

2013



**PGRO**  
**Annual Report**

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## **AN INTRODUCTION TO PGRO**

Since its formation in 1944, PGRO has provided research and technical services to growers and processors of legume crops in the UK. It is funded by (a) *voluntary* grower levy collected by the merchants and processors who purchase the produce, and (b) contracted trials work commissioned by both commercial companies and government agencies. As a registered charity and company limited by guarantee, it is managed by a Board of Trustees appointed from the National Farmer's Union, relevant food processors, and other related industries. This Board meets three times a year and four Board members also form, with the CEO, the Management and Finance Committee which meets to review operational issues every two months. A management team of the four senior members of staff, chaired by the CEO, meets monthly to manage the day-to-day decisions.

PGRO's purpose is to provide a comprehensive technical service to the growers and processors of legume crops in the UK. Its mission is -

*"To provide a responsive, independent technical service to voluntary levy paying members for legume and other selected vegetable crops. To ensure members have access to (a) timely, accurate information, and (b) staff who are competent, enthusiastic, and lead the sector."*

PGRO remains one of the few UK sources of sound, independent technical advice, at a time when food production, quality and provenance have never been more scrutinised, both locally and globally.

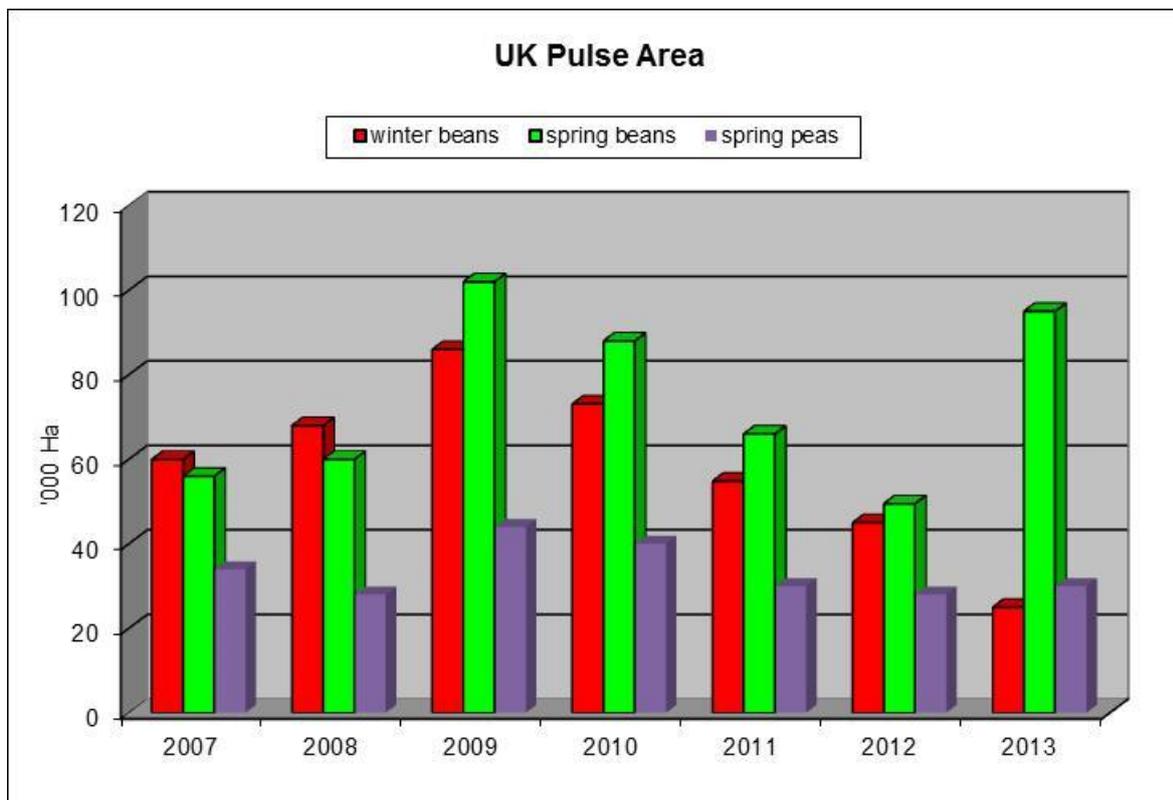
## **2013 LEGUME CROPS IN UK**

2013 emerged in the depths of a very wet and cold winter. The excessive rainfall of the preceding autumn had resulted in the failure to establish significant areas of winter cropping. Estimates were that just 70-80% of the average winter wheat area were established and significant areas of oilseed rape were under performing, hampered by the conditions and bird feeding pressure. This presented spring crops with an opportunity not seen in many years and PGRO was flooded with enquiries for information about late sowings of winter beans, drilling rates and dates for spring beans and peas. Seed was in short supply for all spring crops and seed prices for imported seed went through the roof. The very cold conditions lingered well into March making soil preparation treacherous and drilling extremely difficult. Much seed was sown into low temperature and soggy soils. Early drillings were soon seen to have reduced vigour as a result and the crops sown later (beans were sown into May) rapidly caught up as a result. The spring drilling of both winter and spring beans was later than had been known in living memory and vining pea harvest scheduling was thrown from the start as later sequential sowings closed the gap on the less vigorous early crops.

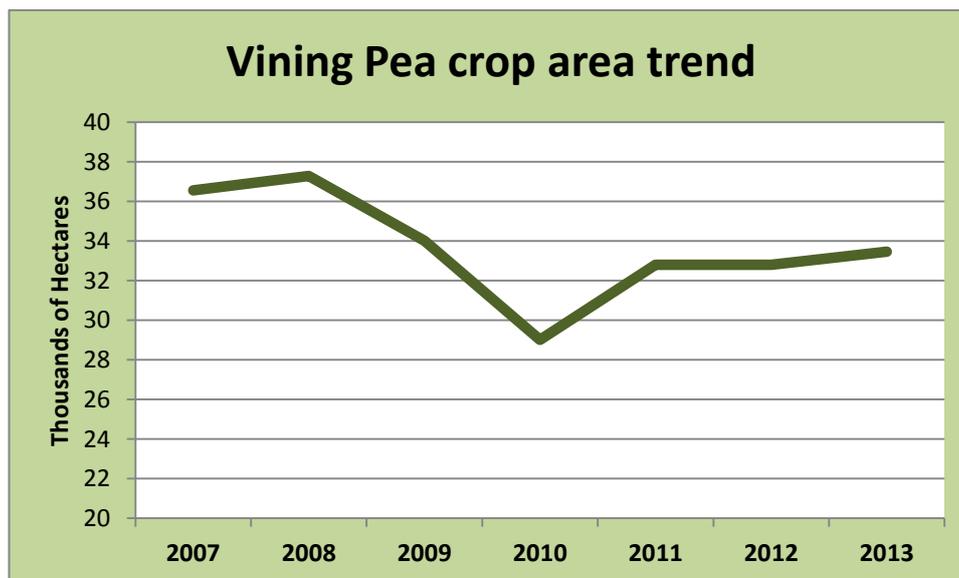
As June unfolded the best estimates were that vining peas were sown at similar levels to previous seasons but that combining peas may have risen by 10%. Winter beans had fallen by perhaps 50% and spring beans risen by as much as 80%. Confident estimates were impossible with the knowledge that large quantities of farm saved seed had been used but without means of quantification. Through the season it became clear that the vining pea area had increased slightly but remained within the normal range. Combining pea area increased slightly but the big winner was spring beans. In total pulses were cropped across approximately 150,000 hectares.

As is well recorded the spring turned into the warmest and driest summer for decades. Conditions looked set for bumper crops but some suffered with heat and water stress in mid-July. Generally pulse crops yielded very well and vining peas enjoyed good returns despite a concertina effect on the harvest sequence resulting in significant bypass crops. It is estimated that beans yielded over 4 tonnes hectare and combining peas around 3.5 tonnes on average. National yields of dry beans and peas were approximately 480,000 tonnes and 105,000 tonnes respectively.

The weather pattern experienced in the UK was also a factor in France where they also suffered significant pest damage. This resulted in a UK bean crop of significantly better quality than the French and UK merchants gained share in the export markets of North Africa and Arabian countries. With product in demand at home and abroad prices for produce in both peas and beans held up well with both reaching and sustaining a long term high. Returns available to growers from a crop in demand and the associated benefits of pulses in the rotation are adding to the compelling reasons for a growth in combining peas and beans. With a strong pulse market and falling prices for rape seed growers are seeing very attractive commercial arguments for pulse production.



Vining peas performed well with approximately 126,000 tonnes being frozen, approximately 4 tonnes per hectare grown. Vegetable levy ended the year 8.9% ahead of budget at £116k. Growers also captured by the HDC/AHDB levy reclaimed a lower amount this year from PGRO but the problem persists. There has been no review of the Statutory Instruments that can change this despite continued lobbying for change. Vining pea area is constantly under pressure for good returns and 2013 was an improved season. Pressure for land from alternative crops in key vining areas is also apparent as renewable energy crops are promoted.



Having fallen considerably in the years to 2010 the Vining pea crop area has enjoyed a period of stability in recent seasons at around 33,000 ha

#### STRATEGIC PROGRESS

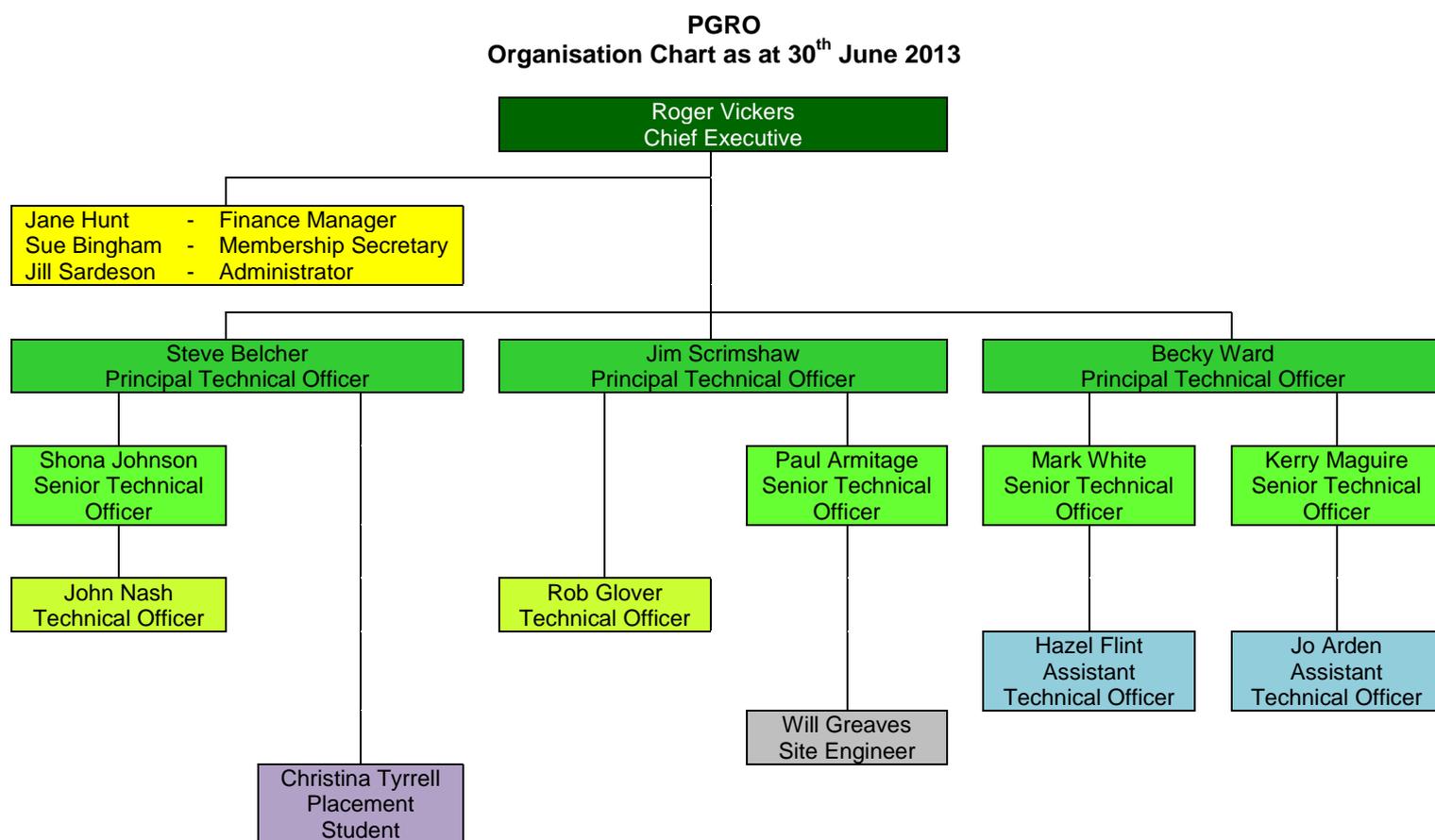
The path outlined in the PGRO "Strategic Review 2012-2014" continued and the process of starting a review for the impending period ahead was begun. The focus continued to be upon levy funded research supported by supplementary income from research contracts. Following a reduction in income from both sources the strategy is under review.

Value for the Levy payers remains core to the PGRO existence and the realisation of this strategy is revealed in the proportion of funds spent on research compared to levy income (see pages 4 and 6).

Success in application for grant funded research rose in 2013 adding to future income streams. Associated phased increases in research costs are apparent with little KT to deliver until projects are nearer conclusion.

In investing for the future and with a solid year end performance in sight, the opportunity was taken to invest some capital in improvements to the building at Thornhaugh, replacing and insulating to the upper flat roof. Improvements in the organisations IT systems began with the start of a programme of computer hard ware replacement and a complete upgrade in more up to date office and R&D software.

## STAFF STRUCTURE & PERSONNEL



Total 17 employees

- Dr Anthony Biddle retired at the end of end of March 2013 after 43 years outstanding service.
- Susan Thompson resigned in January 2013 to pursue other interests into retirement.
- Emma Kercher left after her 6 month assignment under the MDS agronomy training scheme concluded.
- Jo Arden returned from maternity leave in June 2013.
- Christina Tyrrell joined in June on 12 month placement as part of her BSc studies at Lincoln University.
- Funds from the Geoffrey Gent Bursary scheme were used to fund Jo Arden and Hazel Flint in starting Seed Analytics training. The bursary had almost £6k remaining at the end of 2013.

## FINANCES

Net outgoing resources in the 2012 accounts showed a deficit of £109k and with a small harvest in 2012 the first half of 2013 saw very poor income. There was almost no pulse trade in quarters 1 and 2. The 2012 crop (the smallest area sown to pulses in approximately 30 years) produced a very poor yield due to the continued terrible growing conditions and most of it had been traded in quarters 3 and

4 of 2012. With brisk trading immediately post-harvest, the 2013 pulse levy year end total rose year on year. With the larger crop area and good average yields levy receipts reached £498' k, up 17%, still however 5% behind the levy income of 2011.

Vining pea levy on the other hand increased almost 32%, with growers enjoying far better harvests. It finished at the same level in 2011.

Total levy income was up £75k compared to the previous year, but approximately £20k below budget mostly the result of the shortfall in winter bean crops following the previous appalling winter establishment conditions. Pulse levy was 9% below budget at £350k.

Levy and membership income was £498k as opposed to £422k the previous year. Contract income was also up £60k following the failure of certain vegetable trial contracts to materialise. Technical research income totalled £194k as opposed to £179k in 2012.

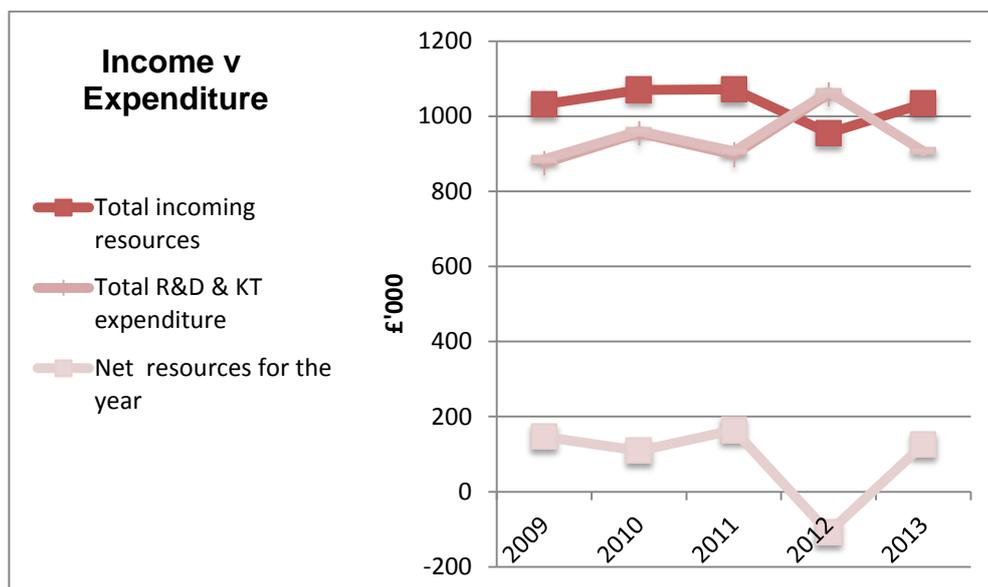
Costs were closely controlled during the year. Leavers were not directly replaced and a saving in staff and overhead costs of £42k was achieved against budget of £591k. A year on year reduction of £98k. Reduced expenditure in Machinery Vehicles and Property was realised saving £11k on the year and significantly better than budget.

Project costs fell by £74k as various projects with public funding came to a conclusion.

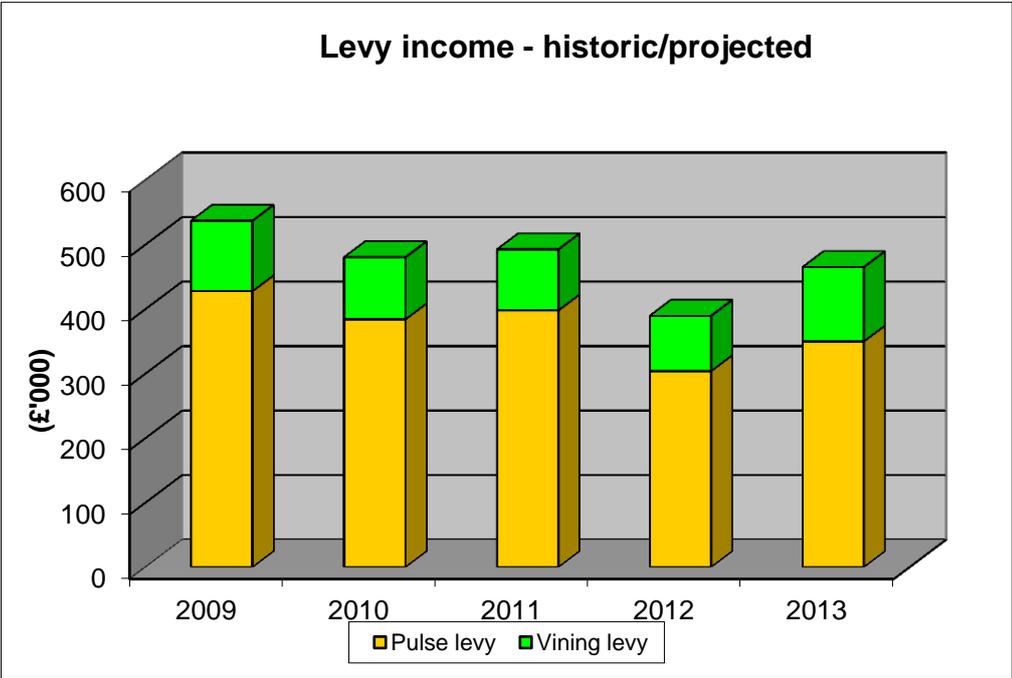
Conferencing income fell in 2013 as organisations continued to feel recessionary squeeze, but the seed lab was up 7% on budget and 20% up on 2012 performance.

PGRO has no borrowings continuing to operate without debt. PGRO's longer term investments ended the year at £676k an increase of approximately £73k following an further £35k investment and stronger stock market performance.

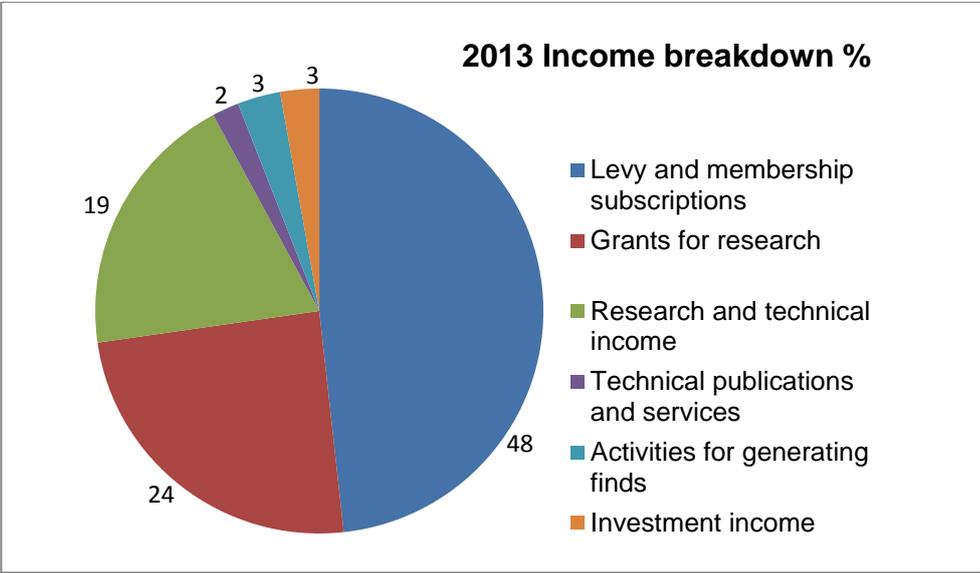
Net current assets at the yearend were up 57% at £374k. Total funds carried forward were increased from £1.21 to £1.41m.



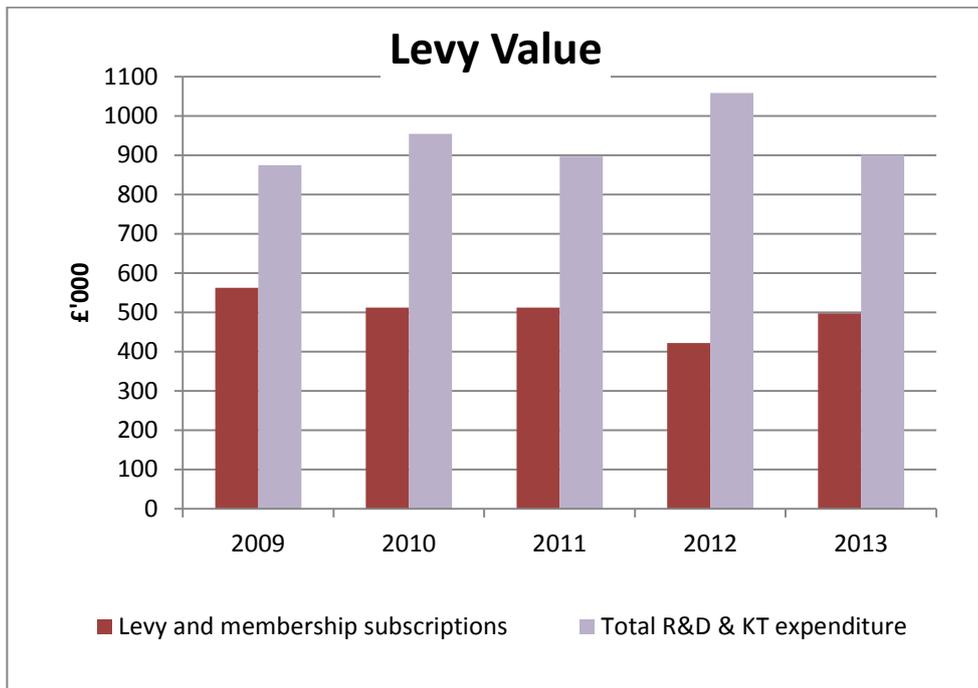
Despite very low receipts in the first half of the year the final balance on trading (above) showed a net incoming resource of £126k, a considerable improvement on 2012 when a net outgoing resource of £109k was recorded. With the phasing of crop trade from the previous harvest being critical to the timing of levy income, close control was vital to avoid an over extension of resource. The realisation of a surplus at the end of 2013 (reversing the fortunes of 2012), means the organisation is in a stronger position to invest in delivering it's objectives in 2014.



The four year declining levy trend (illustrated above) was partially arrested in 2013. A greater spring crop area, a good growing season and a relatively normal harvest saw an increase in both vining pea and pulse returns for 2013. Levy will remain a volatile income source, dependant as it is on the annual fortunes of pulses and vining peas.



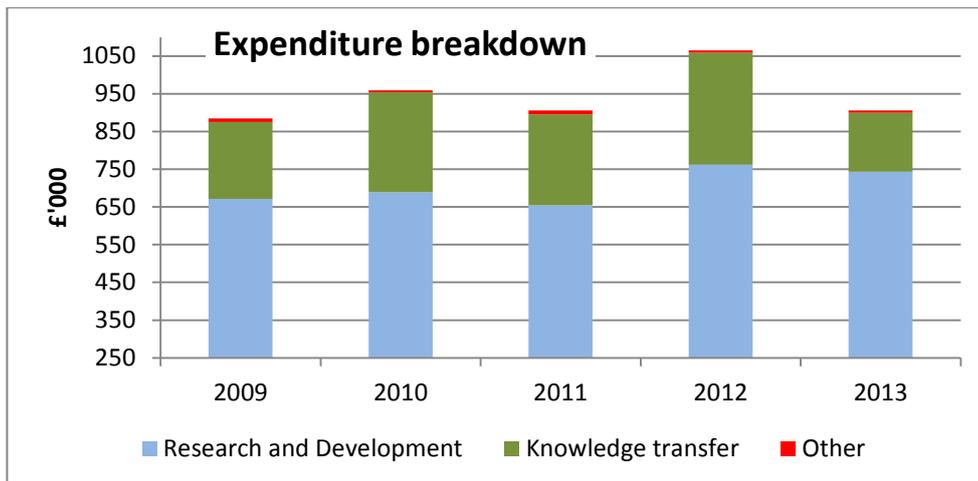
The breakdown (above) shows that 2013 levy and membership receipts again provided less than half of PGRO's income during the year. Research contracts and grant income rose again to further compliment and leverage the value of levy.



The ratio of the levy to the total spent on R&D continues to illustrate the added value the PGRO generates. In 2013 for every £1 in levy received, approximately £2 was spent on research and knowledge transfer activities. With employment costs down significantly more KT activity was delivered with less in 2013.

#### COMMUNICATIONS AND KNOWLEDGE TRANSFER (KT)

The retention of a PR agency, shared with BEPA, has continued to raise the profile of PGRO with the press and has continued to ensure journalist attention to all our events with subsequent excellent press coverage.



The transfer of knowledge gained from research remains a high priority objective, central to PGRO. Considerable effort is made to reach out to levy payers and a significant proportion of total expenditure is allocated to Knowledge transfer Annually. In 2013 KT expenditure fell as all costs were kept under tight control. However KT activities were increased with reduced cost, preserving investment in research.

**The following KT activities can be listed for 2013.**

- a. Advice and literature was produced throughout the year with much of the technical information made available through the PGRO web site [www.pgro.org](http://www.pgro.org)
- b. Marketing reports were collated in conjunction with BEPA and distributed monthly throughout the year
- c. Sixteen crop bulletins were issued throughout the season.
- d. PGRO and BEPA were present at the Cereals 2013 event with displays and plots of peas and beans
- e. PGRO exhibited at the 2 day national Crop Tec event which was attended by staff
- f. 38 Technical updates were produced for the use of growers and agronomists
- g. PGRO corporate image was modernised and the Web site was re-launched presenting a more user friendly interface with improved content
- h. Pea moth bulletins were moved to an on line service hosted on the PGRO web site
- i. Social media was embraced with the launch of a Twitter account @pgrresearch for the dissemination of technical messages and topical activity updates
- j. Considerable time and effort is expended in fielding and responding to requests advice by telephone
- k. Pulse road-shows were held at 5 locations in January and February in conjunction with Syngenta
- l. Technical staff contributed to a number of grower/merchant and Ag-chem. meetings.
- m. Two issues of PGRO Pulse Magazine were distributed through Farmers Weekly with a circulation of around 23,000. The third issue was distributed via CPM magazine under a new contact arrangement giving a more targeted coverage of arable farmers and pulse growers. Distribution via CPM publication will give greater at a technical and practical level for pulse crops in general. The Pulse magazines are a significant vehicle for knowledge transfer to growers.
- n. Vegetable magazine was again produced for the vining pea and vegetable legume industry, directly mailed to growers and grower groups.
- o. The PGRO Pulse Agronomy Guide was revitalised and released in January 2013
- p. The PGRO Recommended Lists of peas and beans were announced in November.
- q. The PGRO Vining Growers Guide including the vining pea descriptive list was also updated and modernised - produced and published in November.
- r. Conventional press/media were used extensively to ensure pulses and vegetable legumes received good coverage in a market expressing strong interest in spring cropping.
- s. Two open day /trials events at PGRO were held for vining peas and pulses.
- t. PGRO supported Open Farm Sunday at Sacrewell Farm, Thornhaugh.
- u. PGRO supported NIAB at the National Science week in Cambridge.
- v. PGRO supported AICC at their annual conference.

## RESEARCH & DEVELOPMENT PROJECTS 2013

The two crop sector panels met during the year to discuss and prioritise research needs for processing legumes and pulses.

### Research Strategy for Combinable Pulse Crops

The Pulse Panel (appendix 2) agreed that it would collate a general plan for PGRO research priorities and would in future meet twice per year (Spring and Autumn).

Steve Marx (PGRO Trustee- see appendix 1) was elected Chairman of the Panel and Stephen Frances as Vice-Chairman

The Pulse Panel has drawn up a working document - current at the turn of the year, reproduced in appendix 3.

### Research Strategy for vining peas and vegetable legumes.

In 2012 PGRO in conjunction with HDC lead the Processed Legume Industry Panel (appendix 2) in formulating a Research and Development Strategy for Vining Peas, Green Beans and Broad Beans. That strategy is being used for the direction of Levy sponsored projects at the PGRO for the period 2012- 2015 and is reproduced in appendix 4.

## SUMMARY OF 2013 PULSE LEVY SPONSORED PROJECTS

### 1. VARIETY EVALUATION

Autumn 2012 was a very wet period and many winter bean crops were not sown until the spring. The poor autumn weather meant some OSR crops failed and the area of spring sown crops (in particular spring beans) benefited. The weather in 2013 was favourable to these late sowings and to spring sown pulse crops in general. Yields from spring beans were higher than average and quality generally good. Peas were a little more variable, but overall yields and quality were good.

After the wet autumn, January experienced a particularly cold period, but winter beans survived this well. Overall spring 2013 was the coldest since 1962 and temperatures only really recovered in July. July however, saw a heat wave from 3 – 22 July which caused wilting in some bean crops. The spring was generally dry across the UK, but drilling in the East was delayed by a wet first 3 weeks of March. The summer was generally dry with favourable harvest conditions, particularly for peas.

#### a. PEAS

*Overall trial yields (5.58t/ha) of peas were a little up on the 5 year (5.02t/ha) average. Seven trials went through to harvest, with yields ranging from 7.28t/ha in Essex to 4.42t/ha in Cambridgeshire.*

There are no changes in the white pea category with Salamanca, Mascara and Gregor all remaining fully recommended. Similarly in the large blues, Crackerjack, Prophet and Daytona remain with a full recommendation. Stratford continues with a second year provisional recommendation (P2) and has the best rating for downy mildew resistance (8). New to the List for 2014 is Campus. Large blue Campus (LS Plant Breeding) just pips Crackerjack as the top yielding variety on the list and combines a very high score (8) for standing ability with a moderate rating for downy mildew resistance. Fully Recommended maple peas Mantara and Rose are joined on the list by Rainbow with a P1 recommendation. Rainbow (IAR Agri) gives similar yields to Rose and larger produce. Pea colour is different to either Rose or Mantara. In the marrowfat category Sakura, Neon and Genki remain fully recommended varieties, while Bibao moves from P1 to P2 recommendation. With the withdrawal of Hawaii from the list by the breeder there are no small blues in that category.

#### b. WINTER BEANS

*In the wet autumn of 2012, 4 out of 6 winter bean trials were sown. Unlike 2012 season, levels of chocolate spot were much lower this year. 2013 trial yields (4.95t/ha) were higher than the 5 year (4.34t/ha) average and much higher than 2012 (3.51t/ha).*

In recent years there has been little change in winter bean varieties, but for 2014, two new varieties were added to the list. In the pale hilum category, Honey now joins Wizard as a fully recommended variety, while Sultan moves from fully recommended to outclassed. New to this category for 2014, with a 1st year provisional recommendation (P1) is Tundra. Tundra (Limagrain UK) is the highest yielding in this this category and has a good all round agronomic package, but produce is a little smaller than Wizard. In the black hilum (feed bean) category, Clipper and Arthur remain fully recommended varieties. Joining these for 2014 with a P1 recommendation is Buzz. Buzz (Wherry

and Sons) is a little lower yielding than Clipper or Arthur and sits between these two for earliness and shortness of straw. Standing ability is better however, and produce has a very large thousand seed weight.

### **c. SPRING BEANS**

*The two new high yielding varieties newly recommended in 2012 have been successful in 2103. Trial yields (5.58t/ha) were better than the 5 year average (5.02t/ha). Levels of downy mildew were much lower than in 2012.*

In the pale hilum category Fury, Pyramid, Fuego and Babylon all remain Fully Recommended varieties, while Boxer gains a full recommendation for 2014. Progressing from P1 to P2 recommendation are Vertigo and Fanfare. Vertigo is the top yielding variety, significantly out-yielding Fuego, while Fanfare is a little behind Vertigo. Downy mildew for these varieties is mediocre (4) compared to Fury and Pyramid (6) and Babylon (7). Finally, tic bean Maris Bead deserves a mention for achieving 50 years on the Recommended List (1964 to 2104). We think this a unique occurrence and one that may not be repeated. 2013 has seen an increased area of spring beans, good yields and good quality. With need for break crops in the rotation and good new varieties in the pipeline we hope to see this trend continue into 2014 and beyond.

## **2. SCOTTISH PULSES** (with SAC)

### Spring beans

SAC conducted two spring field bean variety trials in 2013. One variety trial and one agronomy trial. Both trials in the Perth area suffered from excessive dry weather (in comparison with 2012 when excessive wet weather was experienced) Results were presented as a separate table, including the 3 year means in the PGRO Agronomy Guide

## **3. VARIETAL SUSCEPTIBILITY OF COMBINING PEAS TO DOWNY MILDEW (*Peronospora viciae*)**

As part of the series of trials to assess the relative susceptibility of combining peas to downy mildew, two disease observation trials were carried out by PGRO in conjunction with those carried out by NIAB. Twenty one varieties in the Recommended List trial and four varieties in the NL series were planted at Holbeach, Lincs and Chatteris, Cambs. Data with those from NIAB were collated to provide a rating for the PGRO RL for combining peas.

## **4. PULSE CROP GENETIC IMPROVEMENT NETWORK (PCGIN)** (with JIC and NIAB)

The network, formed in 2005, is based on collaboration between a strong research base and the UK plant breeding industry to promote development of peas, beans and lupins and therefore assist with the more sustainable development of the arable sector. The network has created stakeholder groups to interact within the network and to provide links with the EU research community. PCGIN is managed by JIC, PGRO, NIAB and Defra with input by the commercial sector. This was the final year of the current funding.

The objectives are to identify key phenotypic and performance characteristics within peas and beans, to develop genetic maps in pulse crops to provide novel germplasm and marker traits for commercial development of varieties.

The final report of PCGIN was prepared and is available from John Innes Centre.

In 2013, seed from a number of lines was planted in a replicated trial at Thorney to repeat the failed lines from the 2012 trial.

**A proposal is being considered for Agri-Tech Catalyst funding (DEFRA, TSB, BBSRC) to continue PCGIN**

## **5. WEB BASED FORECASTING SCHEME FOR DOWNY MILDEW IN SPRING BEANS** (with FERA, York)

The automated system at Fera was available for forecasting downy mildew monitoring from 15 sites from April until late June. Updates about the infection risk at each monitoring site were posted weekly on the Spring Beans page on the CropMonitor website ([www.cropmonitor.co.uk](http://www.cropmonitor.co.uk)).

## 6. BRUCHIDCAST

(TSB supported project with PGRO, R-RES, Syngenta, Frontier and OECOS)

The project comprises the following:

- a. Field trapping: Observations in commercial crops indicated later infestation of bruchid adults than 2012 with crops about two weeks behind in growth stage development at the beginning of the summer. Growth stage development and temperature data were collected at trial sites. Data are being analysed for 2013.
- b. Crop damage - Surveys of crops from across the UK were carried out and damage analysis showed damage to be lower than 2013. Most damage occurred to crops in the East and South, with no damage in northern crops.
- c. BruchidCast - A forecasting model is being constructed using met data from regions across the UK. This will be launched on the Syngenta website in 2014. In conjunction with this a series of trapping sites will be managed by PGRO to monitor insect populations from south to north. Willing growers are sought to host trap sites.
- d. The project finishes in September 2014.

## 7. MINIMISATION OF NITROUS OXIDE INTENSITIES IN ARABLE CROP ROTATIONS

(LINK supported project with ADAS, SAC and partners)

Residue and N application trials were completed in 2012. Data analysis is being carried out by ADAS. A full report will be available shortly. The project ends in June 2014.

## 8. MANAGEMENT OF DOWNY MILDEW IN SPRING BEANS

In the third year, two trials were established to manage the disease using a variety with moderate resistance (Fuego) to disease. Seed treatment was compared with a foliar spray programme. Data are being analysed for 2013. In 2012 late Folio sprays reduced disease levels significantly compared to the untreated and Wakil treated seed alone. A late spray plus a seed treatment did not improve control. However there was a slight increase in yield.

## 9. OPTIBEAN

(TSB supported project with NIAB TAG, Wherrys and industrial partners)

The project is in its second year and aims to optimise inputs for field beans whilst maximising outputs. PGRO work involved agronomy studies to assess the yield response to time of sowing and plant populations of both winter and spring beans. In addition, a series of trials examining the response to fungicide applications for chocolate spot and aphicide applications for pea and black bean aphid were carried out. At a further 10 sites, soil SNS were determined following beans and oilseed rape as a comparison and N uptake of the following winter wheat were assessed. Results are currently being analysed.

A third agronomy component is being undertaken by NIAB TAG spray applications unit in examining the potential for inter row weeding using a guided weeder and glyphosate.

Bean feeding studies are being carried out by meat, poultry and fish producers and a LCA for bean feed is being constructed by North Energy Ltd.

The genetic basis for yield stability is being studied by NIAB

## 10. LUPINS FOR UK AGRICULTURE AND AQUACULTURE

(TSB supported project with IBERS, NIAB TAG and industry partners)

This three year project is investigating the potential for lupins for use in poultry and fish production and is based on breeding lines developed by IBERS from the LISA LINK project. PGRO evaluated a range of commercial varieties in a trial in Worcs. Weather conditions delayed the maturity of some types but all varieties were harvested and samples collected for feed analyses values.

## 11. NOVEL COMPUTER VISION TECHNIQUES FOR FOOD QUALITY ANALYSIS – IDENTIFICATION OF *BRUCHUS RUFIMANUS* (BEAN SEED BEETLE) DAMAGE IN FIELD BEANS (*VICIA FABA*) FOR EXPORT FOR HUMAN CONSUMPTION

(PGRO, Lincoln University, Frontier Agriculture (SAF-IP))

The project investigates the potential of novel computer vision technology to identify blemishes in bean seed, including bruchid damage. The aim is to provide information for the development of a hand-held measurement tool. PGRO lead the project with Lincoln University as the science partner,

conducting a feasibility study to test the system. The project is a single year project ending in September 2014. The feasibility study will consider other uses for the technology following the end of the project, and possibilities for further research.

**12. PROTEIN CONTENT VS.YIELD IN LEGUMES:RELEASING THE CONSTRAINT**  
(SAF-IP with Wherry and Son, JIC and other industry partners)

The project investigates the relationship between protein content and yield in pulses. It will produce novel genetic stocks with improved traits, breeding tools and associated marker systems, together with knowledge of screening and characterising mutants. The project will provide advanced understanding and know-how for breeding high-value legume protein crops.

**PROJECT SUBMISSIONS REQUESTING PARTIAL PUBLIC FUNDING**

Applications were submitted for collaborative TSB / Agritech Catalyst funding:

- a. to investigate the remediation of the causes of Pea Sickness
- b. for the investigation of bio control measures for Sitona weevil.

Applications were submitted to HDC for funding of investigations into:

- a. To evaluate glasshouse and microbiological methods as possible techniques for detecting *Aphanomyces euteiches* in vining peas.
- b. To evaluate the effects of soil phosphate levels on rhizobial populations in vining peas.
- c. Pea Downy Mildew diversity in the UK

**SUMMARY OF PROJECTS FUNDED BY PGRO VEGETABLE LEVY, HDC AND OTHER PUBLIC FUNDING IN 2013**

<b>Project title</b>	<b>HDC No.</b>	<b>Start</b>	<b>End</b>	<b>Progress</b>	<b>Sponsor</b>
<b>Vining pea variety evaluation (petits pois and standard peas) – Descriptive List</b>	NA		On-going	Trials complete for 2013. Descriptive List produced Nov 2013. PM and DM included in evaluation.	PGRO levy/ Seed companies
<b>Vining peas – extension of variety evaluation trials (Holbeach)</b>	<b>FV340a</b>	01/03/11	28/02/15	Trial complete for 2013. PM and DM included in evaluation. For continuation the proposal should be submitted at the end of 2014.	<b>HDC</b>
<b>Vining peas – evaluation of new varieties sown at appropriate commercial timings</b>	<b>FV154c</b>	01/03/10	28/12/13	Project ended at the end of 2013. There is not considered a need to continue this work.	<b>HDC</b>
<b>Green bean variety evaluation for Descriptive List</b>	NA	Annual	On-going	Trials complete for 2013. Descriptive List produced Nov 2013.	PGRO levy/ Seed companies
<b>Snap peas – evaluation of varieties sown at appropriate commercial timings (plus herbicide sensitivity trial)</b>	<b>FV419</b>	01/04/13	31/03/14	Trial complete for 2013. Report due March 2014.	<b>HDC</b>
<b>Vining pea populations</b>	NA	01/04/11	31/12/13	Trial complete 2013 and report completed during 2013.	PGRO levy
<b>Minimising Nitrous Oxide Emissions in Arable Rotations</b>	NA	01/07/09	30/06/14	Field trials complete. Report due from ADAS by end of project.	Defra Link/ PGRO Levy/ Industry contribution
<b>Quality Determinants in Pea Seeds</b>	<b>FV351</b>	01/01/10	31/01/14	Project ending in Jan 2014. Data to be disseminated by JIC and PGRO.	<b>HDC/ PGRO</b> levy/ Industry contribution/ Defra Link
<b>Determination of critical soil P levels in vining peas</b>	<b>FV380</b>	01/07/10	31/12/14	Second year of vining pea sites completed. Project meeting 7 <sup>th</sup> Oct 2013. One further year of trials. In conjunction with NIAB	<b>HDC</b>
<b>Field and broad beans - A novel monitoring and forecasting system for the integrated management of bean seed beetle (BruchidCast)</b>	NA	01/10/10	30/09/14	Into final year of monitoring and trials. Traps now almost at commercial stage. BruchidCast will be available by end 2014.	TSB/ PGRO levy/ Industry contributions
<b>Herbicide options in vining peas</b>	NA		On-going	Trials complete for 2013. Report to be completed	Industry/ PGRO levy
<b>Vining and podded peas – control of volunteer potatoes by vision guided spot spraying</b>	<b>FV307b</b>	01/04/13	31/03/15	Trials completed for 2013. Report due for first year. Second year trials 2014.	<b>HDC</b>
<b>Vining peas – downy mildew control using foliar sprays</b>	NA	01/04/13	31/12/13	Trial complete 2013. Report submitted to LIP. Trial to continue in 2014.	PGRO levy
<b>Perennial field margins with combined agronomic and ecological benefits for vegetable rotation schemes</b>	<b>FV334</b>	01/12/08	01/12/13	Trials complete 2013. Report due from STC.	Defra Link/ PGRO levy/ <b>HDC</b>
<b>ABSTRESS</b>	NA	01/01/12	31/12/16	Project in first year of trials. Looking at biotic and abiotic stresses in legumes, of specific interest <i>Fusarium</i> and drought in peas.	EU FP7/ industry contribution

**ABSTESS** is an EU FP7 project with partners across Europe. It aims 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 of these stresses will be developed. Experimental conditions have been established for the two stresses on plant material to enable the study of the plant metabolome. Experiments are underway to determine the genetic and metabolomic markers for the stress. These markers can be used to identify breeding material with greater tolerance to *Fusarium* infection or drought. PGRO has been undertaking knowledge transfer in the first 18 months, in Roadshows, Cereals 2013 and open days. Jim Scrimshaw and Kerry Maguire went to the second project meeting in Lecce, Italy in June 2013. PGRO will start field work in 2014. This will contain varieties from member countries to assess *Fusarium* tolerance or resistance. There will be three replica trials in Spain, England and the Czech Republic so that the data can be compared across Europe.

## **ADDITIONAL PROJECTS**

There are a number of other projects which are not included in this strategy with which PGRO is associated.

They were funded by the HDC and are listed as follows.

### **1. VINING PEAS**

FV 58: Pea midge: pest monitoring and development of synthetic pheromone to aid control

FV 90: Vining peas: threshold for control of pea aphid (*Acyrtosiphon pisum*)

FV 63: Vining peas: seed transmission studies with pea seed borne mosaic virus

FV 72a: Peas, broad beans and green beans; evaluation of air assisted spray application technique

FV 90a: Determination of pea aphid thresholds in vining peas

FV 192: Vining peas: monitoring and control of silver Y moth (*Autographa gamma*)

FV 58a: Vining Peas: monitoring and control of the Pea Midge (*Contarinia Pis*)

FV 231: 3D Farming: making biodiversity work for the farmer (LINK)

### **2. BROAD BEANS**

FV 91: Broad beans: effect of foliar diseases on yield

FV 72a: Peas, broad beans and green beans; evaluation of air assisted spray application technique

FV 347: Biopesticide product gap analysis and evaluation to support development policy for biopesticides for use in integrated vegetable crop production

### **3. OTHER BEANS PROJECTS**

FV 72a: Peas, broad beans and green beans; evaluation of air assisted spray application technique

FV 175: Runner beans: development of pre-emergence herbicide treatments

FV 252: Dwarf green beans: strategy for the control of pod rot by *Botrytis cinerea*

FV 354: Dwarf green beans: Evaluation of *Rhizobium* inoculant for nitrogen fixation

### **4. GENERAL PROJECTS**

FV 334 Perennial field margins with combined agronomical and ecological benefits for vegetable rotation schemes

FV 347: Biopesticide product gap analysis and evaluation to support development policy for biopesticides for use in integrated crop production

CP 61: Cross-crop benefits: developing crop combinations to promote conservation biological control in horticulture (HDC Studentship)

## **PGRO LABORATORY SERVICES**

The plant clinic received 123 samples of plant seed or soil which required laboratory work for identification or diagnostic purposes as part of the PGRO advisory service. Pea moth spray date predictions were made available through an online web service and 16 crop bulletins were issued by email. Seed and soil testing continued as a fee paid service, maintaining the number of samples of seed for testing from overseas producers. 1038 seed samples were tested in the period August 2012 – July 2013, 15% up on the previous 12 months.

PGRO continued to operate the tenderometer standardisation service with 34 tests in the year.

## **CONTRACT TRIALS**

As well as running the levy and grant/ award funded programmes of research and development, PGRO also carry out a number of privately funded trials and projects which include variety evaluation and agrochemical screening in the field, glasshouse and laboratory. PGRO is GEP accredited and officially recognised by CRD to carry out efficacy trials with pesticides for agricultural and horticultural crops. Whilst this work continues each year, the volume fluctuates and “Research and Technical Income” from these activities can vary from year to year. During 2013 PGRO embarked upon the process of seeking GLP accreditation which if achieved will give wider opportunities for contract research.

## **ACKNOWLEDGEMENTS**

The Organisation is grateful to the many seedsmen and agrochemical manufacturers for the provision of considerable quantities of seed and agrochemicals.

The assistance and co-operation of Mr. Brian Redrup of Velcourt who manages the arable land at Walcott Estates where the PGRO home based trial ground is sited and the owner, Mr. Darby Dennis is gratefully acknowledged. The cooperation of Mr Michael Sly of Park Farm, Thorney is also acknowledged in allowing part of his land for PGRO off-site pulse trials.

The help of the growers for provision of additional outside trial sites, and of the many commercial concerns and individuals too numerous to mention by name, is hereby also gratefully acknowledged with thanks.

## **Appendix I**

### **PGRO BOARD OF TRUSTEES**

Secretary – R.G.VICKERS <sup>\$</sup>

***Elected by the British Edible Pulse Association:***

P.E. BARRETT	Askew & Barrett (Pulses) Ltd.
P.J. RIX	Dunns (Long Sutton) Ltd
A.G. BURY	Frontier Agriculture Ltd

***Elected by the British Fruit & Vegetable Cannery Association:***

C. STOWE	Princes Ltd
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***Elected by the National Farmers Union:***

S.W. BUMSTEAD <sup>\$</sup>	Ouse Bank Farm, Great Barford, Bedford
S.J. FRANCIS <sup>\$</sup> (Chairman)	The Old Farmhouse, Church End, Old Leake, Boston.
J. FENTON <sup>\$</sup>	Springwell House, Elmswell, Driffild, N. Yorkshire
M. HAYWARD	Swaythorpe Growers Ltd.
M.R. LEGGOTT <sup>\$</sup>	The Limes, Holland Fen, Chapel Hill, Lincoln
R.T. THOMAS	Whatoff Lodge, Quorn, Loughborough

***Elected by the UK Frozen Food Producers:***

S.P. MARX <sup>\$</sup>	1, The Courtyard, Stamford, Lincs
J.A. YOUNG	Birds Eye Ltd

***Elected by the Board:***

J. HALLETT	British Growers Association Ltd.
P.J. SMITH <sup>#</sup>	Wherry & Sons Ltd.
W.A. van der HAVE <sup>+ \$</sup> (Vice Chairman)	Limagrain UK Ltd.

<sup>\$</sup> member of the Management & Finance Committee

<sup>#</sup> nominated by AIC

<sup>+</sup> nominated by BSPB

## **Appendix 2**

### **INDUSTRY PANELS**

#### **PROCESSING LEGUMES INDUSTRY PANEL**

S. Ashton	Penguin Foods Ltd
W. Bradley	Green Pea Company Ltd
C. Brewster	Horticultural Development Council
M. Brown	A.P. (East Anglia) Ltd
R. Corfield	Aylsham Growers
K. Costello	Princes Ltd
S. Dawson	National Farmers Union
R. Fitzpatrick	Holbeach Marsh Cooperative
S. Francis	Fen Peas Ltd
I. Grant	Bishop Farm Partners
J. Grant	J.W. Grant & Co
M. Hayward	Swaythorpe Growers Ltd
M. Heading	A. & E.G. Heading Ltd
R. Hirst	Anglian Pea Growers Ltd
E. Jadin	Ardo
P. Langley	Sandfields Farms Ltd
A. Leatham	Scottish Borders Produce Ltd
A. Lee	A.L. Lee & Sons
M. Leggott	West Fen Peas Ltd
A. Lenson	Wootton Marsh Farms Ltd
T. Mudge	BGA Ltd
N. Murray	W.P. Bruce
R. Pinder	Raymond Caudwell Produce
K. Taylor	K.H. Taylor Ltd
J. Thompson	Beeswax Farming (Rainbow) Ltd
P. Waldock	Mack Multiples
I. Watson	Stemgold Peas
A. Whiting	Birds Eye Ltd

#### **PULSE PANEL**

J. Ogborn	Crop Protection Association
M. Buurman	Limagrain UK
D. Cooper	Dept. of the Environment, Food and Rural Affairs
K. Costello	Princes Limited
S. Cree	British Edible Pulse Association
R. Pickard	Abbots Ripton Estates
D. Robinson	Crop Dynamics
M. Sly	Cambridgeshire Grower
J. Taylor	Federation of Agricultural Co-Operatives
J. Wallace	Agricultural Industries Confederation
M. Wells	Leicestershire Grower
D. Wherry	BSPB

## Appendix 3

### Pulse Panel - Research and Development Strategy for Field Beans, Combining Peas and Lupins (2013 - 2016)

The working strategy document of the PULSE PANEL.

The Pulse Panel is made up Growers, trade and industry representatives. Meeting twice each year its' purpose is to give guidance and priority to the PGRO for the expenditure of Pulse Levy in the pursuit of grower led objectives concerning the production of combinable pulse crops.

By partnering with growers, other science and research organisations, and by collaborating with commercial industry, PGRO works to leverage additional resources and access EU and UK funds to compliment the levy contributions to deliver maximum effect.

The 5 key priorities identified by the Pulse Panel are as follows.

- 1: Deliver **YIELD STABILITY** by understanding and quantifying the influencing factors and providing recommendations to ensure its realisation.
- 2: **SOIL HEALTH** and plant and soil biological interactions greatly influence pulse crops. Provide recommendations for remedial actions and the delivery of soil health improvement.
- 3: Deliver **CROP NUTRITION** plans for modern production techniques providing recommendations for optimum performance.
- 4: **ENVIRONMENTAL CHANGE** will influence future cropping techniques. Deliver recommendations for growing in a changing environment.
- 5: **LEGISLATION UPDATES**: To provide relevant information which can be used to impact and promote production and consumption

<b>Objective 1: Deliver YIELD STABILITY by understanding and quantifying the influencing factors and providing recommendations to ensure its realisation</b>				
Target	Initiative examples	Previous, pipeline, or current work	Priority 1-10 1 highest	Status Planned Current Emerging Gap Previous
General	<b>Identifying traits for peas and beans for yield stability, disease tolerance and quality that can be used for breeding new varieties</b>	Defra Link: PCGIN – Pulse Crop Genetic Improvement Network	1	Current
Pea weevil/thrips	<b>Peas:</b> Development of seed treatment delayed  <b>Peas and beans:</b> A novel 'lure and kill' system for the control of <i>Sitona lineatus</i> and <i>Bruchus rufimanus</i>	Evaluation testing in collaboration with chemical company (not currently being tested) Proposal submitted to Agri-Tech Catalyst	2 2	On-Hold Concept
Aphids in beans	<b>Field beans:</b> Improved control and optimisation of product use	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops	2	Current
Bruchid beetle	<b>Field Beans:</b> UK crops at risk with severe losses in 2006/7 Control strategy required	Defra Link LK09102: Field beans: monitoring and control of bean seed beetle ( <i>Bruchus rufimanus</i> ) (ended)	1	Previous Current

**Objective 1: Deliver YIELD STABILITY by understanding and quantifying the influencing factors and providing recommendations to ensure its realisation**

Target	Initiative examples	Previous, pipeline, or current work	Priority 1-10 1 highest	Status Planned Current Emerging Gap Previous
		TSB 100871: A novel Monitoring and Forecasting System for the Integrated Management of Bean Seed Beetle <i>Bruchus rufimanus</i>		
Pea bruchid risk assessment	<b>Peas:</b> Risk assessment and mitigation strategy. Options for prevention. Communication needed following completion of RA	HDC fact sheet 01/12	10	Previous
Downy mildew	<b>Peas:</b> Improved control of secondary disease required as currently reliant on seed treatments. Further varietal tolerance studies and screening for foliar fungicides required	Peas: downy mildew varietal resistance (PGRO levy) Vining peas: Foliar control of downy mildew using SL567A (PGRO levy/ Syngenta UK Ltd)	1	Current
Sclerotinia	<b>Peas:</b> Development of improved control strategy as disease becoming more frequent	SA Link SA563/LK09130 Sustainable Arable Link: Reducing the impact of Sclerotinia disease on arable rotations, vegetable crops and land use (ended)	3	Previous
Pigeon control	To be raised at AHDB by HDC for industry action. Potential for investigation of bitterness genes	None	1	Gap
Chocolate spot	<b>Field Beans:</b> Limited approved products and severe infection in 2008 and 2012	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops HDC FV 355: Broad beans: Fungicide programme for chocolate spot control (ended) EUFP7 – Legumes for the Agriculture of Tomorrow (LEGATO) – investigating resistance to chocolate spot	3	Current  Previous  Current Current
Ascochyta fabae	<b>Field beans:</b> development of improved control strategy	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops EUFP7 – Legumes for the Agriculture of Tomorrow (LEGATO) – investigating resistance to <i>Ascochyta fabae</i>	4	Current  Current Current
Pulse Varieties	<b>Peas and Field beans:</b> Variety evaluation <b>Lupins:</b> Variety evaluation  Optimum sowing density for field	Recommended List trials – Pulse Levy TSB: An Integrated Program for the Development of Lupins as a Sustainable Protein Source for UK Agriculture and Aquaculture (LUKAA)	1 5  3	Current Current  Current

**Objective 1: Deliver YIELD STABILITY by understanding and quantifying the influencing factors and providing recommendations to ensure its realisation**

Target	Initiative examples	Previous, pipeline, or current work	Priority 1-10 1 highest	Status Planned Current Emerging Gap Previous
	beans  Drought tolerance in peas	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops EUFP7 – Improving the resistance of legume crops to combined Abiotic and Biotic Stresses (ABSTRESS) – investigating drought tolerance in peas	7	Current
Mechanisation	<b>Field Beans:</b> Inter-row weeding using precision spraying equipment <b>Peas:</b> Use of vision guided spot sprayer for control of weeds	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops HDC FV307b – Control of volunteer potatoes in vining peas	3	Current  Current
Harvest guidance	Providing guidance for the most effective way to avoid losses at harvest		2	Gap
Visual quality retention	Providing guidance for the most effective way to retain visual quality of grains		2	Gap
Weed Control	Inter row weeding and wide spaced rows with inter row glyphosate	As part of Optibean and PGRO SRUC collaboration 2013 2014	3	Current
Resource management	Efficient use of energy	<ul style="list-style-type: none"> <li>Alternative energy sources?</li> <li>Cold storage</li> </ul>	3	Gap
	Resource management	Direct drilling/ non-inversion in peas	2	Gap
Population	<b>Peas:</b> Assessing yields to determine optimum target populations		3	Gap
Pod Set	<b>Peas and beans:</b> Maximisation and stability of pod set		2	Gap
Dessication	Most effective timing and comparative effectiveness of Diquat and Glyphosate		2	Gap

**Objective 2. SOIL HEALTH and plant and soil biological interactions greatly influence pulse crops. Provide recommendations for remedial actions and the delivery of soil health improvement**

Target	Initiative examples	Previous, pipeline, or current work	Priority 1-5 1 highest	Status Planned Current Emerging Gap Previous
Pea decline	Understanding the complex that is believed to cause this phenomenon and providing recommendations as to how to manage rotations to best effect.	Application in for TSB Catalyst funding a partner- decision awaited	3	Gap
Root diseases	<b>Peas:</b> An increasing problem with no chemicals available. An evaluation of cultural methods of suppression is required and the use of mustard bio fumigant cover crops. Build BBSRC proposal with WCC on bio-fumigants. Evaluation of identification techniques.	Potential for opportunities in the HDC soils call in spring 2014 HDC proposals submitted for identification of <i>Aphanomyces euteiches</i> in peas and relationship between rhizobia and levels of phosphate ins soils EUFP7 – Improving the resistance of legume crops to combined Abiotic and Biotic Stresses (ABSTRESS) – investigating Fusarium root rots EUFP7 – Legumes for the Agriculture of Tomorrow (LEGATO) – investigating resistance to <i>Mycosphaerella pinodes</i>	1	Gap Current Current Current
Ascochyta	The development of a laboratory based assay for the detection of Common Root Rot ( <i>Aphanomyces euteiches</i> )	Using funding from HDC in Vining peas.	1	Current
Rhizobium and nodulation	The effect of soil phosphate levels on rhizobia populations	Using funding from HDC in Vining peas	1	Current

**Objective 3: Deliver CROP NUTRITION plans for modern production techniques providing recommendations for optimum performance**

Target	Initiative examples	Previous, pipeline, or current work	Priority 1-10 1 highest	Status Planned Current Emerging Gap Previous
Nutrition	<b>Peas and Field Beans:</b> More information needed on P and K requirements and N residues	HGCA 3425/ HDC FV 345: Establishing Best Practice for determining soil nitrogen supply - addition of field Veg sites to HGCA project 3425 HDC FV380: Identification of critical soil P levels in peas TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – investigating the residual benefit of N from field beans to the following crop – Sustainable Protein Crops	3	Previous  Current  Current
Production continuity	The balance of supply and demand is crucial to determining market price: <ul style="list-style-type: none"> <li>• Forecasting supply and demand.</li> <li>• Techniques to alter crop maturity i.e. delay or bring forward harvest.</li> <li>• Improved storage techniques.</li> </ul>	TSB 131422: TSB 131422: Novel computer vision techniques for food quality analysis - identification of <i>Bruchus rufimanus</i> (bean seed beetle) damage in field beans ( <i>Vicia faba</i> ) for export for human consumption	4	Current
Root development	Ensuring stronger more vigorous root development and greater nodulation for improved nitrogen fixation and plant growth		1	Gap
Micro nutrient studies	Understanding the impact of Micronutrient benefits in crop health and providing recommendations		4	Gap
Sulphur	Revisiting the potential need for sulphur (as a major nutrient) applications as a result of environmental change.		2	Gap
Protein production	Influence of foliar N applied at and shortly after pod set and its effect on yield and protein content	Studies show that N fixation declines abruptly after flowering. Just 10-16% of the total plant N requirement is fixed after flowering, just at the point when seed is being set.	2	Gap

<b>Objective 4: ENVIRONMENTAL CHANGE will influence future cropping techniques. Deliver recommendations for growing in a changing environment</b>				
Target areas	Initiative	Current or previous work	Priority 1-10 1 highest	Status Planned Current Emerging Gap Previous
Minimise risks of diffuse pollution (nitrate, phosphate, pesticides, silt)	<ul style="list-style-type: none"> <li>Is agriculture making a substantial contribution to diffuse pollution?</li> <li>Fertigation techniques to minimise N and P pollution.</li> <li>Improved drainage management</li> <li>Efficient use of N,P &amp; K</li> <li>Precision farming, variable rate application</li> </ul>	HGCA 3425/ HDC FV 345: Establishing Best Practice for determining soil nitrogen supply - addition of field Veg sites to HGCA project 3425 HDC FV380: Identification of critical soil P levels in peas TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – investigating the residual benefit of N from field beans to the following crop – Sustainable Protein Crops	1	Previous  Current  Current
Minimise climate change impact	Minimisation of nitrous oxide emissions in a range of crop types including vining peas and field beans – in addition, to establish the impact of returning crop residues	DEFRA Link LK09128–Minimising nitrous oxide intensities of arable crop products (MIN-NO)	3	Current
Irrigation	Effect of irrigation post flowering on pod set and yield		3	Gap

<b>Objective 5: LEGISLATION UPDATES: To provide relevant information which can be used to impact and promote production and consumption</b>				
Target	Initiative	Previous or current work	Priority 1-10 1 highest	Status Planned Current Emerging Gap Previous
Encouraging Use and Consumption	Review of health benefits of pulses to be used to promote use and consumption.  High Collaborative approaches to pulse promotion.	Pulse and Legume Research Network – new Defra Link: PCGIN – Pulse Crop Genetic Improvement Network Defra Link: QDiPS – Quality Determinants in Pea Seed	5	Current
CAP reform	Interpret and provide guidance upon the impact of CAP reform for Pulse cropping		1	Gap
Changes in Ag Chem registrations	Identifying and anticipating changes in ag chem registration legislation and where possible proposing solutions to gaps created.		1	Gap

## Appendix 4

### Processing Legume Industry Panel - Research and Development Strategy for Vining Peas, Green Beans and Broad Beans (2012 - 2015)

<b>Objective 1: Ensuring adequate and sustainable crop protection measures are available for the key pests, diseases and weeds of each crop/category</b>				
<b>Target</b>	<b>Initiative examples</b>	<b>Previous, pipeline, or current work</b>	<b>Priority</b>	<b>PLP Co-ordinator</b>
Pea weevil/ thrips/ bean seed fly	<b>Vining Peas:</b> Development of seed treatment delayed	FV 58: Evaluation testing in collaboration with chemical company	HIGH	
Aphids in beans	<b>Vicia faba:</b> Improved control and optimisation of product use	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops		
Bruchid beetle	<b>Broad Beans:</b> UK crops at risk with severe losses in 2006/7 Control strategy required	FV 184: Broad beans: monitoring and control of bean seed beetle ( <i>Bruchus rufimanus</i> ) FV 322: Broad beans: Management and control of Bruchid bean seed beetle TSB 100871: A novel Monitoring and Forecasting System for the Integrated Management of Bean Seed Beetle <i>Bruchus rufimanus</i>	HIGH	
Pea bruchid risk assessment	Risk assessment and mitigation strategy. Options for prevention. Communication needed following completion of RA	HDC fact sheet	Medium	
Slugs	<b>Vining Peas:</b> Improved control Industry initiative (AHDB) needed	FV 230: Vining peas: reducing risk of slug contamination FV 379: Leafy salads and Brassicas: Slugs - A review	Medium	
Downy mildew	<b>Vining Peas:</b> Improved control of secondary disease required as currently reliant on seed treatments. Further varietal tolerance studies and screening for foliar fungicides required	FV 215: Peas: downy mildew control	HIGH	
Sclerotinia	<b>Vining Peas:</b> Development of improved control strategy as disease becoming more frequent	FV 361 (SA Link SA563/LK09130) Sustainable Arable Link: Reducing the impact of Sclerotinia disease on arable rotations, vegetable crops and land use	HIGH	
	<b>Green Beans:</b> Development of improved control strategy as disease becoming more frequent	FV 361 as above	HIGH	
Pigeon control	To be raised at AHDB by HDC for industry action. Potential for investigation of bitterness genes		HIGH	

Chocolate spot	<b>Broad Beans:</b> Limited approved products and severe infection in 2008	FV 355: Broad beans: Fungicide programme for chocolate spot control TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops	HIGH	
Ascochyta fabae	<b>Vicia faba: development of improved control strategy</b>	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops	Medium	
Root diseases	<b>Vining Peas:</b> An increasing problem with no chemicals available. An evaluation of cultural methods of suppression is required and the use of mustard bio fumigant cover crops. Build BBSRC proposal with WCC on bio-fumigants.	Proposal submitted to HDC rejected for funding	HIGH	
Weed Control	<b>Vining Peas:</b> Volunteer potatoes - No herbicides available for peas. Post emergent product being evaluated. FV307a extension including pea row width to adapt spot weeder.	FV 307a FV 243: Vining peas: the use of mechanical weeding techniques	HIGH	
	<b>Vining Peas:</b> Post emergence broad leaved weed control - Limited products available. Evaluation of potential products and management of existing products is required	FV 181: Volunteer oilseed rape control in vining peas and broad beans	HIGH	
	<b>Vining Peas:</b> Loss of pre and post emergence herbicides with limited number of products available. Screening of potential products for both pre and post and management of applications and product use required	FV 256c Continuation - solutions to the loss of active ingredients for weed control in vegetable crops	HIGH	
	<b>Green Beans:</b> Loss of pre emergence and limited post emergence products available		HIGH	

<b>Objective 2. Increase returns on investment through efficient use of resources</b>				
<b>Target</b>	<b>Initiative examples</b>	<b>Previous, pipeline, or current work</b>	<b>Priority</b>	<b>PLP Co-ordinator</b>
Nutrition	<b>Vining Peas:</b> More information needed on P and K requirements	FV 345: Establishing Best Practice for determining soil nitrogen supply - addition of field Veg sites to HGCA project 3425 FV 354 Dwarf green beans: Evaluation of Rhizobium inoculant for nitrogen fixation FV380: Identification of critical soil P levels TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops	HIGH	
Potato apples in vining peas		Investigate options for processing control	HIGH	
Pea maturity		Investigate possible options for current cross check standards and validation of products	HIGH	
Mechanisation	Vicia faba: Inter-row weeding using precision spraying equipment Harvesting technology for Mange Tout peas	TSB 10182: Improving the availability of UK sourced protein feed through new faba varieties, production and utilisation systems – Sustainable Protein Crops	HIGH	
Crop storage				
Efficient use of water resources	Drought tolerance in vining peas.	FV 363 HortLink: developing precision irrigation for field scale vegetable production, linking in-field moisture sensing, wireless network CP 54 Rhizobacteria to reduce water use and enhance crop quality (HDC Studentship)	HIGH	
Efficient use of energy	<ul style="list-style-type: none"> <li>• Alternative energy sources?</li> <li>• Cold storage</li> </ul>			
Waste management	<ul style="list-style-type: none"> <li>• Recycling of crop covers</li> <li>• Composting and use of pack house waste</li> </ul>			
Staff management	Labour efficiency	FV 298 - Production of increased labour efficiency models in field veg		
Resource management	Direct drilling/ non-inversion in vining peas			

<b>Objective 3: To supply consistent quality product and continuity and to achieve customer satisfaction</b>				
<b>Target</b>	<b>Initiative examples</b>	<b>Previous, pipeline, or current work</b>	<b>Priority</b>	<b>PLP Co-ordinator</b>
Vining Pea Varieties	<ul style="list-style-type: none"> <li>Variety evaluation - Limited sites for trials Site on a silt soil type now running at Holbeach</li> <li>Variety performance at optimum sowing times,</li> <li>Optimum sowing density for varieties - Only limited indications that this may be necessary</li> <li>Drought tolerance</li> <li>Pre-germinated seed</li> </ul>	<ul style="list-style-type: none"> <li>FV 154, 154a, b &amp; c: Vining Peas: Evaluation of new and established varieties sown at appropriate commercial timings</li> <li>FV 340 Vining Peas: Extension of variety evaluation trials</li> </ul>	HIGH HIGH LOW	
Broad Bean Varieties	No variety trials undertaken since 1999 Broad bean variety evaluation trial for fresh market	<ul style="list-style-type: none"> <li>FV 182: Evaluation of new and established broad bean varieties for processing</li> <li>FV 369 Broad bean: evaluation of varieties</li> </ul>	HIGH	
Sugar snap varieties	Variety evaluation for stringiness. Screening trial for 2013.			
Production continuity	The balance of supply and demand is crucial to determining market price: <ul style="list-style-type: none"> <li>Forecasting supply and demand.</li> <li>Techniques to alter crop maturity i.e. delay or bring forward harvest.</li> <li>Improved storage techniques.</li> </ul>			
Improving product quality	<ul style="list-style-type: none"> <li>Influencing agronomic and pre-harvest factors.</li> </ul>	<ul style="list-style-type: none"> <li>FV 295: Carbon dioxide as muscle relaxant for removal of invertebrates in salad crops</li> <li>FV 351: Understanding Quality Determinants in Pea Seeds</li> </ul>		
Improving the quality of flavour/nutritional aspects	<ul style="list-style-type: none"> <li>Flavour and colour</li> </ul>	FV 196: Vining peas: commercial assessment of near infrared (NIR) spectroscopy for measuring pea maturity		
Shelf life and storability				

**Objective 4: Develop technologies and practices that will keep the sector ahead of changing EU and government legislation that affect agriculture and horticulture**

Target areas	Initiative	Current or previous work	Priority	PLP Co-ordinator
Minimise risks of diffuse pollution (nitrate, phosphate, pesticides, silt)	<ul style="list-style-type: none"> <li>• Is horticulture making a substantial contribution to diffuse pollution?</li> <li>• Fertigation techniques to minimise N and P pollution.</li> <li>• Improved drainage management</li> <li>• Efficient use of N,P &amp; K</li> <li>• Precision farming, variable rate application</li> </ul>	FV 345		
Waste management				
Securing water supplies	How to define the footprint – understanding required	Factsheet 07/05 'Securing your water supply for the future' (Abstraction and Supply issues)		
Minimise climate change impact	Minimisation of nitrous oxide emissions in a range of crop types including vining peas and Vicia faba – in addition to establish the impact of returning crop residues	DEFRA Link LK09128– <i>Minimising nitrous oxide intensities of arable crop products (MIN-NO)</i>		

**Objective 5: To provide information which can be used to promote the consumption vegetables**

Target	Initiative	Previous or current work	Priority	PLP Co-ordinator
Encouraging Consumption	<ul style="list-style-type: none"> <li>• Review of health benefits of legume vegetables to be used to promote consumption.</li> <li>• High Collaborative approaches to Legume/vegetable promotion.</li> </ul>	HDC Board-funded promotion to encourage consumption of seasonal British produce		

## Appendix 5

### LEVY COLLECTION

#### 1. PULSE CROPS

2 Agriculture Ltd.  
Acorn Arable Ltd.  
Adams & Howling Ltd.  
ADM Direct  
Agrii – A divn of Masstock Arable Ltd  
S.C. Andrews & Son  
Robin Appel Ltd.  
Argrain Ltd.  
Armstrong, Richardson & Co. Ltd.  
Askew & Barrett (Pulses) Ltd.  
AtlasFram Group  
H. Banham Ltd.  
Bartholomews (Chichester) Ltd.  
Henry Bell & Co. (Grantham) Ltd.  
Andrew Bird (Seeds & Services)  
Bodle Bros. Ltd.  
Campbell & Penty Ltd.  
Cherwell Valley Silos Ltd.  
Chilton Grain Ltd.  
W.A. Church (Bures) Ltd.  
Cotswold Agricultural Merchants  
A.L. Cox & Sons Ltd.  
Criddle & Co. Ltd.  
Crop Marketing (Groups) Ltd.  
Dalmark Grain Ltd.  
J.E. & V.M. Dalton Ltd.  
G. O. Davies (Westbury) Ltd.  
Dengie Crops Ltd.  
Dodson & Horrell Ltd.  
Dunns (Long Sutton) Ltd.  
John Ebbage Seeds Ltd.  
Ellingham Grain Ltd.  
Elsoms Seeds Ltd.  
Fengrain Ltd.  
Fengrain (Services) Ltd.  
John Foad & Co.  
Frontier Agriculture Ltd.  
Glasson Grain Ltd.  
Gleadall Agriculture Ltd.  
Glencore Grain UK Ltd.  
Peter Glossop Seeds  
GrainCo Ltd  
Grain Harvesters Ltd.  
Grainlink Ltd.  
Grainmonitor Ltd.  
Harlow Agricultural Merchants  
Heart of England Grain Co. Ltd.  
Henson & Jackson Retail Ltd.  
Hubbards Seeds  
J.S. Hubbuck Ltd.  
l'Anson Bros. Ltd.

A. Inglis & Son  
Charles Jackson & Co. Ltd.  
Robert Kerr Agriculture Ltd.  
Limagrain UK Ltd.  
W.N. Lindsay Ltd.  
Marriage's Specialist Foods  
Maviga Europe Ltd.  
James Mortimer Ltd.  
Nidera UK Ltd.  
Openfield Agriculture Ltd.  
Organic Arable Marketing Co. Ltd.  
Peters Commodities Ltd.  
Premium Crops Ltd.  
Saxon Agriculture Ltd.  
Scotgrain Agriculture Ltd.  
Senova Ltd.  
Simpson Malt Ltd.  
Soya UK Ltd.  
David Trethewey Seeds  
United Oilseeds Marketing Ltd.  
R.W. Warnock Ltd.  
Wellgrain Ltd.  
Wessex Grain Ltd.  
Westland Horticulture Ltd.  
Weston Mill Farming Co.  
Wherry & Sons Ltd.  
G. Williams & Co. (Grain) Ltd.  
G. Williams & Co. (Seeds)  
Witney Grain Ltd.  
Charles Wright & Sons Ltd.

#### 2. VEGETABLE CROPS

Anglian Pea Growers Ltd.  
Aylsham Growers Ltd.  
Beeswax Farming (Rainbow) Ltd.  
Bishop Farm Partners  
W.P. Bruce Ltd.  
R. Caudwell (Produce) Ltd.  
Fen Peas Ltd.  
J.W. Grant & Co.  
The Green Pea Co. Ltd.  
A & E G Heading Ltd.  
Holbeach Marsh Co-Operative  
Mack Multiples  
Scottish Borders Produce Ltd.  
Stemgold Peas Ltd.  
Swaythorpe Growers  
K.H. Taylor Ltd  
Birds Eye Ltd and their growers  
Wootton Marsh Farms

## Appendix 6

### ASSOCIATE MEMBERS

The following were Associate Members of the Organisation at 31st December 2013

#### **UNITED KINGDOM**

Acorn Seeds  
Agrichem (International) Ltd.  
Agrii – Trading div of Masstock Arable UK Ltd.  
Agrii – Trading div of United Agri Products Ltd.  
Agrivice Ltd.  
Agrovista UK Ltd.  
Allen Agriculture Ltd.  
A.P. (East Anglia) Ltd.  
Bartholomews Agri Food Ltd.  
BASF Plc  
Bayer CropScience Ltd.  
BCS Agriculture Ltd.  
Belchim Crop Protection Ltd.  
Birds Eye Ltd.  
British Society of Plant Breeders Ltd.  
Certis Europe  
Chelmsford & W Essex Training Group  
Coles, K.S.  
Coy, C.R.  
Dodman Ltd.  
Doug Balderson Agriculture Ltd.  
Du Pont (UK) Ltd.  
Elsoms Seeds Ltd.  
Eurofins Agrosociences Ltd.  
Exeter, University of  
Field Technique Ltd.  
Finlays Fresh Produce UK Ltd.  
Freemantle, M.J.  
Frontier Agriculture Ltd.  
Harper Adams University College  
Hartpury College  
Headland Agrochemicals Ltd.  
H.L. Hutchinson Ltd.  
l'Anson Bros. Ltd.  
James Hutton Institute \*  
J.S. Frozen Foods Ltd.  
Knight, R.  
Lanwin Pulses Ltd.  
Limagrain UK Ltd.  
Lincoln, University of  
L.S. Plant Breeding Ltd.  
Mack Multiples  
Makhteshim-Agan (UK) Ltd.  
Monsanto UK Ltd.  
Norman & Spicer (Agrochemicals) Ltd.  
Nottingham, University of  
NuFarm Ltd.  
Pinguin Foods UK Ltd.  
PMC Harvesters Ltd.  
Prime Agriculture LLP  
Princes Ltd.  
Procam UK Ltd.  
Pro-Veg Seeds Ltd.  
REA Agronomy  
Royal Agricultural College  
Sandfields Farms Ltd.  
SAC FBS Office  
Scottish Borders Produce Ltd.  
Syngenta Crop Protection Ltd.  
David Trethewey Seeds  
Trevan Cropcare Ltd.  
A.L. Tozer Ltd.  
United Phosphorus Ltd. \*  
Walford & North Shropshire College \*  
G. Williams & Co. (Seeds)  
Woodheads Seeds Ltd.  
Writtle College  
Zantra Ltd \*

#### **OVERSEAS**

Agis, Germany  
Agro Seed Services bvba, Belgium  
Alterra SA, Greece  
Barba Stathis SA, Greece \*  
W. Brotherton Seed Co. Inc., USA  
Canterbury Seed Co. Ltd., New Zealand  
Columbia Seed Co. Ltd., Canada \*  
Crites Seed Inc., USA  
Dept. of Industry & Investment – Primary  
Industry & Investment, Australia  
Findus Sveridge, Sweden  
Hans-Georg Lembke KG, Germany  
Holland Select BV, Holland  
Inagro VZW, Belgium  
Massey University, New Zealand  
Midland Seed Ltd., New Zealand  
Novozymes France S.A.S., France  
Nunhems Netherlands BV, Holland  
PGG Wrightson Seeds Ltd., New Zealand  
Plant & Food Research, New Zealand  
Ploeger Machines BV, Holland  
Pop Vriend Seeds BV, Holland  
Seneca Foods Corporation, USA \*  
Strube Espana SA, Spain \*  
Toft Plant Breeding, Denmark  
Van Waveren-Saaten GmbH, Germany  
Vegras CVBA, Belgium  
Vilmorin SA, France  
Charles R. Wynne Ltd., Eire  
Yaadim Development Corporation, Israel  
\* Joined during 2013

### **Processors & Growers Research Organisation**

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