

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Total available funding for this competition was £8.5m from the Technology Strategy Board, BBSRC, DEFRA and ScotGov.

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Adas UK Limited (lead) Yara UK Limited Countrywide Farmers plc Precision Decisions Limited DLF Trifolium Limited	Development of measurement technologies to increase productivity, nitrogen use efficiency and nitrogen management decisions for grass crops	£543,061	£278,004
Project description (provided by applicants)			
<p>Grass yields currently achieved on-farm are less than half of the biological potential for the UK environment. One of the main reasons for low grass yields is the sub-optimal use of nitrogen (N) fertiliser and failure to account for spatial variation in N fertiliser demand within fields. Current methods of estimating fertiliser N requirements are complex and there is no method for variably applying N according to crop needs. This project aims to develop technology used on arable crops (Yara N-Sensor) to measure the N fertiliser requirement of grass crops. This will provide farmers with a simple, automated method of controlling more precisely the amount of N fertiliser applied to their grass crops.</p> <p>The benefits include greater grass yields, greater farm profitability and environmental benefits such as fewer greenhouse gas emissions and a lower risk of nitrate leaching. The consortium consists of Yara (lead and N manufacturer), ADAS (management and research), Precision Decisions (technical), Countrywide Farmers (knowledge transfer), and DLF Trifolium (grass breeders). This complimentary consortium ensures world class technical expertise alongside an effective route for exploitation.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
BASF Public Limited Company (lead) Adas UK Limited Courtyard Limited VSN International Limited British Geological Survey	AGRONOMICS: spatial experimentation to transform research in agronomy worldwide	£1,621,436	£949,595
Project description (provided by applicants)			
<p>The Agronomics Project, led by ADAS and involving the Courtyard Partnership, BASF, Trials Equipment Ltd, VSN International and the British Geological Survey, will develop statistical approaches to enable high precision spatial experimentation on-farm using precision farming technologies. Agronomics has the twin aims of improving precision and extending the scale of agronomic testing and experimentation, so that farmers, advisors, suppliers, researchers and regulators will all be able to detect and aggregate small, as well as large, effects of treatments on crop performance and their interactions with soil type.</p> <p>New statistical approaches will also enable close optimisation of input rates in support of genetic (or other) enhancement of nutrient and agrochemical efficiencies. Agronomics will apply to all field crops and all cropping practices, and so will underpin the urgent quest for 'sustainable intensification' by transforming agronomic intelligence and maximising returns from research investment, first in the UK and then worldwide.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Berry Gardens Growers Limited (lead) East Malling Limited East Malling Research Driscoll's Genetics Limited IMEC	Developing robustness to biotic stress in fruit crops by below-ground phenotyping using novel image acquisition techniques	£1,366,223	£896,445
Project description (provided by applicants)			
<p>Strawberries contribute to a nutritious and healthy diet and are an important UK crop. Increasing restrictions in the type and frequency of chemical controls mean that existing varieties will soon be unsuitable for sustainable production in the soil.</p> <p>This project will develop technologies to aid the measurement of below-ground traits controlling natural plant resistance to nematodes, which in combination with a fungal pathogen called <i>Verticillium dahliae</i> (the causative agent of a wilting disease) cause major crop losses. Novel measurement techniques will be developed, which will allow the identification of wilt and nematode resistance genes that UK breeding programmes can harness to improve new varieties. Furthermore, this novel trait measurement system can be applied to other crop breeding programmes (along with other applications) to enhance the efficiency of trait measurement on large plant populations.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
BerryGardens Growers Ltd (lead) East Malling Research Delta-T Devices Limited Eden Irrigation Consultancy Ltd The Technology Research Centre Ltd	Developing innovative tools to manage risks associated with improving resource efficiency and fruit quality and reducing waste in substrate soft fruit production	£852,541	£504,731
Project description (provided by applicants)			
<p>More efficient use of inputs including water, fertilisers and pesticides is vital to the future success of all UK agri-businesses. Although over-irrigation and high fertiliser inputs can lead to excessive vegetative growth, increased disease susceptibility, lower marketable yields, poor organoleptic quality and a short shelf-life, many growers are reluctant to reduce water (and fertiliser) inputs due to the lack of information, suitable management tools and crop monitoring systems.</p> <p>Scientifically-derived fertigation strategies have been developed at East Malling Research that improve resource use efficiency, increase marketable yields and fruit quality and reduce waste during production. Scaling up this precision fertigation approach so that it can be implemented safely across many hectares of high-value substrate strawberries requires a step change in the detail of on-farm measurement data. The project consortium (BerryGardens Growers Ltd, East Malling Research, Delta-T Devices Ltd, Eden Irrigation Consultancy Ltd and the Technology Research Centre Ltd) will develop new technologies needed to implement, monitor and manage precision fertigation across many hectares of high value soft fruit production. Imaging tools to assess plant health, quantify crop quality and predict marketable yields will be developed and validated against conventional but intensive scientific measures of productivity in commercial strawberry varieties exposed to differing degrees of biotic and abiotic stresses. The benefits to the UK horticulture industry will be improved resource use efficiency, reduced pesticide use, improved yield predictions, extended shelf-life and reduced wastage in store and better fruit quality for consumers.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
East Malling Research (lead) Worldwide Fruit Limited The Technology Centre Ltd Fruition PO Limited Stemmer Imaging Limited	Developing a vision system to enhance phenotyping in apples (Pomevision)	£755,072	£514,453
Project description (provided by applicants)			
<p>The UK is not self sufficient in apples, even during the high season, providing only one third of our own consumption, with the shortfall made up by imports. Our consortium, representing one third of UK growers, believes that, by standardising best-practice orchard management, and with a strategic approach to helping breed new cultivars, we could gear up our orchards to take back at least 100,000T of lost import volume, worth £50M.</p> <p>This project develops a novel vision-based crop measurement technology for apple growers, capable of measuring commercially relevant phenotype traits in the field and providing quantified data to help breeders accelerate their programmes for new elite cultivars. The detailed data captured by tree over the season and between seasons will be correlated with environmental factors and the apple genome. It will provide growers the opportunity to meet three important industry objectives: To better manage the quality and yield of their crops through a precision horticulture approach; to strategically increase cropping intensity via improved strategic orchard management knowledge; and to inform breeders of the desired routes for the accelerated development of new elite cultivars, providing quantified information on the commercially important traits at phenotype level. This new technology will allow the UK to lead the world in the precision management and development of pome crops, and help increase production capacity by up to 50% from the current acreage.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Hellenic Systems Ltd (Lead) Tulip Limited Newcastle University University of Dundee	Automated screening for pathologies at abattoir through computer vision based inspection of pig carcasses	£654,915	£427,378
Project description (provided by applicants)			
<p>Visual inspection of carcasses is an important factor for ensuring the quality of meat products. However, manual inspection puts a strain on meat inspector resources, which effectively prevents detailed screening as, for example, for the purposes of health schemes.</p> <p>The aim of this project is to develop an automated system for visual screening at abattoir. The system will analyse images taken at abattoir in order to detect a number of health hazards on pig carcasses, and to screen them at slaughter for indications of underlying subclinical diseases. The project will: (1) develop a system for capturing images of carcass; (2) acquire image data sets and have experts annotate pathologies in them; (3) develop software that learns to recognise pathologies automatically; (4) validate the system on large scale datasets for the detection of routine health hazards, and disseminate results to relevant users, incl. providing feedback to farmers.</p> <p>The project brings together market leaders in meat production (Tulip) and supplier for abattoirs (Hellenic), pig levy board (BPEX), the UK's leading centre for research into pig science (Newcastle Univ.), and experts in computer vision and pattern recognition (Newcastle Univ. and Univ. of Dundee). It will enhance confidence in detecting health hazards in pig carcasses, aiming towards automated detection of underlying subclinical disease. Feeding this back to pig farmers will increase productivity and improve efficiency on farms through preventing further diseases. Producers will be able to make decisions about improving the health of their herd through the information they receive from the abattoir. The project will thus contribute towards sustainability and competitiveness of the UK pig industry.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Kingshay (lead) University of the West of England Bristol	Precision cow health management	£715,249	£513,097
Project description (provided by applicants)			
<p>This project seeks to develop innovative 3D-imaging technology to enhance the simultaneous measurement of cow body condition score (BCS), liveweight and mobility (gait) as a highly advanced management decision-making tool. The aim is to improve the pace at which these key quality and production traits are identified for animal welfare, sustainability and profitability.</p> <p>The technology will simultaneously and unobtrusively provide stress-free monitoring of incremental changes in individual cow condition and lameness to inform and improve nutrition management, cow health, welfare and productivity leading to increased herd lifespan and more efficient milk production. These traits are currently measured by visual assessment requiring high skill levels and training, but is nevertheless open to the subjectivity of individuals.</p> <p>Our novel imaging technology and web-based analysis software will enable the farmer and others in the value chain such as vets, nutritionists and livestock advisers to make use of much more precise, consistent and frequent measurements, creating greater opportunities to improve cow performance and welfare.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Masstock Arable (UK) Limited (lead) Velcourt Limited University of Manchester	SoilSense: Real-time measurement of primary soil nutrients for efficient crop production and management	£897,576	£618,164
Project description (provided by applicants)			
<p>This project will deliver a low-cost, wireless, in-soil sensor system for monitoring available moisture, pH and nutrients continuously and at multiple depths in 'indicator' sections of fields. Early adoption will be against labile N for Velcourt's arable wheat production. This will be extended to potatoes, OSR and livestock forage, including the technically demanding sensing of semi-labile P and K.</p> <p>The commercial proposition will build-on the integrated agronomy services offered by Origin to calibrate the sensor results and determine the relationship between sensor output and available plant nutrients. Field and lab trials will relate this data to seasonal plant responses to understand the dynamics of nutrient release / mineralisation and plant uptake / immobilisation. Delivery of the validated sensor will allow 'smart' dynamic control of fertiliser application and optimise nutrient inputs Vs field biological yield potential.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Molecuar Vision Ltd (lead) Linear Diagnostics Limited Food and Environment Research Agency (FERA)	Agri-food production and storage: portable, rapid and simple diagnostics for pathogens	£551,875	£392,430
Project description (provided by applicants)			
<p>Crops that are grown for food are often vulnerable to diseases that cause the quality of the food to deteriorate over time. One important food crop is potatoes and these are particularly susceptible to bacteria and fungi that cause the potatoes to break down during storage or after they have been packed and dispatched to supermarkets. There are a number of organisms that can cause this breakdown and tests for these can be carried out individually using current technology. However, these tests look for one type of organism at a time and are often time consuming and expensive.</p> <p>We are developing a simple to use, fast and economical test that can detect the most important organisms in one sample at the same time in a few minutes. This means that the results are available quickly so prompt action can be taken as the potatoes enter storage or when they are washed prior to packing rather than waiting for lab results - by which time it is often too late to do anything about the spread to other batches.</p> <p>As well as testing the potatoes directly, another important area where this test will help is in monitoring the water that is used to wash the crops before packing. The amounts of water used are large and for economic and environmental reasons it makes sense to recycle this water. Companies have methods to recycle water and our rapid monitoring method will support the recycling process by providing a quick, easy and cheap tool to test when batches of wash water need to be replaced. Overall, the developments will result in less waste and potatoes that that can be stored for longer. Once successfully demonstrated for use with potatoes the technology will be developed for use in other food products.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Oxford Instruments Ltd (lead) Waitrose Limited Anglia D N A Services Ltd Food Forensics Limited Institute of Food Research	Development of molecular spectroscopy screening and pre-screening methods for the rapid authentication of food products and ingredients.	£902,682	£611,227
Project description (provided by applicants)			
<p>Molecular spectroscopy techniques are a family of rapid analysis methods that use electromagnetic radiation (infrared and radio waves) to obtain information about the chemical composition of a wide range of different samples. Two of these techniques – infrared, IR, and nuclear magnetic resonance, NMR, spectroscopy – will be used on the present project to establish fast, cheap methods for quality assurance in the food industry.</p> <p>We aim to use a new low-cost, benchtop NMR approach, along with proven IR technology and in tandem with DNA testing, to develop comprehensive screening protocols for verifying the species of origin of animal fats, edible oils, raw and cooked meat products. Beneficiaries of the research will be retailers, producers and other intermediaries in the food chain, analytical service providers, public analysts, and, ultimately, the consumer.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Paragon Veterinary Group (lead) XLVets UK Ltd Cogent Breeding Limited University of Kent University of Nottingham	Optimising the delivery of superior genetics through advanced genomic selection of bovine embryos	£1,123,845	£809,163
Project description (provided by applicants)			
<p>This project will apply advanced breeding technologies to produce (both in-vivo and in-vitro) pre-implantation bovine embryos from which biopsies will be taken to interrogate their genomic makeup using single nucleotide polymorphism arrays (SNP chips). It is currently possible to screen dairy and beef cattle genomically, but responses to selection are impeded by waiting for the gestation of the calf on which genomic selection is performed.</p> <p>The screening of bovine embryos will optimise the delivery and amplification of superior genetics by advancing the time of selection and reducing “wastage” of unwanted calves. This project will therefore combine advanced embryo breeding technologies with state-of-the-art genomic screening (so called pre-implantation genetic diagnosis), and karyomapping (combining parental DNA information with the offspring's genomic information to provide more genetic detail). The project will develop strategies for optimal bovine embryo biopsy, cryopreservation and genomic screening of small cell numbers. It will provide proof of principle that the new technologies can be used to deliver superior genetics more efficiently to the breeding herd.</p>			

Results of competition: Measurement technologies for efficient agrifood systems - Collaborative R&D

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Thanet Earth Marketing Limited (lead) Gildea Photonics Limited MMR Research Worldwide Limited University of Northumbria at Newcastle Verivide Ltd	Measurement of biochemical traits in fresh produce using imaging technologies	£1,057,388	£743,046
Project description (provided by applicants)			
<p>The project involves the development and use of novel digital and hyperspectral imaging technologies to be used as QC tools throughout the fresh produce supply chain (from breeders to retailers). Such tools will be demonstrated in both controlled environments and in the field to allow for the characterisation and prediction of yields, nutrient content and quality characteristics such as colour, flavour and texture across the supply chain. Biochemical traits will also be correlated with sensory evaluation attributes to derive cause-and-effect relationships that affect consumer choice and hence commercial value. Moreover, technology developments will be complemented with genomic data to assist future developments in the field of plant breeding and the effect of environmental factors on product quality.</p> <p>This applied industrial research project will use different varieties of tomato plants (<i>Solanum lycopersicon</i>) as the subject of the investigations with the potential to build applications for other commercially important genera/species.</p>			

Results of competition: Measurement technologies for efficient agrifood systems

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
University of Nottingham (lead) Greengage lighting Saturn Bioponics Tioga Limited Cambridgehok Limited Scotherbs Ocean Optics	Measurement of plant growth and health for optimal crop yield in LED horticulture (MePGhOL)	£1,349,858	£961,895
Project description (provided by applicants)			
<p>Growing urban populations and a shrinking land base means that the global level of food production will need to increase over the next 30 - 40 years and this will need to occur in the face of an unpredictable climate and lowered resource availability. Precision agriculture will play an important role in alleviating these problems and here we propose the novel use of plant sensors combined with efficient Light Emitting Diode (LED) arrays to increase the efficiency of crop growth in horticulture. We also propose the use of cutting edge genetics to assist with breeding tomato plants for high efficiency under LEDs. LEDs are set to replace existing horticultural lighting sources (such as sodium lamps) due to their low cost, long lifespan and high energy efficiency.</p> <p>We sit at a point where the uptake is yet to occur on a large scale so the market is potentially large and we expect new agri-markets to open as a result of the low cost and low infrastructure requirements of LEDs. We propose the novel use of plant sensors in combination with LED lamps to improve the energy efficiency of LEDs further. We will use spectral reflectance and chlorophyll fluorescence to assess plant area, photosynthetic functioning and 'health'. Data from these sensors will be supplied to a control unit that will modulate the output of the LEDs according to the requirements of the plant (leaf green area, photosynthetic capacity, etc). It will also allow the grower to 'speed up' or 'slow down' the rate of growth to alter time to market and provide some novel possibilities for adjusting the morphology of the crop since the individual wavelengths will be tuneable. These adjustments will permit the optimisation of LED output, reducing energy costs.</p>			