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| **PGRO R AND D STRATEGIC PRIORITIES 2019-2022** | | |
|  | 1 | Improve **AGRICULTURAL PRODUCTIVITY** by delivering **YIELD STABILITY** and improved **QUALITY**. Improve understanding and quantification of factors that influence yield and quality.   * Plant breeding, genetic improvement and varietal evaluation * Agronomy * Production continuity * Resource management * Crop protection – pest, disease and weed management * Integrated pest management |
|  | 2 | **SOIL HEALTH** and plant and soil biological interactions greatly influence pulse crops. Improve understanding of factors affecting soil health.   * Soil structure * OM content * Microbial populations * Impacts of soil health on pathogens * Management practices to improve soil health |
|  | 3 | Deliver **CROP NUTRITION** plans for modern production techniques providing recommendations for optimum performance of UK pulses.   * P and K and Trace element requirements * Root development * Protein content |
|  | 4 | **ENVIRONMENTAL CHANGE** will influence future cropping techniques. Measure impacts of changing environment on legume production and investigate techniques for remediation.   * Sustainable systems * Climate impact on pest and disease occurrence * Greenhouse gas emissions * Environmental benefits of legumes in farming systems * Irrigation |
|  | 5 | **LEGISLATION UPDATES**: To provide relevant information that can be used to impact and promote production and consumption. Review crop protection priorities based on changes to pesticide approvals.   * Promote production and consumption of legumes * Update on EU and UK Policy decisions and potential impacts * Identify and anticipate changes in product registration and develop new IPM systems for improved crop management |
|  | 6 | **KNOWLEDGE EXCHANGE**: Disseminate outputs of work carried out at PGRO, and in collaboration with other organisations and institutes, to provide improved crop production recommendations. |

**CURRENT PROJECTS**

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| **Title** | **Objective** | **Funding** |
| **Improvement of soil health using cover crops in peas** | The objectives are to evaluate cover and catch crops for improving soil structure, organic matter content, nutrient retention and management of soil moisture. In addition, soil-borne pathogen levels are being monitored using standard plate tests, with the aim of using molecular tests once developed, to indicate the influence of improved soil structure on soil-borne pathogens over several years. Grant funding is in place until January 2020. An additional evaluation of the influence of vetch in the cover for disease impact is being carried out. Reports will be available. Although being carried out in vining peas, results will be relevant to combining peas. Cover crops were established in August/September 2016, 2017 and 2018. Initial results showed improvements in soil structure following inclusion of cover and catch crops.  *Addresses strategic priorities 1, 2, 3, 4 and 6.* | Co-funded by EIP-Agri (via the Rural Payments Agency), the Green Pea Company and PGRO |
| **Downy mildew varietal tolerance screening** | This project followed the end of project AHDB FV346 (PGRO and JIC) (Pea downy mildew diversity in the UK) and evaluated downy mildew varietal tolerance at 6 field sites across the UK. Trials included pea varieties selected by the vining pea groups and from the Descriptive and Recommended List varieties. Seeds were untreated or treated only with thiram. The aim was to create a map of the Eastern regions of the UK to show which varieties show better tolerance to downy mildew.  *Addresses strategic priorities 1, 4 and 6.* | PGRO levy |
| **Downy mildew control using foliar sprays in vining peas** | Trials have been established in Yorkshire and Lincolnshire for several years to evaluate the efficacy of different products to control downy mildew infection in vining peas, including the screening of new and existing foliar active ingredients. Products tested in 2018 were Amistar (azoxystrobin) as the standard fungicide and 6 confidential active substances. Most treatments significantly reduced foliar infection when compared to the untreated plots, but none of the treatments provided statistically significant reduction in number of pods infected. Amistar provided statistically significant reduction of foliar infection compared to untreated plots, although this was not the case when combined with an adjuvant. There were no differences in yield between treatments.  *Addresses strategic priorities 1, 5 and 6.* | PGRO levy with contributions from chemical manufacturers |
| **Development of diagnostic tests for key footrot pathogens** | The project aims to develop qPCR diagnostic tests for the soil pathogens *Fusarium solani* and *oxysporum, Aphanomyces euteiches* and *Didymella pinodella* (previously *Phoma medicaginis* var. *pinodella*). The project started in January 2018 and ends in March 2019. Work is being carried out to further develop the diagnostic tests.  Following the Innovate UK-sponsored diagnostics project, we will focus on the interaction of soil properties, foot rot pathogens and yield loss. The aim is to determine which other factors in addition to presence of pathogens prior to planting peas will determine whether foot rot disease will develop. Soil characteristics like compaction, soil type, pH and organic matter content will be monitored in areas of the field that show disease versus healthy areas. Yield mapping will be performed to help determine the impact of foot rot disease development on yield loss. If successful in the first year in collaboration with HMC Peas Ltd. we would like to widen the project out to include further geographical area.  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | Co-funded by Innovate UK (132852) and PGRO levy with Warwick University and Nottingham University. Further work in collaboration with HMC Peas Ltd. |
| **Bio-remediation of *Aphanomyces* infected soils using plant baiting technique** | This project investigates the potential to interrupt the *Aphanomyces* disease life cycle using alternative host plants. The selected alternative hosts may cause *Aphanomyces* oospores to germinate and the life cycle to be disrupted before they can release new zoospores. This will be undertaken in the glasshouse only in 2019.  *Addresses strategic priorities 1, 2, 4 and 6.* | PGRO levy |
| **Foliar applied active substances for control of downy mildew in field beans** | Evaluation of new active substances has been undertaken for several years. Six foliar products were evaluated for efficacy in a trial at Stubton in 2018. Some products are confidential, and we use this trial to pursue approvals for products for field beans. None of the treatments gave a statistically significant reduction of downy mildew, although there was an observed reduction in infection when SL567 was applied. Rust infection was reduced by all treatments compared to untreated plots, although this was not statistically significant. Treatments with Amistar increased the amount of healthy green tissue. There were no differences in yield between treatments.  *Addresses strategic priorities 1, 3, 5 and 6.* | PGRO levy with contributions from chemical manufacturers |
| **Combining pea optimum populations** | Re-examination of optimum plant density for combining peas began in 2015, initially for the large blue variety Crackerjack. Original recommendations for 70 plants/ m² for blues and 65-70 plants/ m² for marrowfats were based on work done in the late 1960’s and varieties have changed agronomically since then. 2018 was the fourth year in which Crackerjack was included in trials and Sakura, a marrowfat, was included from 2016 until 2018. Results showed that the recommended target population for marrowfats of 65-70 plants/ m² remained the most profitable plant stand in most years. However, the results for Crackerjack were not as straightforward and indicated that a higher plant stand may be required for optimum profitability, although results are not consistent enough to change the current recommendation, and work will continue in 2019.  *Addresses strategic priorities 1, 4 and 6.* | PGRO levy |
| **Intercropping peas to improve standing ability** | Combining peas have a reputation for lodging before harvest and many growers avoid the crop because of this. Lodging can lead to both yield and quality losses and farmers often quote the damage caused to combines from harvesting lodged crops. Wide combine headers do not help in this respect. There are varieties on the Recommended List with good standing ability, but this cannot be guaranteed, unlike spring beans. An intercrop with peas could provide a scaffold for peas and improve standing ability. In 2017, PGRO grew plots of peas with varying rates of spring oats, barley and oilseed rape with virtually no inputs. The crops were hand weeded, but there was an indication that the intercrops suppressed weed levels. The spring oilseed rape suffered establishment issues and was all but wiped out by pollen beetle. Barley provided little support for the peas. Spring oats were better, and while lodging still occurred, this was later than peas grown on their own. However, the oats were still green when the peas were ready for harvest despite desiccation. The work continued in 2018, using varying rates of oats and spring beans with peas.  <http://www.pgro.org/spring-2018/mobile/index.html#p=10>  *Addresses strategic priorities 1, 4 and 6.* | PGRO levy |
| **Evaluation of spring bean row width** | Currently there is no recommendation in the PGRO Pulse Agronomy Guide for row widths (RWs) for either spring or winter beans. From the 1994 PGRO Field Bean Handbook it was concluded that ‘narrow RWs of 20cm or less are optimum for spring beans and their use has become general practice’. The target plant population at that time was 40 plants/m². Through the Optibean project, higher plant populations have been recommended, up to 50 to 55 plants/m² as an economic optimum, considering sowing date, likely yield and produce value and cost of the seed. Where beans are grown in higher rainfall areas, or fertile conditions, or where vigorous growth is expected, plant populations should remain around the 40 to 45 plants/m².  Increasing the plant population means drilling more seed, which means the plants will be more closely associated within the rows (intra-row space). Work conducted by SRUC in Scotland as part of the Optibean project, and PGRO-funded work on RW and inter-row herbicide applications, had indicated that lower yields were obtained from wider RWs (up to 48cm), with the tentative conclusion that there was competition between plants within the row. When direct drilling, RWs are often wider than the 20cm mentioned in the Handbook and, indeed, all the spring bean Optibean work was done on 25cm row width.  In 2016 a small replicated plot trial was established in spring beans to look at the effect of row width on yield. Two densities (40 and 60 plants/m²) were used and 3 RWs (15, 24 and 36cm). In 2017 and 2018 RW’s were 15, 18.75, 15/30, 25 and 37.5cm. Density and RW appear to have a bearing on the number of plants established. At 60 plants/m² density there was a clear trend of decreasing establishment with increasing RW. At 40 plants/m² density there was a similar, but less pronounced trend. There was no influence of either density or RW on plant height, with the average range only 3cm across the treatments. Branch counts, % Brackling, Standing ability and Maturity appeared to be little influenced by either density or RW. At 40 plants/m² density there was a small influence of RW on yield, with the highest yields at 25-30cm RW. At 60 plants/m² density yields increased with increasing RW up to 25cm after which yields were lower. Treatment of 15/30 was a double row at 15cm RW with a 30cm gap between the double rows. This attempted to simulate some types of direct drill which drill a double row and a wider gap, but the drill used was not a direct drill. The 15/30 treatment did not perform as either 15 or 30cm RW. Nor did it perform the same as the 25cm RW (in both cases there were 6 rows across the drilled plot).  *Addresses strategic priorities 1, 4, 5 and 6.* | PGRO levy |
| **Pea and bean weevil control – screening products in field beans (applicable to peas also)** | Several active substances are included in trials each year, to evaluate efficacy and support future EAMU approvals.  *Addresses strategic priorities 1, 5 and 6.* | PGRO levy with contributions from chemical manufacturers |
| **Lure-and-kill technology to manage beetle pests (*Sitona lineatus* and *Bruchus rufimanus*) of field beans and peas** | The project aimed to develop a ‘lure and kill’ system using a bio-control agent*, Beauveria bassiana*, to control the beetle pests, pea and bean weevil and bruchid beetle (*Sitona lineatus* and *Bruchus rufimanus*). Pea and bean weevil was the main target. The system tested inoculation stations to attract pests which would then be coated in either the fungal pathogen *B. bassiana* or an insecticide, formulated with an electrostatic sticking agent. The project was co-funded by Innovate UK and BBSRC, with additional funding provided by the industry partners PGRO, BASF Plc., Exosect Ltd. and Oecos. The project started on 1 October 2014 and ended on 31 December 2018. The project showed that *B. bassiana* gave good control of both pests in laboratory conditions, and there were good indications that the formulations worked under protected conditions (field cages). Further work using traps in field margins following harvest is being carried out to determine the density at which inoculation stations should be placed. Results indicated that large numbers of weevils were caught as they moved into overwintering sites.  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | Co-funded by Innovate UK (101910) and industrial partners PGRO, Oecos, BASF and Exosect Ltd. with Keele University and Velcourt Ltd. |
| **Bean seed fly management** | Bean seed fly (*Delia platura*) affects many plant species world-wide and is an important pest of UK legumes. Crop losses due to bean seed fly (BSF) are reported to be up to 60% due to failure of establishment and seedling damage. BSF has been identified as high priority for UK vining peas, picking peas, green and runner beans, as well as alliums, asparagus and leafy salads, due to increasing incidents of damage and the loss of key insecticidal substances. There are no approved seed treatments available in UK legumes that control BSF, and ground sprays are not always effective. Crops at most risk are those planted in late spring and early summer (from mid-late April onwards), and it is reported that the presence of germinating seeds, with recently disturbed soil and high levels of organic material are the key factors that attract the flies. We would like to evaluate several cultivation techniques that may help to manage BSF attack in legumes, to include timing of spring cultivations compared to drilling date, and degree of tillage (including min-till and no-till). We will also evaluate the effects of cultivation techniques and BSF damage on plant infection with soil-borne diseases, to evaluate the impact of changing cultivation techniques for peas and beans. Trials will be large plot trials using farm-scale machinery with the assistance of grower groups.  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | PGRO levy with vining pea grower groups |
| **AHDB Surveillance approaches, impact and epidemiology of virus diseases to improve management strategies** | Plant viruses are transmitted by vectors including invertebrate, fungal or human. Once a plant is infected with a virus it can’t be treated and will form a source of inoculum for other plants. Gaining an in-depth knowledge of the epidemiology of plant virus diseases is the key to effective disease management. With the decrease in availability of pesticides for the horticultural industry, alternative approaches such as novel chemistries and cultural management can be expensive to apply prophylactically or may only be allowed with a limited number of applications. Therefore, the primary elements to understanding effective virus management become identification of key vectors and the timing of transmission to formulate management strategies. The aim is to develop a cost-effective generic approach to allow surveillance of any horticultural crop for the presence of both known and unknown viral pathogens, and to also allow quantification of the incidence of such pathogens. Working in pea crops as an exemplar system virus incidence data will be used to identify fields for focused further study of virus yield reduction/impact assessment. The proposal is funded under the AHDB call ‘Improved management of virus diseases’.  *Addresses strategic priorities 1, 4, 5 and 6.* | AHDB (FV 459), co-funded with PGRO and FERA Science Ltd. |
| **Fertiliser Manual (RB209), PLANET and MANNER-NPK updates** | RB209 was updated in May 2017 and priorities for review and further research are in place, as per steering group meetings. PGRO has a place on the steering group and in the technical working groups. The update is available as a downloadable pdf document containing basic principles and crop sections <https://ahdb.org.uk/projects/RB209.aspx>.  There are currently no changes for legumes.  *Addresses strategic priorities 1, 2, 3, 4, 5 and 6.* | AHDB, PGRO and BBRO  Peas and beans |
| **Biostimulants, bio-control agents and nutritional products in vining peas, combining peas and field beans for legume disease management** | Following preliminary trials of several biostimulants, fertilisers and trace element seed treatments in vining peas in 2017, additional trials have been undertaken to evaluate products in vining peas, combining peas and field beans. Impacts on yield and legume diseases (*Aphanomyces euteiches* (root rot) and *Peronospora viciae* (downy mildew)) were monitored. New biological products may offer an opportunity to improve management of soil-borne diseases, and the project aims to test a variety of biostimulants, biocontrol agents and nutritional products in field conditions. Soil applied products were TFP Pro Soil and Serenade ASO. Seed treatments were Radiate ST, Start-Up ST, Take-Off ST, MultiMax GPA ST and Kick-Off ST. TFP Pro-Tect, Zynergy Na13, Agrihit Foliar Tonic, Phorce and Prestop were foliar applications made on two occasions. A full report is available on request.  *Addresses strategic priorities 1, 2, 3, 4, 5 and 6.* | PGRO levy |
| **Improving productivity in pea and bean growing through advanced data analytics, machine learning and artificial intelligence techniques** | The project aims to develop a remote sensing software analytics platform for peas and field beans. The platform will allow growers to better understand the health of crops and aid early decision making. Experiments and ground truthing will focus on soil health, nutrition and crop growth to stabilise and improve yield and quality in peas and field beans. The project started in October 2018 and ends in September 2020.  *Addresses strategic priorities 1, 2, 3, 4, 5 and 6*. | Co-funded by Innovate UK (104473) and Hummingbird Technologies, with PGRO as a partner |
| **Pulse Crop Genetic Improvement Network –** **combining** **peas, field beans and lupins** | CH0110: The Defra-funded network, initially formed in 2005, is based on collaboration between a strong research base and the UK plant breeding and additional industries to promote genetic research and development of pea and faba bean crops and assist with more sustainable development of the arable sector. PCGIN has been extended for 5 years until 2023. Please visit the website for further details: [www.pcgin.org](http://www.pcgin.org)  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | DEFRA (CH0110) and led by the John Innes Centre |
| **PeaGen - Genetic improvement of pea to replace soyabean in the diets of poultry and monogastric livestock – peas** | In this LINK project new genetic approaches to enhance the nutritional value (protein and water-soluble carbohydrate) of the pea (*Pisum sativum* L.) seed will be developed and applied. The aim is to increase the use of peas as a high-quality feed in animal diets, reducing the UK protein deficit from the import of soya products and delivering environmental benefits to livestock production systems. The project started in October 2017 and duration is 5 years. PGRO will carry out trials to evaluate the agronomic character of the peas and will help to disseminate findings.  *Addresses strategic priorities 1, 3, 5 and 6.* | BBSRC Link (BB/P017517/1) with Aberystwyth University (IBERS), Stonegate Holdings Ltd., Gressingham Foods, Moy Park Food Company, Senova Ltd., The John Innes Centre, Dalehead Foods, iDNA Genetics, PGRO and Phytatec UK Ltd. |
| **Fostering sustainable legume-based farming systems and agri-feed and food chains in the EU (LEGVALUE)** | The goal of LEGVALUE is to develop routes to sustainable and competitive legume-based farming systems and agri-feed and food chains in the EU. The project will assess both the economic and environmental benefits for the EU agro industry to widely produce and use legumes in a sustainable manner. PGRO is a work package manager for dissemination of findings, as well as a partner to develop farm networks and supply chain case studies. Within this project three UK farm networks have been created to provide further information about the following:  Field beans – benefit of N to following crop  Vining peas – effects of cover crops on soil health  Combining peas – PEA YEN will be used in the first instance to start the pea farm network and show examples of best practice – this farm network is still being formed.  Other case studies across the EU are being used to demonstrate best practice and novel interventions for pulses. There are several combining pea networks.  <http://www.legvalue.eu/>  *Addresses strategic priorities 1, 2, 3, 4, 5 and 6.* | EU Horizon 2020, project no. 727672 |
| **Transition paths to sustainable legume-based systems in Europe (TRUE)** | The main aim of TRUE is to identify and enable pathways to successful legume-supported production systems and agri-feed and -food chains. PGRO is a partner for dissemination and stakeholder engagement.  <https://www.true-project.eu/>  *Addresses strategic priorities 1, 2, 3, 4, 5 and 6.* | EU Horizon 2020, project no. 727973 |
| **PGRO Recommended and Descriptive Lists for vining peas and pulses** | Varietal evaluation  <http://www.pgro.org/downloads/A4-rec-list-2019.pdf>  <http://www.pgro.org/agronomy-guides-publications/>  *Addresses strategic priorities 1, 4, 5 and 6.* | PGRO and seed industry |
| **PGRO PhD program (**[**http://www.pgro.org/phd-studies/**](http://www.pgro.org/phd-studies/)**):** |  |  |
| **Developing novel seed treatments for legumes: Optimising sustainable outcomes in agricultural systems** | Legumes fix atmospheric nitrogen through their symbiotic root-nodule bacteria (e.g. *Rhizobium* spp.) and reduce the need for synthetic fertiliser input. Successful root nodulation relies upon agricultural soils having a sufficiently high inoculum potential. Intensively farmed soils are often lacking in populations of rhizobia due to the rotation of non-leguminous crops and high application rates of synthetic nitrogenous fertilisers. A strategy to combat this is to directly treat the seed with a concentrated inoculum of rhizobia, which ensures suitably high concentrations of root-nodule bacteria in the rhizosphere of the growing root. Because this technology is suitably advanced, there is the opportunity to optimise this process by combining seed treatments that can simultaneously increase biological nitrogen fixation and induce disease resistance through the addition of plant growth-promoting rhizobacteria (PGPR) and resistance elicitors. The focus of this studentship is to develop novel legume-microbe seed treatments as practical liquid, solid or seed coating formulations, and assess subsequent root nodulation, plant development and disease resistance in peas and faba bean. The PhD started in October 2017.  *Addresses strategic priorities 1, 2, 3, 4, 5 and 6.* | Co-funded by the University of Stirling, Legume Technology Ltd., PGRO and The James Hutton Institute |
| **Investigating the relationship between *Aphanomyces euteiches* and yield decline in peas** | The PhD investigates the relationship between *Aphanomyces* and yield in peas and aims to develop molecular techniques for identification of the disease. The PhD started on 1 October 2015 and study continues for 3 years, with a 4th year for writing. Soil sampling and testing was carried out in several fields in different UK regions in 2016 and 2017, prior to planting and just before harvest. Sampling was undertaken to determine UK distribution of *Aphanomyces* and factors that encourage disease. Molecular LAMP assays were carried out at Nottingham University and correlated against the plate test developed at PGRO to determine whether the LAMP assay can be used for quantification of *Aphanomyces* levels. Good correlations were shown, and qPCR was followed up to further validate the LAMP assays. A glasshouse experiment was undertaken in 2018 to determine effects of cover crops (including legumes) on *­­Aphanomyces* infection. Thesis submission is due September 2019.  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | Co-funded by PGRO and Nottingham University |
| **Understanding and mitigating the causes of yield decline in peas** | The objectives are to understand the components and dynamics of the foot-rot complex as well as associated microbiota in the pea rhizosphere using both conventional and metagenomics approaches, DNA sequence key pathogens and investigate soil microbial communities and to Identify green manure / biofumigant crops that can suppress foot-rot.  The PhD study period started in March 2018. Several pathogens contribute to the foot rot complex and we identified that least is known about *Didymella pinodella*. The PhD will therefore focus on *Didymella* and its role within the complex. Interactions with the other foot rot pathogens will be investigated.  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | Co-funded by PGRO and BBSRC with Warwick University |
| **Stem nematode in field beans** | The study aims to better understand the crop pest relationship, to establish a more reliable quantification method and to investigate likely control methods, whether biological treatments (such as catch/ cover/ biofumigation) or cropping techniques, to speed the remediation of infested land and bring it back into economic bean crop production. The PhD started in April 2017 and initial trials were carried out at a site known to have a high level of stem nematodes. Results are being analysed. The 2018 site selected for trials is known to have a pre-existing infestation of *Ditylenchus gigas* (previously ‘giant’ race) and potentially *Ditylenchus dipsaci* (previously ‘oat-onion’ race) and is based at Harper Adams University.  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | Co-funded by industry with Harper Adams University |
| **Strategies to optimise pollination of the UK field bean crop** | The project will explore strategies to maximise pollination of the UK field bean crop. Recent reports suggest that pollination service is limiting yields in field beans. We will explore strategies for optimising field bean flowers to provide maximum reward to pollinators for minimum foraging energy expenditure. This will have the dual benefit of increasing pollinator attraction to current crops, thus increasing yield, while also supporting wild pollinator populations, thus increasing future pollinator population sizes. A combination of analytical, molecular genetic and behavioural ecology techniques will be used. Commercial lines will be screened for variation in pollinator-relevant traits and to identify genetic variation of potential use in breeding programmes.  *Addresses strategic priorities 1, 4, 5 and 6.* | PGRO and BBSRC with Cambridge University. |
| **The biology and ecology of *B. rufimanus*** | The PhD ended successfully in March 2018 and focused on several areas of *B. rufimanus* biology and ecology. The following were included in the study: UK distribution; factors stimulating emergence from overwintering sites; factors influencing oviposition; control with insecticides; management using cultural techniques such as sowing timing, variety and plant density. The research provided evidence for the influence of temperature on damage caused by *B. rufimanus* and provided guidance for the distribution of the pest across the UK, allowing growers to plan insecticide applications according to regional pest pressure. It has been possible to link these findings with data supporting improved cultural methods to reduce the impact of the pest, particularly the timing of sowing.  *Addresses strategic priorities 1, 4, 5 and 6.* | PGRO and The Perry Foundation with Newcastle University |
| **Knowledge Exchange** | * Advice and literature are produced throughout the year with technical information made available via the web site at [www.pgro.org](http://www.pgro.org). * Marketing reports are collated in conjunction with BEPA and distributed monthly throughout the year. * Pulse roadshows are held across the country each year during January and February. Details are available at <http://www.pgro.org/pgro-diary-of-events/>. * Technical members of staff contribute to an increasing number of grower/merchant and Ag-chem Meetings. * All issues of PGRO Pulse Magazine are distributed through Crop Protection Magazine (CPM). * The PGRO Recommended and Descriptive Lists of vining peas and pulses are published annually. * PGRO has developed an android and Apple application to replace the Pulse Agronomy Guide and Vining Pea Guide. All information from the guides will be updated in the App. * Monitoring services are carried out for pea and bean weevil, pea moth, silver Y moth and bruchid beetle. * Field visits are carried out on request. * The PGRO legume crop protection training course is held annually at the beginning of the year. * The plant clinic operates all year. * Crop updates are distributed to inform about topical issues throughout the year. * AHDB Aphid News is distributed to members via the PGRO website amongst others. * A series of Technical updates is maintained. |  |

**PROJECTS RECENTLY FINISHED**

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| **Pea Downy Mildew diversity in the UK (Lea Herold)** | Downy mildew isolates have been collected from a range of varieties from trials and commercial sites. The project has established successful means of inoculating peas and of storing downy mildew. A culture collection of 110 isolates has been created and is being maintained. The isolates cover a wide range of different races. This project finished in March 2018 and outputs will be used to screen commercial pea lines for resistance to downy mildew.  <https://horticulture.ahdb.org.uk/project/pea-downy-mildew-diversity-uk>  *Addresses strategic priorities 1, 4, 5 and 6.* | AHDB-Horticulture FV346 and PGRO with JIC |
| **Improving the resistance of legume crops to combined Abiotic and Biotic Stress (ABSTRESS) Peas** | The project aimed to use different tools to study the effect of drought and *Fusarium* stress on the pea crop both at the genetic and field level. Breeding material with tolerance to both stresses has been developed.  <https://secure.fera.defra.gov.uk/abstress/>  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | EU FP7 project with partners across Europe |
| **Legumes for the Agriculture of Tomorrow (LEGATO) – Field beans, combining peas and lupins** | The overall aim was to contribute to the sustainable reintroduction of grain legumes in European cropping systems. Working on pea, faba bean and with specific objectives for white lupin and grass pea, the project focused on identification of and testing novel legume breeding lines possessing characteristics such as pest and disease resistance, tolerance to abiotic stresses and quality for human consumption. This project ended in December 2017.  <http://www.legato-fp7.eu/>  *Addresses strategic priorities 1, 2, 4, 5 and 6.* | EU FP7 project |