts in these financial statements are rounded to the nearest whole £1,000, except where otherwise indicated. Sterling is the Group's functional and presentational currency.

In accordance with FRS 102, the charity has taken advantage of the exemption from the following disclosure requirement in its individual financial statements: Section 33 'Related Party Disclosures' – Compensation for key management personnel.

### GOING CONCERN

The Group has net current assets of £20,584k (2017: £28,304k) and the Charity £20,592k (2017: £28,328k).

The Charity undertakes a detailed annual Business Planning and budgeting exercise where income, expenditure and cashflow are forecast for the following 5 (five) years. The forecast is revised for major changes at least three times per year. The forecasts reflect the funding from the successful 2017-2022 BBSRC ISPG applications. The forecasts also include an intentional and strategic draw down of both unrestricted and restricted reserves, in line with the Reserves Policy and with the full support of BBSRC.

The Directors have reviewed the going concern status of the Group and the Charity and their assessment based on these forecasts is that the Charity and the Group can continue as a going concern for the foreseeable future.

### BASIS OF CONSOLIDATION

The results of Rothamsted Manor Limited have been included in the consolidated financial statements on a line by line basis, using the acquisition method of accounting. Rothamsted Manor Limited is the only UK subsidiary undertaking that has traded during the year (see Note 11). Other subsidiaries have not been consolidated on grounds of immateriality.

### JOINT VENTURES

Undertakings in which the group has a long-term interest and which are under joint control are defined as joint ventures. Joint ventures are accounted for using the equity method.

### TANGIBLE ASSETS

Tangible assets are depreciated to their estimated residual values over their expected useful lives on a straight-line basis. Items over £3,000 are capitalised.

Buildings	25 - 50 years
Plant & Machinery	5 - 10 years
Fixtures, Fittings and Vehicles	3 - 10 years

Assets under the course of construction are included at cost, and will be depreciated to their estimated residual values over their expected useful lives on a straight-line basis once the asset is available for use. Freehold land is included at cost and not depreciated. An assessment is made at each reporting date of whether there are any indications that a fixed asset may be impaired or that an impairment loss previously recognised has fully or partially reversed. If such indications exist, the recoverable amount of the asset is estimated. Shortfalls between the carrying value of fixed assets and their recoverable amounts are recognised as impairments in the Statement of Financial Activities.

# Rothamsted Research Limited

## ACCOUNTING POLICIES

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### STOCKS

Inventory takes the form of both materials to be consumed in the rendering of services and assets held for sale in the ordinary cost of business (farm livestock). Inventory is measured at the lower of cost and estimated selling price less cost to complete and sell.

### INVESTMENTS

Unlisted investments are carried at directors' estimate of fair value as at the Balance Sheet date, and any gains or losses taken to the Statement of Financial Activities.

### INVESTMENTS IN GROUP UNDERTAKINGS

Investments in group undertakings are stated at cost less impairment, where relevant, as these represent shareholdings in unlisted companies.

### FUND ACCOUNTING

General funds are unrestricted funds which are available for use at the discretion of the trustee-directors in furtherance of the general objectives of the Charity and which have not been designated for other purposes.

Designated funds comprise unrestricted funds that have been set aside by the Directors for particular purposes. The aim and use of each designated fund is set out in the notes to the financial statements.

Restricted funds are funds which are to be used in accordance with specific restrictions imposed by donors or which have been raised by the Charity for particular purposes. The cost of raising and administering such funds is charged against the specific fund. The aim and use of the restricted funds are set out in the notes to the financial statements.

### INCOME

All income except grants is included in the Statement of Financial Activities when the Group or Charity is legally entitled to the income and the amount can be quantified with reasonable accuracy. Income from grants, including capital grants, is included within income when these are receivable, except as follows:

- When donors specify that grants given to the Charity must be used in future accounting periods, the income is deferred until those periods.
- When donors impose conditions, which must be fulfilled before the Charity becomes entitled to use such income, and those conditions are outside the control of the Charity, the income is deferred and not included in income until pre-conditions for use have been met.

When donors specify that grants, including capital grants, are for restricted purposes, which do not amount to pre-conditions regarding entitlement, this income is included in restricted funds when receivable.

Rothamsted Manor Limited (RML) generates income from property and events management. The income and expenditure associated with this activity are included within income from trading and expenditure on raising funds.

### EXPENDITURE

Liabilities are recognised as expenditure as soon as there is a legal or constructive obligation committing the Group or Charity to the expenditure. All expenditure is included in the Statement of Financial Activities on an accruals basis, inclusive of any VAT which cannot be recovered, and have been classified under headings that aggregate all costs related to the category.

- Costs of raising funds are those costs incurred in trading activities which raise funds.
- Charitable activities include expenditure associated with scientific research and postgraduate education and training and include both the direct costs and support costs relating to these activities.
- Governance costs include those incurred in the governance of the Charity and its assets and are primarily associated with constitutional and statutory requirements.
- Support costs include central functions and have been allocated to activity cost categories on a basis consistent with the use of resources

# Rothamsted Research Limited

## ACCOUNTING POLICIES

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### OPERATING LEASES

Rentals under operating leases are written off on a straight-line basis over the term of the lease.

### GRANTS

Expenditure by the Charity, which is financed by grants from third parties and applied to buildings not owned by the Group, is capitalised and included within Restricted Funds. The rent-free provision to the Charity of the buildings, on which such expenditure has been applied, is not treated as a donation as it is not possible to place an appropriate value on such arrangements.

Grants received as Unrestricted Funds, whether designated or general, are deferred to the extent that they relate to expenditure where the donor has stipulated that they be incurred in future periods, or are subject to pre-conditions that have not been met at the balance sheet date.

### PENSION COSTS

Employees who remain on BBSRC contracts are members of the Research Councils' Pension Schemes. These are defined benefit schemes, the finances of which are administered by the BBSRC, and for which separate accounts are published (see Note 9). The pension schemes are administered by the Research Councils' Joint Superannuation Services and the schemes' finances are administered by the BBSRC. Under the definitions set out in FRS 102, the scheme is a multi-employer pension scheme. The Charity is unable to identify its share of the underlying assets and liabilities of the scheme. Accordingly, the Charity has accounted for its contributions to the scheme as if it were a defined contribution scheme. The pension costs represent contributions payable by the Group to the schemes.

Employees with Rothamsted contracts are members of a defined contribution scheme. The amount charged as expenditure represents the contributions payable by the Group in the year and is split between restricted and unrestricted funds based on how the individual is funded.

### REDUNDANCY COSTS

A liability is recognised for redundancy where the charity is demonstrably committed to terminating the employment of an employee or to provide termination benefits. A redundancy payment is charged to the Statement of Financial Activities immediately on recognition at the best estimate of the cost at the reporting date. Where the responsibility for funding the redundancy payment lies with a third party in full or in part the associated income is immediately recognised in the Statement of Financial Activities.

Redundancy payments for employees who remain on BBSRC contracts are linked to severance arrangements under the exit terms outlined in the Civil Service Compensation Scheme Terms (CSCS). These terms cover all agreed exits under Voluntary Redundancy, Compulsory Redundancy and Voluntary Exit. Payments are made following a process approved by Joint Superannuation Services (JSS) who administer the CSCS on the charity's behalf. Severance estimates are provided as part of the agreed redundancy process with funding being agreed at 100% with BBSRC until 31 March 2020, tapering off to 50% from 1st April 2020, 25% from 1st April 2021 and 0% from 1st April 2022.

Redundancy payments for staff employed by the charity under Rothamsted contracts are not funded and are calculated in accordance with statutory provisions.

### RELATED PARTY TRANSACTIONS

BBSRC and LAT are related parties of the Institute.

### RESEARCH AND DEVELOPMENT

All research and development costs are written off as incurred.

### CHARITABLE STATUS

Rothamsted Research Limited is a registered charity, registration number 802038, and in consequence is exempt from taxation on income arising from and expended on its charitable activities.

# Rothamsted Research Limited

## ACCOUNTING POLICIES

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### FOREIGN CURRENCIES

Transactions in foreign currencies are recorded using the rate of exchange ruling at the date of that transaction. Monetary assets and liabilities denominated in foreign currencies are translated using the rate of exchange ruling at the balance sheet date and unrealised and realised gains and losses on translation are included in the Statement of Financial Activities.

### FINANCIAL INSTRUMENTS

The Group has elected to apply the provisions of Section 11 'Basic Financial Instruments' and Section 12 'Other Financial Instruments Issues' of FRS 102, in full, to all its financial instruments.

Financial assets and financial liabilities are recognised when the Group becomes a party to the contractual provisions of the instrument, and are offset only when the Group currently has a legally enforceable right to set off the recognised amounts and intends either to settle on a net basis, or to realise the asset and settle the liability simultaneously.

#### Financial Assets

##### *Debtors*

Debtors which are receivable within one year and which do not constitute a financing transaction are initially measured at the transaction price. Such debtors are subsequently measured at amortised cost, being the transaction price less any amounts settled and any impairment losses.

A provision for impairment of debtors is established when there is objective evidence that the amounts due will not be collected per the original terms of the contract. Impairment losses are recognised as expenditure in the Statement of Financial Activities for the excess of the carrying value of the debtor over the present value of the future cash flows discounted using the original effective interest rate. Subsequent reversals of an impairment loss that objectively relate to an event occurring after the impairment loss was recognised, are recognised immediately in the Statement of Financial Activities.

Concessionary loans are initially measured at the amount paid, including interest accrued and after impairment, where applicable.

#### Financial Liabilities

##### *Creditors*

Creditors payable within one year that do not constitute a financing transaction are initially measured at the transaction price and subsequently measured at amortised cost, being the transaction price less any amounts settled.

### SIGNIFICANT JUDGEMENTS AND ESTIMATES

Under the terms of the bare licence, the Charity has unencumbered usage of the buildings reported as fixed assets in note 10 in these financial statements. The trustee-directors are confident that the Institute will retain a legal right to occupy the land and buildings for the foreseeable future. The land is owned by The Lawes Agricultural Trust.

The Charity recognised Research and Development tax credits of £2.25 million in its 2015/16 financial statements on receipt of these funds from HMRC. With regard to this previously recognised income, the trustee-directors believe that it is prudent to acknowledge that HMRC is seeking clarification on eligibility for some of this credit but their judgement is that it remains correctly recognised at 31 March 2018.

Grants received for capital expenditure are included in the Statement of Financial Activities when the Group is entitled to receipt, whereas the depreciation on those grant-funded capital assets is reflected in the Statement of Financial Activities over the useful economic lives of those assets as stated on page 30. The depreciation cost (included in note 10) is significant to the result as shown in the financial statements and, accordingly, the expected useful lives are an important estimate in the context of these financial statements.

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

1	TRADING INCOME GROUP	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
	Consultancy	11	21	-	-	11	21
	Other	731	333	-	-	731	333
	Sale of goods trading	115	194	-	-	115	194
		<u>857</u>	<u>548</u>	<u>-</u>	<u>-</u>	<u>857</u>	<u>548</u>
	CHARITY	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
	Consultancy	11	21	-	-	11	21
	Other	731	333	-	-	731	333
		<u>742</u>	<u>354</u>	<u>-</u>	<u>-</u>	<u>742</u>	<u>354</u>
2	INVESTMENT INCOME	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
	GROUP						
	Dividend income	14	23	-	-	14	23
	Interest receivable	112	240	-	-	112	240
		<u>126</u>	<u>263</u>	<u>-</u>	<u>-</u>	<u>126</u>	<u>263</u>
	CHARITY	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
	Dividend income	14	23	-	-	14	23
	Interest receivable	112	240	-	-	112	240
		<u>126</u>	<u>263</u>	<u>-</u>	<u>-</u>	<u>126</u>	<u>263</u>



# Rothamsted Research Limited

## NOTES TO THE FINANCIAL STATEMENTS

### for the year ended 31 March 2018

#### 3 CHARITABLE ACTIVITIES

Total income from charitable activities are analysed as follows:

GROUP AND CHARITY	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
BBSRC ISPG	-	12,652	11,653	-	11,653	12,652
Competitive Project Grant	5,916	8,275	-	-	5,916	8,275
Capital Equipment	-	-	6,604	988	6,604	988
Building project funding	-	-	-	638	-	638
Maintenance funding	-	-	-	335	-	335
Redundancy funding	-	-	1,502	-	1,502	-
Open Access funding	-	-	85	50	85	50
Strategic Hires	-	-	200	-	200	-
Institute Development Grant Funding	-	1,535	-	-	-	1,535
<b>TOTAL BBSRC</b>	<b>5,916</b>	<b>22,462</b>	<b>20,044</b>	<b>2,011</b>	<b>25,960</b>	<b>24,473</b>
DEFRA	874	1,220	-	-	874	1,220
Other Government Departments / Public Sector (see below)	2,878	2,222	-	-	2,878	2,222
European Union	610	647	-	-	610	647
Industry	2,443	3,947	-	-	2,443	3,947
Trusts, Foundations, Charities	613	530	-	-	613	530
Income from Farm	521	539	-	-	521	539
Open Access (RCUK)	-	-	56	-	56	-
Postgraduate Education and Training	653	1,002	-	-	653	1,002
Bill and Melinda Gates Foundation	-	-	-	3,592	-	3,592
Miscellaneous income	711	741	-	-	711	741
<b>TOTAL INCOME</b>	<b>15,219</b>	<b>33,310</b>	<b>20,100</b>	<b>5,603</b>	<b>35,319</b>	<b>38,913</b>
Other Government Departments / Public Sector: Other Research Councils	1,256	1,182	-	-	1,256	1,182
Other	1,622	1,040	-	-	1,622	1,040
	<b>2,878</b>	<b>2,222</b>	<b>-</b>	<b>-</b>	<b>2,878</b>	<b>2,222</b>

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

**4 INCOME**

GROUP	Unrestricted	Unrestricted	Restricted	Restricted	Total	Total
Analysis of income by	2018	2017	2018	2017	2018	2017
geographical region:	£'000	£'000	£'000	£'000	£'000	£'000
United Kingdom	14,539	32,982	20,187	2,011	34,726	34,993
Europe:						
EU	1,249	576	-	-	1,249	576
Other	119	105	-	-	119	105
North America	107	458	-	3,592	107	4,050
Other	188	-	-	-	188	-
	<u>16,202</u>	<u>34,121</u>	<u>20,187</u>	<u>5,603</u>	<u>36,389</u>	<u>39,724</u>

CHARITY	Unrestricted	Unrestricted	Restricted	Restricted	Total	Total
Analysis of income by	2018	2017	2018	2017	2018	2017
geographical region:	£'000	£'000	£'000	£'000	£'000	£'000
United Kingdom	14,424	32,788	20,187	2,011	34,611	34,799
Europe:						
EU	1,249	576	-	-	1,249	576
Other	119	105	-	-	119	105
North America	107	458	-	3,592	107	4,050
Other	188	-	-	-	188	-
	<u>16,087</u>	<u>33,927</u>	<u>20,187</u>	<u>5,603</u>	<u>36,274</u>	<u>39,530</u>

5 COST OF TRADING	Unrestricted	Unrestricted	Restricted	Restricted	Total	Total
	2018	2017	2018	2017	2018	2017
	£'000	£'000	£'000	£'000	£'000	£'000
<b>GROUP</b>						
Consultancy	16	16	-	-	16	16
Cost of goods sold	222	197	-	-	222	197
	<u>238</u>	<u>213</u>	<u>-</u>	<u>-</u>	<u>238</u>	<u>213</u>
<b>CHARITY</b>						
	Unrestricted	Unrestricted	Restricted	Restricted	Total	Total
	2018	2017	2018	2017	2018	2017
	£'000	£'000	£'000	£'000	£'000	£'000
Consultancy	16	16	-	-	16	16

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
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6a) CHARITABLE ACTIVITIES	Direct costs	Other costs	Support costs	Total 2018	Total 2017
GROUP	£'000	£'000	£'000	£'000	£'000
Scientific research	26,344	3,885	6,315	36,544	37,808
Postgraduate education and training	342	-	90	432	564
	<u>26,686</u>	<u>3,885</u>	<u>6,405</u>	<u>36,976</u>	<u>38,372</u>
Unrestricted	10,383	3,885	6,405	20,673	32,533
Restricted	16,303	-	-	16,303	5,839
	<u>26,686</u>	<u>3,885</u>	<u>6,405</u>	<u>36,976</u>	<u>38,372</u>
CHARITY	Direct costs	Other costs	Support costs	Total 2018	Total 2017
	£'000	£'000	£'000	£'000	£'000
Scientific research	26,453	3,885	6,315	36,653	37,809
Postgraduate education and training	342	-	90	432	564
	<u>26,795</u>	<u>3,885</u>	<u>6,405</u>	<u>37,085</u>	<u>38,373</u>
Unrestricted	10,492	3,885	6,405	20,782	32,534
Restricted	16,303	-	-	16,303	5,839
	<u>26,795</u>	<u>3,885</u>	<u>6,405</u>	<u>37,085</u>	<u>38,373</u>

Direct costs (2017: £26,442k) are those associated with providing the activity, such as laboratory supplies. Other costs (2017: £5,051k) include indirect costs relating to premises and equipment. Support costs are detailed in Note 6b.

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

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6b) SUPPORT COSTS

The Group and Charity allocate support costs as shown in the table below. Support costs are allocated on a basis consistent with the use of expenditure.

GROUP AND CHARITY

	Scientific research £'000	Postgraduate education and training £'000	Total 2018 £'000	Total 2017 £'000
Commercial and Finance	708	10	718	777
Human Resources	360	7	367	537
Computing Service	761	12	773	899
Institute Management	1,033	16	1,049	1,235
Other administration	3,366	44	3,410	3,355
Governance	87	1	88	77
	<hr/>	<hr/>	<hr/>	<hr/>
	6,315	90	6,405	6,880
	<hr/>	<hr/>	<hr/>	<hr/>

# Rothamsted Research Limited

## NOTES TO THE FINANCIAL STATEMENTS

### for the year ended 31 March 2018

7 GOVERNANCE COSTS	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
GROUP AND CHARITY						
Audit fee	43	49	-	-	43	49
Trustees' expenses	3	3	-	-	3	3
Technical support	40	77	-	-	40	77
Professional advice to Trustees	2	20	-	-	2	20
	<u>88</u>	<u>149</u>	<u>-</u>	<u>-</u>	<u>88</u>	<u>149</u>

6 Directors claimed reimbursement of travel expenses, the amount of which was £2,739 (2017: 5 Directors claimed reimbursement of £2,840).

Under the amended Articles of Association approved by Special Resolution on 10 December 2013, the Charity is authorised to remunerate its Chairman, and in the year ended 31 March 2018 paid an honorarium of £10,932 (2017: £10,932). Other trustees received £Nil (2017: £Nil).

8 NET INCOME/EXPENDITURE IS STATED AFTER CHARGING/ (CREDITING) THE FOLLOWING:	Group 2018 £'000	Charity 2018 £'000	Group 2017 £'000	Charity 2017 £'000
Interest receivable	(112)	(112)	(240)	(240)
Auditor's remuneration – audit services – parent	40	40	45	45
Auditor's remuneration – audit services – subsidiary	2	-	2	-
Auditor's remuneration – taxation advisory	15	-	11	11
Auditor's remuneration – taxation compliance	4	2	3	1
Auditor's remuneration – other	4	4	2	2
Hire of plant and machinery	-	-	-	-
Depreciation	2,442	2,422	3,233	3,212
	<u></u>	<u></u>	<u></u>	<u></u>

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

9 STAFF COSTS AND NUMBERS	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
<b>GROUP</b>						
Salaries and wages	10,115	15,226	4,680	-	14,795	15,226
Social security costs	1,007	1,553	498	-	1,505	1,553
Other pension costs	1,846	2,900	932	-	2,778	2,900
Redundancy costs	57	-	1,502	-	1,559	-
	<u>13,025</u>	<u>19,679</u>	<u>7,613</u>	<u>-</u>	<u>20,638</u>	<u>19,679</u>
<b>CHARITY</b>						
Salaries and wages	10,081	15,160	4,680	-	14,761	15,160
Social security costs	1,006	1,550	498	-	1,504	1,550
Other pension costs	1,844	2,890	932	-	2,776	2,890
Redundancy costs	57	-	1,502	-	1,559	-
	<u>12,987</u>	<u>19,600</u>	<u>7,613</u>	<u>-</u>	<u>20,601</u>	<u>19,600</u>

The average number of persons employed by category was:

	Group Total 2018 No.	Charity Total 2018 No.	Group Total 2017 No.	Charity Total 2017 No.
Science staff	282	282	300	300
Technical and administrative staff	128	127	143	135
	<u>410</u>	<u>409</u>	<u>443</u>	<u>435</u>

The average number of persons (full time equivalent) employed by category was:

Science staff	265	265	280	280
Technical and administrative staff	121	120	130	124
	<u>386</u>	<u>385</u>	<u>410</u>	<u>404</u>

# Rothamsted Research Limited

## NOTES TO THE FINANCIAL STATEMENTS

### for the year ended 31 March 2018

#### 9 STAFF COSTS AND NUMBERS (continued)

The number of staff with emoluments greater than £60,000, all of whom were accruing pension benefits, was:

	Group Total 2018	Group Total 2017	Charity Total 2018	Charity Total 2017
£60,000 - £69,999	12	17	12	17
£70,000 - £79,999	8	2	8	2
£80,000 - £89,999	1	2	1	1
£90,000 - £99,999	1	0	1	
£100,000 - £109,999	0	1	0	1
£110,000 - £119,999	1	0	1	
£120,000 - £129,999	1	1	1	1
£130,000 - £139,999	0	1	0	1
£180,000 - £189,999	1	1	1	1
	25	25	25	24

Remuneration for 8 key management employees was £934k including employer's national insurance (2017: £1,132k, 8 employees).

Charity staff employed prior to the change in governance are BBSRC employees who are subject to BBSRC terms and conditions of service and are appointed by the Charity under delegated powers. Although the legal liability for employment rested with the BBSRC through to 31 March 2017, the Charity is expected to meet all staff costs arising from normal activities.

Ex BBSRC staff employed by RRes are members of the Research Councils' Pension Schemes (RCPS), which are funded on a pay-as-you-go basis principally through employer and employee contributions and annual Grant-in-Aid. The pension schemes are by analogy to the Principal Civil Service Pension Scheme (PCSPS), except that the schemes, which are defined benefits schemes and provide retirement and related benefits on final emoluments, redundancy and injury benefits are administered and funded by the Council. The pension schemes are administered by the Research Councils' Joint Superannuation Services and the schemes' finances are administered by the BBSRC. Under the definitions set out in Financial Reporting Standard 102 the scheme is a multi-employer pension scheme. The Charity is unable to identify its share of the underlying assets and liabilities of the scheme. Accordingly, the Charity has taken advantage of the exemption of FRS 102 and has accounted for its contributions to the scheme as if it were a defined contribution scheme. For 2017/18, the Group paid £1,555k (2017: £1,794k) in employer's contributions into the scheme. A separate Research Councils' Pensions Schemes Account was published for the year ended 31 March 2017 and contains the further disclosure of information under the relevant accounting standard. The combined schemes' accounts as at 31 March 2018 have not yet been published, the total net liability as at 31 March 2017 was £5,137k (2016: £4,148m). The Group expects to pay £1,417k in respect of RCPS and £907k in respect of the defined contribution scheme in employer's contributions in 2018/19.

Staff employed since 1 April 2012 are members of a defined contribution scheme, as noted on page 4. Group contributions made in 2017/18 amounted to £1,221k (2017: £1,106k), and there were £nil accrued or prepaid contributions at 31 March 2018 (2017: £Nil). In the year, the Charity paid £9.3k in premiums for Professional Indemnity Insurance (2017: £8.4k).

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

10	<b>TANGIBLE FIXED ASSETS</b>	<b>Land &amp; Buildings £'000</b>	<b>Assets in the course of construction £'000</b>	<b>Plant and machinery £'000</b>	<b>Fixtures, fittings and vehicles £'000</b>	<b>Total £'000</b>
	<b>GROUP</b>					
	Cost:					
	As at 1 April 2017	64,247	505	21,526	2,379	88,657
	Additions	2,315	-	3,824	3,198	9,337
	Transfers	505	(505)	-	-	-
	As at 31 March 2018	<u>67,067</u>	<u>-</u>	<u>25,350</u>	<u>5,577</u>	<u>97,994</u>
	Accumulated depreciation:					
	As at 1 April 2017	25,861	-	18,746	1,923	46,530
	Charge for the year	1,050	-	1,187	205	2,442
	As at 31 March 2018	<u>26,911</u>	<u>-</u>	<u>19,933</u>	<u>2,128</u>	<u>48,972</u>
	Net book value:					
	As at 31 March 2018	<u>40,156</u>	<u>-</u>	<u>5,417</u>	<u>3,449</u>	<u>49,022</u>
	As at 31 March 2017	<u>38,386</u>	<u>505</u>	<u>2,780</u>	<u>456</u>	<u>42,127</u>
	<b>CHARITY</b>	<b>Land &amp; Buildings £'000</b>	<b>Assets in the course of construction £'000</b>	<b>Plant and machinery £'000</b>	<b>Fixtures, fittings and vehicles £'000</b>	<b>Total £'000</b>
	Cost:					
	As at 1 April 2017	64,247	505	21,526	2,258	88,536
	Additions	2,315	-	3,824	3,193	9,332
	Transfers	505	(505)	-	-	-
	As at 31 March 2018	<u>67,067</u>	<u>-</u>	<u>25,350</u>	<u>5,451</u>	<u>97,868</u>
	Accumulated depreciation:					
	As at 1 April 2017	25,861	-	18,725	1,842	46,428
	Charge for the year	1,050	-	1,187	185	2,422
	As at 31 March 2018	<u>26,911</u>	<u>-</u>	<u>19,912</u>	<u>2,027</u>	<u>48,850</u>
	Net book value:					
	As at 31 March 2018	<u>40,156</u>	<u>-</u>	<u>5,438</u>	<u>3,424</u>	<u>49,017</u>
	As at 31 March 2017	<u>38,386</u>	<u>505</u>	<u>2,801</u>	<u>416</u>	<u>42,108</u>



# Rothamsted Research Limited

## NOTES TO THE FINANCIAL STATEMENTS

### for the year ended 31 March 2018

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#### 10 TANGIBLE FIXED ASSETS (Continued)

Under the terms of the bare licence, the Charity has unencumbered usage of the buildings reported as fixed assets above. The trustee-directors are confident that the Institute will retain a legal right to occupy the land and buildings for the foreseeable future. The land is owned by The Lawes Agricultural Trust.

#### 11 INVESTMENTS

GROUP	Unlisted investments 2018 £'000	Unlisted investments 2017 £'000
Valuation: As at 1 April 2017	153	153
Unrealised gain in the year	-	-
Net Book Value: As at 31 March 2018	153	153

The unlisted investments relate to the following holdings:

The Company owns 2,833 £0.01 ordinary shares in VSN International Limited, a 15.87% shareholding.

The Company also owns 103,675 £0.001 ordinary shares, a 0.9% shareholding in Insense Limited.

Investments are held at the Directors' estimate of fair value. The valuation was undertaken by management based on audited financial information.

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

11	INVESTMENTS (Continued)	Unlisted investments £'000	Shares in group undertakings £'000	Total £'000
	CHARITY			
	Cost / valuation:			
	As at 1 April 2017	153	45	198
	Unrealised gain	-	-	-
		<u>153</u>	<u>45</u>	<u>198</u>
	Impairment as at 1 April 2017	-	(45)	(45)
	Charge for the year	-	-	-
	As at 31 March 2018	<u>-</u>	<u>(45)</u>	<u>(45)</u>
	Net Book Value:			
	As at 31 March 2018	<u>153</u>	<u>-</u>	<u>153</u>
	As at 31 March 2017	<u>153</u>	<u>-</u>	<u>153</u>

Shares in subsidiary undertakings

The Charity held the following shares in subsidiary undertakings at 31 March 2018:

	Shares held Class	%	Capital and Reserves £	Country of Incorporation
Rothamsted Research Holdings Limited (dormant)	Ordinary	100	(77,254)	England & Wales
Rothamsted International Consulting Limited (dormant)	Ordinary	100	2	England & Wales
Genetic Technologies Limited (dormant)*	Ordinary	100	2	England & Wales
Rothamsted Manor Limited	Ordinary	100	(584,015)	England & Wales
Rothamsted Experimental Station Limited (dormant)*	Ordinary	100	1	England & Wales
AfSIS Ltd	Ordinary	100	16,959	Tanzania

\* held indirectly via Rothamsted Research Holdings Limited.

# Rothamsted Research Limited

## NOTES TO THE FINANCIAL STATEMENTS

for the year ended 31 March 2018

### 11 INVESTMENTS (Continued)

The registered office of these undertakings is Rothamsted Research Limited, Harpenden, Hertfordshire AL5 2JQ except AfSIS Limited. The registered office of this entity is P.O. Box 2704, Dodoma Road, Arusha, Tanzania.

The results of Rothamsted Manor Limited (company no 03706064), for the year ended 31 March 2018, which are included in the consolidated financial statements, are set out below:

	2018 £'000	2017 £'000
Turnover	115	174
Expenditure	(223)	(197)
Retained loss for the year	(108)	(23)
Net liabilities at 1 April	(476)	(453)
Net liabilities at 31 March	(584)	(476)
Being:		
Tangible fixed assets	5	19
Current assets	301	332
Current liabilities	(890)	(827)
Net liabilities at 31 March	(584)	(476)

Rothamsted Manor Limited's principal activity during 2017/18 was property and events management. AfSIS Ltd has traded during the year but with a turnover of £188k and profit of £17k has not been included in the consolidated financial statements on grounds of immateriality.

Rothamsted Centre for Research and Enterprise Limited, as shown below, is a joint venture between Rothamsted Research Limited (40%), the Lawes Agricultural Trust (40%), and the Biotechnology and Biological Sciences Research Council (20%). The Charity owns 40% of the 5 ordinary shares issued. Accordingly, based on joint control, 40% of the results and the assets of the joint venture have been included in the consolidated financial statements of Rothamsted Research Limited as follows:

	2018 £'000	2017 £'000
Turnover	617	541
Administrative expenses	(692)	(660)
Retained loss for the year	(75)	(119)
Net liabilities at 1 April	(220)	(101)
Net liabilities at 31 March	(295)	(220)

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

11 INVESTMENTS (Continued)

	2018 £'000	2017 £'000
Being:		
Tangible fixed assets:		
Fixed assets	4,682	4,883
Net current assets	425	344
	<u>5,107</u>	<u>5,227</u>
Deferred income	(5,402)	(5,447)
Net liabilities at 31 March	<u>(295)</u>	<u>(220)</u>

12	DEBTORS	Group 2018 £'000	Charity 2018 £'000	Group 2017 £'000	Charity 2017 £'000
	Due within one year				
	Trade debtors	3,944	3,944	3,255	3,108
	Other debtors	9	9	171	171
	Prepayments and accrued income	3,024	3,024	2,505	2,505
	Due from joint venture	607	582	357	357
	Other tax and social security	364	352	10	-
	Corporation tax	364	364	364	364
	Due from subsidiary undertaking	-	270	-	379
		<u>8,312</u>	<u>8,545</u>	<u>6,662</u>	<u>6,884</u>
	Other debtors – due after one year				
	Due from joint venture	200	200	200	200
		<u>8,512</u>	<u>8,745</u>	<u>6,862</u>	<u>7,084</u>

13	CREDITORS: Amounts falling due within one year	Group 2018 £'000	Charity 2018 £'000	Group 2017 £'000	Charity 2017 £'000
	Trade creditors	3,991	3,973	675	651
	Other creditors	42	53	493	493
	Accruals	2,448	2,432	2,658	2,710
	Due to joint venture	207	207	248	248
	Deferred income (see note 14)	5,159	5,159	4,188	4,188
		<u>11,847</u>	<u>11,824</u>	<u>8,262</u>	<u>8,290</u>

# Rothamsted Research Limited

## NOTES TO THE FINANCIAL STATEMENTS

### for the year ended 31 March 2018

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14	DEFERRED INCOME represents income received in advance of expenditure. The movement can be analysed as follows:	Group 2018 £'000	Charity 2018 £'000	Group 2017 £'000	Charity 2017 £'000
	Opening balance	4,188	4,188	7,713	7,713
	Amounts deferred during the year	5,159	5,159	4,188	4,188
	Release of amounts previously deferred	(4,188)	(4,188)	(7,713)	(7,713)
		<u>5,159</u>	<u>5,159</u>	<u>4,188</u>	<u>4,188</u>

#### 15 INSURANCE

In line with government policy no proportion of funds contributed by Government bodies is expended upon insurance on equipment, stocks etc. unless it is required by statute or where it is cost effective to do so. The Charity carries appropriate levels of insurance on all buildings, plant and equipment and has regular risk reviews and insurance audits.

#### 16 COMMITMENTS

As at 31 March 2018, the Charity had capital commitments amounting to £1,060k (2017: £1,060k) in respect of buildings.

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

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17 FUNDS

	Unrestricted 2018 £'000	Unrestricted 2017 £'000	Restricted 2018 £'000	Restricted 2017 £'000	Total 2018 £'000	Total 2017 £'000
<b>GROUP</b>						
Funds as at 31 March	24,312	25,896	45,152	44,468	69,464	70,364
Funds balances are represented by:						
Fixed assets	10,219	8,059	38,661	34,001	48,880	42,060
Current assets	25,940	26,099	6,491	10,467	32,431	36,566
Current liabilities	(11,847)	(8,262)	-	-	(11,847)	(8,262)
	24,312	25,896	45,152	44,468	69,464	70,364
<b>CHARITY</b>						
Funds as at 31 March	24,610	26,121	45,152	44,468	69,762	70,589
Funds balances are represented by:						
Fixed assets	10,509	8,260	38,661	34,001	49,170	42,261
Current assets	25,925	26,151	6,491	10,467	32,416	36,618
Current liabilities	(11,824)	(8,290)	-	-	(11,824)	(8,290)
	24,610	26,121	45,152	44,468	69,762	70,589

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

17 FUNDS (continued)

GROUP – GENERAL FUNDS	2018 £'000	2017 £'000
Balance brought forward	24,396	23,140
Net (expenditure)/income	(4,784)	1,256
Transfer from restricted fund	3,200	-
	<u>22,812</u>	<u>24,396</u>
Balance carried forward		
	<u>22,812</u>	<u>24,396</u>
 CHARITY – GENERAL FUNDS	 2018 £'000	 2017 £'000
Balance brought forward	24,621	23,244
Net (expenditure)/income	(4,711)	1,377
Transfer from restricted fund	3,200	-
	<u>23,110</u>	<u>24,621</u>
Balance carried forward		
	<u>23,110</u>	<u>24,621</u>
 DESIGNATED ESTATE REBUILD FUND GROUP AND CHARITY	 2018 £'000	 2017 £'000
Balance brought forward	1,500	1,500
Utilised in the year	-	-
	<u>1,500</u>	<u>1,500</u>
Balance carried forward		
	<u>1,500</u>	<u>1,500</u>

The designated fund relates to funds set aside by the trustee-directors to ensure the long-term sustainability of the Institute's estate facilities. Funding received from the BBSRC for this purpose is included as a restricted fund.

GROUP AND CHARITY RESTRICTED	1 April 2017 £'000	Income £'000	Expenditure £'000	Transfers £'000	31 March 2018 £'000
Capital fund	34,001	6,604	(1,944)	-	38,661
Estate Rebuild fund	6,659	-	-	(3,200)	3,459
Open Access fund	516	56	(139)	-	433
Newton fund	667	-	(89)	-	578
Gates Foundation	2,625	-	(2,269)	-	356
BBSRC Resource Grant	-	11,918	(10,340)	-	1,578
BBSRC Capital Grant	-	20	(20)	-	-
Donations	-	87	-	-	87
Redundancy Funding	-	1,502	(1,502)	-	-
	<u>44,468</u>	<u>20,187</u>	<u>(16,303)</u>	<u>(3,200)</u>	<u>45,152</u>

**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

**17 FUNDS (continued)**

The Capital fund principally represents funding received, largely from the BBSRC, for the acquisition of tangible fixed assets. These assets are built on land that is not owned by the Institute. It represents the net book value of such fixed assets. The Estate Rebuild fund represents funding received from the BBSRC in respect of ensuring the long-term sustainability of the Institute's estate facilities. The Open Access fund represents funding received, primarily from the BBSRC, in respect of the RCUK requirement for publications to be openly available on a publisher's site. The Newton fund represents funding received from the BBSRC, in respect of increasing international partnerships with scientific organisations in Brazil, China, Colombia and the Philippines. The Bill and Melinda Gates Foundation supports the work of the African Soil Information Service (AFSIS). In accordance with the Institute Standard Conditions of Grant it has become required to place all grant award payments from the BBSRC in relation to the ISP's in a restricted reserve called BBSRC resource grant, or BBSRC capital grant for capital spend on the ISP's, against which actual costs incurred will be charged.

There was a transfer from the restricted Estate Rebuild Fund to unrestricted funds during the year. This was in order to invest in the institutes facilities ahead of the new round of ISPG funding and the release of the restriction on funds had the written approval of the BBSRC.

An analysis of the comparative 2016/17 restricted fund movements follows:

GROUP AND CHARITY RESTRICTED	1 April 2016 £'000	Income £'000	Expenditure £'000	31 March 2017 £'000
Capital fund	36,520	988	(3,507)	34,001
Estate Rebuild fund	6,669	973	(983)	6,659
Open Access fund	598	50	(132)	516
Newton fund	917	-	(250)	667
Gates Foundation	-	3,592	(967)	2,625
	<u>44,704</u>	<u>5,603</u>	<u>(5,839)</u>	<u>44,468</u>

<b>18 RECONCILIATION OF GROUP NET INCOME/ (EXPENDITURE) FOR THE YEAR TO NET CASH (USED BY)/GENERATED BY OPERATIONS</b>	<b>2018 £'000</b>	<b>2017 £'000</b>
Net income / (expenditure) for the year	(900)	1,020
Adjustments for:		
Depreciation of tangible fixed assets	2,442	3,233
Dividends, interest and rents from investments	(126)	(263)
Gain on disposal of tangible fixed assets	-	(5)
Share of joint venture loss	75	119
Capital grants	(6,604)	-
Operating cash flows before movements in working capital	<u>(5,113)</u>	<u>4,104</u>
Increase in stocks	(266)	(18)
(Increase) / decrease in debtors	(1,650)	(105)
(Decrease) / increase in creditors	3,585	(3,097)
	<u>1,669</u>	<u>(3,220)</u>
Cash (used by)/generated from operations	<u>(3,444)</u>	<u>884</u>



**Rothamsted Research Limited**  
**NOTES TO THE FINANCIAL STATEMENTS**  
for the year ended 31 March 2018

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**ANALYSIS OF CASH AT BANK AND IN HAND**

	2018	2017
	£'000	£'000
Cash and cash equivalents represent:		
Bank balances	8,339	12,428
Short Term Deposits 90 days or less	5,370	4,962
	<hr/>	<hr/>
Cash and cash equivalents	13,709	17,390
Short term deposits more than 90 days	9,500	11,870
	<hr/>	<hr/>
Cash at bank and in hand as per balance sheet	23,209	29,260
	<hr/>	<hr/>

**19 RECONCILIATION OF CHARITY NET INCOME/  
(EXPENDITURE) FOR THE YEAR TO NET CASH (USED  
BY)/GENERATED BY OPERATIONS**

	2018	2017
	£'000	£'000
Net income / (expenditure) for the year	(827)	1,141
Adjustments for:		
Depreciation of tangible fixed assets	2,422	3,212
Dividends, interest and rents from investments	(126)	(263)
Gain on disposal of tangible fixed assets	-	(4)
Capital grants	(6,604)	-
	<hr/>	<hr/>
Operating cash flows before movements in working capital	(5,135)	4,086
Increase in stocks	(266)	(18)
(Increase)/Decrease in debtors	(1,661)	328
Increase/(Decrease) in creditors	3,534	(3,494)
	<hr/>	<hr/>
	1,607	(3,184)
	<hr/>	<hr/>
Cash (used by)/generated from operations	(3,528)	902
	<hr/>	<hr/>

**ANALYSIS OF CASH AT BANK AND IN HAND**

	2018	2017
	£'000	£'000
Cash and cash equivalents represent:		
Bank balances	8,091	12,258
Short Term Deposits 90 days or less	5,370	4,962
	<hr/>	<hr/>
Cash and cash equivalents	13,461	17,220
Short term deposits more than 90 days	9,500	11,870
	<hr/>	<hr/>
Cash at bank and in hand as per balance sheet	22,961	29,090
	<hr/>	<hr/>

# Rothamsted Research Limited

## NOTES TO THE FINANCIAL STATEMENTS

### for the year ended 31 March 2018

#### 20 RELATED PARTY TRANSACTIONS

As explained in the Trustees' Report (incorporating the Strategic Report), LAT and BBSRC are members of the charitable company and, accordingly, are considered related parties. BBSRC funds scientific research and equipment purchases for the Institute. Funding for 2017/18 was £25,960k (2017: £24,473k) and the breakdown of this is shown in Note 3. At the 2017/18 year-end BBSRC had £1,017k (2017: £1,043k) included within trade debtors of the Charity, £90k (2017: £Nil) included within trade creditors, and £55k (2017: £Nil) included within accruals. Note 9 of the financial statements explains the staffing arrangements between BBSRC and the Charity. Land and buildings at North Wyke, Devon are owned by the Biotechnology and Biological Sciences Research Council and occupied by the Charity under a formal lease and at a peppercorn rent.

LAT also funds scientific research through grants to the Institute, and in the year 2017/18 the value of this to the Charity was £500k (2017: £320k). The Charity's subsidiary, Rothamsted Manor Limited (RML), used to collect some rents and pay some expenses for several LAT properties, which were then transferred to LAT but this activity ceased in 2016/17. In 2016/17 RML paid out £115k in costs and collected £115k in income on behalf of LAT. At year-end, the Charity was owed £261k (2017: £154k) by LAT, and RML was owed £Nil by LAT (2017: £42k). During the year, the Charity made a further provision of £111k against the amount due from RML (see note 12), (2017: £35k). Details of the agreements regarding the Charity's use of buildings owned by LAT are set out in Note 10, which are currently rent free. At the year end, the Charity was owed £782k (2017: £557k) by Rothamsted Centre for Research and Enterprise Limited (RoCRE). This includes a concessionary loan of £200k (2017: £200k) which falls due after more than one year and on which no interest is payable. At 31 March 2018 the Charity owed RoCRE £207k (2017: £248k). RoCRE provides conference centre facilities, meeting rooms and catering. RRes provides back office support, site support and scientific services to RoCRE and their tenants.

Rothamsted Research is a member of AgriMetrics Ltd and performed administrative and scientific services for the company. The balance of monies owed to RRes outstanding at the year-end was £33k (2017: £109k). In order to enable the local delivery of the Africa Soil Information Service work supported by The Bill and Melinda Gates Foundation, the Charity has a subsidiary established in Tanzania, AFSIS Ltd. The Charity made refundable grants of £150k (2017: £89k) to the subsidiary during the year for that purpose.

#### 21 CONTINGENT LIABILITIES

Under the terms of the contract between the Charity and the Biotechnology and Biological Sciences Research Council, should certain fixed assets be sold, a proportion of the proceeds might become payable by the Charity to the Research Council. No such liability exists at 31 March 2018 (2017: £Nil).

#### 22 FINANCIAL INSTRUMENTS

	Group 2018 £'000	Charity 2018 £'000	Group 2017 £'000	Charity 2017 £'000
Financial assets which are debt instruments at amortised cost	7,584	7,829	5,896	6,128
Other financial assets:				
- concessionary loans at cost plus accrued interest less impairment, where applicable	200	200	200	200
Financial liabilities at amortised cost	(6,688)	(6,665)	(4,074)	(4,102)

**Rothamsted Research Limited**  
**INCOME AND EXPENDITURE ACCOUNTS**  
for the year ended 31 March 2018

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	Group 2018 £'000	Charity 2018 £'000	Group 2017 £'000	Charity 2017 £'000
Gross income of continuing operations	29,785	29,670	38,736	38,542
Total expenditure of continuing operations	(35,345)	(35,157)	(35,197)	(34,882)
Net income / (expenditure) for the year	<u>(5,560)</u>	<u>(5,487)</u>	<u>3,539</u>	<u>3,660</u>
Net income / (expenditure) for the year	(5,560)	(5,487)	3,539	3,660
Capital grants received	6,604	6,604	988	988
Expenditure of capital grants included in resources expended	-	-	(988)	(988)
Release of deferred capital grant in line with depreciation	(1,944)	(1,944)	(2,519)	(2,519)
Net income / (expenditure) for the year per SOFA	<u>(900)</u>	<u>(827)</u>	<u>1,020</u>	<u>1,141</u>