Cereals in Practice

5 July 2018

Notes

Welcome to Cereals in Practice 2018

Welcome to the tenth Cereals in Practice event and thank you for taking the time to attend.

We are convinced you will find much to enlighten and inform you and this will lead to improved performance in your business. Cereals in Practice is a unique event, bringing variety trials and research together in one place to create a must-attend date for anyone interested in cereal farming and associated industries. The aim of the event is to showcase and bring together the messages arising from Scottish Government funded work on sustainable cereal production from the main research providers SRUC and James Hutton Institute. Cereals in Practice attracts a wide range of visitors including farmers, agronomists, cereals industry representatives and scientists working with cereals. With arable farmers coming under pressures from both home and abroad it is important the industry takes advantage of all the new technologies to remain competitive.

We hope you find the mix of scientific innovation with Farm Advisory Scotland (FAS) and AHDB's practical take-home messages useful.

Future locations

In 2019 the existing partners and some new collaborators will launch Arable Scotland, a new, larger and broader industry event for the whole cereals and oilseeds sector. It will occupy a similar date in the calendar next year (Tuesday 2 July) and will take place at the James Hutton Institute's Balruddery farm near Dundee. The event will bring together research, demo plots, trials and a Recommended List site and provide a tremendous opportunity for growers, agronomists, processors, trade bodies, development bodies and other influencers to see, hear, learn, compare and review all aspects of the arable sector in Scotland.

Feedback

It would help us enormously if you would take the time to complete a feedback form today so that we can accurately assess the usefulness and success of this event and use it to shape Arable Scotland next year, adding things you're interested in and knowing what you find less useful. Also, you'll be entered into the SSCR Whisky Prize Draw for doing so!

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Today's Timetable

2.30pm Registration

2.45pm Welcome and briefing from Colin West and Fiona Burnett

From 3pm onwards, visitors are welcome to visit the plots and indoor demos at their leisure for the rest of the afternoon.

5.00pm Hog roast and refreshments

6.00pm SSCR prize draw for pre-registrations and completed feedback forms

6.30pm Event closes

Event Content

Field trials and demonstrations

The demonstration plots are free to visit at any time throughout the day. All will be manned so please take the opportunity to find out more about the research. There is no particular order in which to visit the plots but we've tried to devise a route through the site which makes it easy to find them all.

Indoor demonstrations and exhibits

We also have a number of indoor stands and exhibits which are free to visit at any time:

- Centre for Sustainable Cropping
- Plant Health Centre
- SEFARI – Scotland's Environment, Food and Agriculture Research Institutes
- International Barley Hub
- EU DIVERSify project
- Farming and Water Scotland
- SoilEssentials
- SASA
- The Rowett Institute
- General displays from James Hutton Institute, James Hutton Ltd and SRUC

The James Hutton Institute

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The James Hutton Institute is a world-leading scientific organisation encompassing a distinctive range of integrated strengths in land, crop, waters, environmental and socio-economic science. It undertakes research for customers including the Scottish and UK Governments, the EU and other organisations worldwide.

The institute has a staff of approximately 550 and almost 150 PhD students, operating over two main campuses, Aberdeen and Dundee, and four research farms; Glensaugh, Balruddery, Mylnefield and Hartwood. We work collaboratively and in partnership with a number of Scottish and overseas universities.

The Institute organises its research through a trans-disciplinary and inter-disciplinary approach: we have just launched our new five-year strategy which sees us aligning with 10 of the 17 UN Sustainable Development goals.

The James Hutton Institute operates a commercial subsidiary, James Hutton Limited, which commercialises the scientific expertise, intellectual property, facilities and resources of the James Hutton Institute. JHL offers commercial customers a comprehensive range of analytical, research and development, breeding, and consultancy services.

By operating in partnership with people, organisations and governments, our work enhances sustainable environmental, social and economic development, delivers practical solutions, and influences the agenda for land-use and development.

Scotland's Rural College

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Scotland's Rural College (SRUC) supports innovation and sustainable development in agriculture and the rural sector in Britain and internationally. We are one of the UK's leading agriculturally-focused higher education institutions, offering a unique blend of research, education and consultancy. We work collaboratively and in partnership with several research and higher education institutes in the UK and in 2014, agricultural and veterinary research at SRUC and the University of Edinburgh was ranked as most powerful in the UK in the Research Excellence Framework (REF) results.

SRUC's research and education activities operate from six campuses and eight farms and research centres across Scotland. Our consultancy arm, SAC Consulting, supports more than 12,000 farms and rural businesses across the UK from 25 consultancy offices and eight veterinary disease surveillance centres.

Our Crop & Soil Systems research group carries out research to underpin the development of resilient and sustainable systems of crop production that are economically viable, but also environmentally and socially acceptable. Soils are the fundamental base of all future production, hence our interest in rotations, organic matter and nutrient cycling. Our work in crop genetics and breeding considers not only increasing yields of some of our key crops, but also assesses new ways to protect the health of our plants. Managing pests and diseases makes farming more efficient and sustainable, so that more food can be produced on smaller areas of land.

As a Further and Higher Education institution we offer land-based courses at all levels – from access courses and vocational studies, through undergraduate programmes covering HNC, HND and undergraduate degree courses, to taught postgraduate programmes and PhDs. Within six months of completing their course, 95% of our graduates are in work or are continuing in full-time education.

SAC Consulting offers a wealth of local knowledge and expertise covering all aspects of rural enterprise; from agronomy, livestock and dairy services to disease surveillance, farm animal diagnostics and environmental consultancy. Our own dedicated UKAS-accredited analytical facilities provide a seamless service from field to lab.

Scotland's Farm Advisory Service (FAS)

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Scotland's Farm Advisory Service (FAS) is part of the Scottish Rural Development Programme (SRDP) which is co-funded by the EU and Scottish Government, providing information and resources aimed at increasing the profitability and sustainability of farms and crofts.

The Farm Advisory Service is being delivered by SAC Consulting (part of Scotland's Rural College) and Ricardo Energy and Environment.

Cereal varieties update - Barley

Steve Hoad

SRUC

Winter barley

- In the two-row feed varieties small improvements in yields are found in KWS Creswell and KWS Orwell, though specific weights tend to be intermediate, rather than good.
- Most two-varieties have weakness to one or more of the major diseases e.g. mildew, Rhynchosporium or net blotch. Disease resistance along with variation in maturity and straw stiffness should be considered when making sowing decisions.
- The list for six-row varieties is dominated by hybrids; for 2018/18 there are two new hybrids, Belmont and Libra, and one new conventional six-row, KWS Astaire.

Spring barley

- Concerto's dominance of the Scottish malting intake is now being challenged by Laureate.
- Other varieties expected to take some market share for malt distilling are KWS Sassy and Sienna.
- The new variety LG Diablo has recently achieved provisional approval for malt distilling and brewing. Another new provisionally approved variety RGT Asteroid has potential for malting distilling, brewing and grain distilling.
- The market positioning of new candidate varieties will be discussed on a tour of the AHDB Recommended List trial.

Winter wheat

- Winter wheat varieties with soft endosperm remain the most important choices for Scottish growers in meeting the demands of the grain distilling sector.
- This Summer's list of soft Group 4 varieties for distilling and feed includes established varieties such as Viscount, Leeds, Myriad and Revelation, as well as more recent introductions with LG Motown and LG Sundance, and new varieties KWS Jackal and Elation.
- The Group 3 biscuit making variety Zulu also suits distilling. For hard feed wheat, newer varieties including Dunston, Freiston and Shabras offer high yield potential.
- When making variety decisions check for the best balance of disease resistance, maturity, straw stiffness and specific weight.

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These trials are funded by Scottish Government RESAS and AHDB Cereals & Oilseeds

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CAP Greening, N fixing, Green Cover & Protein Crops

John Baddeley, Robin Walker, Lorna Cole, SRUC

Key Principles

- Ecological Focus Areas are part of the Basic Payments Scheme and aim to increase biodiversity
- The list of eligible crops changes from time to time as well as restrictions of what can and cannot be grown in a mixture, planting and harvesting dates as well as management within the season linked to the encouragement of a broader spectrum of biodiversity
- Other alternative crops being tested are crops with multi-end use potential, including intercrops aimed at home grown protein which have a grain legume component

Key Recommendations

- Autumn 2017 sown mixtures of different proportions of winter vetch with rye
- Spring 2018 sown mixtures of forage and grain legumes with other species known to provide biodiversity and soil enhancing properties
- Trials at Aberdeen and Edinburgh are examining agronomic, environmental and economic performance of CAP Greening crops as well as more targeted investigation of protein crops for food and feed at a site in Aberdeenshire
- Results are being presented at various KE events and in publications as they become available

Economic Benefits

- Growing a green cover crop, or a sole legume or legume in a mixture (intercrop) may increase the yield of a following crop
- Growing a mixture that includes a legume reduces the amount of N fertiliser needed for the following crop
- Less reliance on bought in feed

Environmental Benefits

- Increased soil organic matter and biological activity, improved soil structure
- Extended flowering period for pollinators and improved wildlife habitat
- Overwinter cover crops help reduce leaching losses of N and limit soil erosion and P losses
- Sole crops or mixtures that contain a legume add biologically fixed N to the soil
- Potential suppression of weeds and reduced pest and disease problems

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These trials are currently funded by Scottish Government RESAS and EU ReMIX

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Using varietal mixtures as an IPM tool

Henry Creissen, SRUC

Key Principles

- Scottish winter barley crops are predominately grown for animal feed.
- The lack of emphasis on grain homogeneity make varietal mixtures a considerably more viable option than it would be for malting barley
- Varietal mixtures may offer a solution to the problem of needing to maintain productivity in a reduced input system

Key Recommendations

- Combinations of winter barley varieties can achieve both high yields and high quality feed products (straw and grain)
- Reduce the fungicide inputs required
- This is first season of a three year study so results are still to be achieved

Economic Benefits

- Obtain the evidence needed to inform growers of the potential suitability of barley mixtures to be incorporated into production systems as part of an IPM approach

Environmental Benefits

- Use of reduced fungicide levels protects the environment

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These trials are funded by the Mains of Loirston Trust

Rationalising spring barley fungicide use according to rhynchosporium risk

Ian Bingham

Key Principles

- Using more resistant varieties and tailoring treatments to the actual risk in the crop we can reduce our reliance on fungicides.
- In spring barley the aim of disease management is to first protect the canopy during stem extension in order to maximise the number of grains produced.
- After that, the aim is to minimise effects of disease on grain filling.
- Trials funded by the Mains of Loirston Trust are being conducted over four sites and three years to investigate effects of fungicide timing in situations where the risk of rhynchosporium ranges from low to high

Key Recommendations

- Choose varieties with rhynchosporium resistance
- If the rhynchosporium risk is low and no disease is visible in the crop at T1 there may be scope for omitting this treatment and relying on applications during booting (T2) to provide the required protection during grain filling.

Economic Benefits

- Obtain the evidence needed to inform growers of the potential suitability of rhynchosporium resistant spring barley varieties and risk assessment of rhynchosporium to reduce fungicide inputs

Environmental Benefits

- Use of reduced fungicide levels protects the environment

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These trials are funded by the Mains of Loirston Trust

Integrated disease management in wheat

Fiona Burnett, SRUC

Key Principles

- Wheat is the most profitable cereal in the rotation
- Yield losses to disease can be high and some varieties have weak ratings
- Fungicide actives are being lost through legislation and resistance development so more integrated control measures are vital

Key Recommendations

- Utilise varietal resistance ratings when determining product choice and dose rates
- Late drilled crops can be at lower risk
- T1 (leaf 3 emerged) applications may include an SDHI if disease risk is high
- SDHIs are important at T2 (leaf 1 emerged)
- The risk of ear disease is greater in wet summers - T3 ear sprays should also target foliar disease risk and maintaining green leaf
- Septoria strains with mutations conferring reduced sensitivity to SDHIs and azoles continue to increase in frequency
- Stewardship is vital - use balanced mixtures and include multisites.

Economic Benefits

- Disease management can give yield increases of 2 t/ha at this site
- Using appropriate and effective dose of fungicides protects yield and margin over costs
- Varieties with good resistance ratings can cut fungicide costs – for example mildew in Leeds this year has lead to greater spend on mildewicides

Environmental Benefits

- Use of reduced fungicide levels protects the environment

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These trials are funded by Scottish Government RESAS

Fungicide inputs on barley

Neil Havis, SRUC

Key Principles

- Barley is still the major cereal crop grown in Scotland
- Disease control is an important driver of yield and quality
- Fungicide use should be appropriate to risk and also recognise the importance of anti-resistance strategies

Key Recommendations

- Use fungicides based on disease risk to the crop
- Utilise varietal resistance ratings when determining dose rates
- Consider a T0 (GS24) spray only if disease levels are high during early winter barley crop growth.
- T1 (GS30) applications protect early growth and tillers
- T2 (GS39-45) applications protect yield and quality. Include chlorothalonil at this timing.
- Be aware of emerging fungicide resistance issues within barley diseases such as net blotch, ramularia and loose smut
- Avoid applications of single mode of action fungicides and repeated applications of the same actives.

Economic Benefits

- Disease management can give yield increases averaging 0.75 t/ha in spring crops
- Using appropriate and effective dose of fungicides protects yield and margin over costs
- Barley prices are rising but markets could change post harvest

Environmental Benefits

- Use of reduced fungicide levels protects the environment

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These trials are funded by Scottish Government RESAS

IMPROMALT: Improved malting quality for winter barley

Bill Thomas, Mark Looseley, Luke Ramsay: the James Hutton Institute

Background

- UK winter barleys lag behind spring varieties for important malting quality traits
- Key spring barley genes responsible for malting quality differences
- IMPROMALT consortium bring together UK research organisations, barley breeders and maltsters
- Crossing winter varieties with spring types offer breeders a route to bridge malting quality gap

Project progress

- Winter barley lines incorporating key spring quality genes have been produced
- Field trials and micro-malting analyses have confirmed improved malting characteristics in lines with spring quality genes
- Detailed characterisation of this material is providing further information on the genetic control of malting quality traits

Economic Benefits

- High malting quality, high yielding varieties gives greater market diversity for winter barley
- Improved supply security for the UK malting industry
- Increased winter malting quality offers resilience against likely climate change scenarios

Outlook

- Outputs from the IMPROMALT project will lead directly to new winter malting varieties over the next 3-5 years
- Understanding genetic control of malting offers route to more rapid breeding progress

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DIVERSifying cereal crops using cereal-legume 'Plant Teams'

Adrian Newton and Alison Karley, James Hutton Institute

Key Principles

- Crop species mixtures - or 'plant teams' - could be adopted more widely to improve yield stability between seasons and locations, reduce pest and disease damage and enhance climate stress resilience in agricultural systems
- Most crop species are bred to perform well in monoculture, and there is limited information about the varieties that work well in mixtures
- Research at the James Hutton Institute is being conducted to identify the crop species and varieties that perform optimally in cereal-legume plant teams
- Legumes are often used to enhance the performance of crop systems due to their capacity to convert (or 'fix') atmospheric nitrogen gas into a form that can be used by the plant

Key Recommendations

- The 2017 trials showed that some variety combinations gave higher yield than expected relative to the yield in monoculture
- Seed yield of barley-pea mixtures was optimal when the pea varieties Daytona or Ingrid were grown with the barley varieties RGT Planet or KWS Sassy
- Biomass yield for silage was optimal for wheat-faba bean mixtures that included the wheat variety Tybalt

Economic Benefits

- Potentially lower input costs as no nitrogen fertiliser was required
- Reduced requirement for pest and disease control

Environmental Benefits

- Enhanced biodiversity for ecosystem services (nutrient cycling, pest and disease suppression, pollination)
- Reduced losses of inputs to water, soil and air resulting in reduced pollution and lower requirement for agrochemical inputs to maintain the system in the long term

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50 years a mutant – the Golden Promise story

B Thomas, the James Hutton Institute

Origin

- Golden Promise was produced by induced mutation of Maythorpe
- Two semi-dwarf sister lines were isolated: 759/4 and 759/10
- 759/4 was released as Golden Promise
- 759/10 was crossed to other lines to produce Midas
- Golden Promise was first recommended 50 years ago in 1968
- It stayed on the recommended list in Scotland until 1990

Impact

- Golden Promise dominated Scottish barley production from the 1970s to mid 1980s
- During that time, approx. 500kt certified seed have been produced
- Short straw and early maturity meant it responded well to fertiliser and mildew susceptibility could be controlled with fungicides
- Almost all Scotch whisky will have been produced from Golden Promise from the early 70s to mid 80s

Current Status

- Golden Promise did not prove to be a good parent as none of its progeny made a significant commercial impact
- Midas proved a much more successful parent, giving rise to varieties like Goldmarker, Tyne, and Chad
- Changing the sieving standard for UK grain and the introduction of Triumph means that Golden Promise and Midas no longer feature in the pedigrees of current varieties
- Golden Promise malt is, however, in great demand by craft brewers
- Recent US research has shown that it contributes different flavour characteristics to beer compared to other malting varieties
- The Midas pedigree lives on in Australia through varieties like La Trobe.

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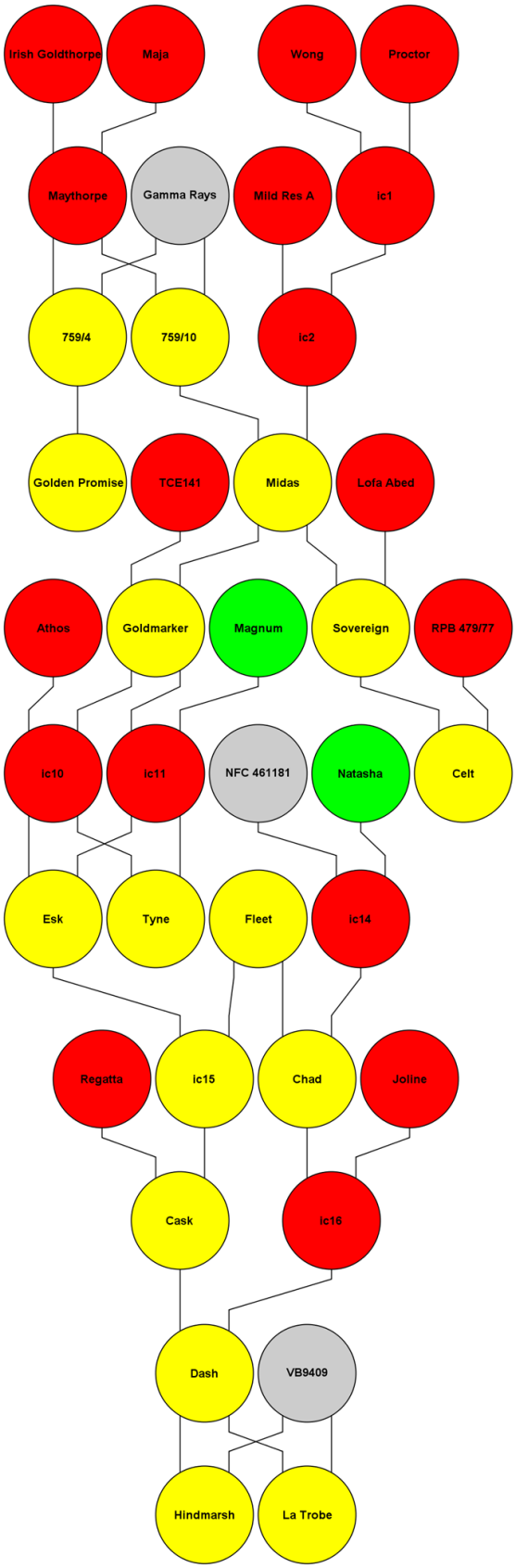
50 years a mutant – the Golden Promise story

B Thomas, the James Hutton Institute



Mains of Loirston Winter Wheat Challenge

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The Mains of Loirston Winter Wheat Challenge is a competition where the farmers and advisers of the future pit their wits against each other to achieve the crop with the highest gross margin. Teams from SRUC's campuses at Aberdeen, Edinburgh, Oatridge, Barony and Ayr are represented. The field trials team at SRUC grow field plots under instruction from the teams. Decisions that have to be made include: variety, seed rate, fertiliser, and disease control. Trials are replicated at three sites, including Fife, Edinburgh and here at Cereals in Practice.

At harvest, each plot is yielded and WN Lindsay's then offer a price for the crop based on its quality.

Last year's winners were based at Aberdeen, and won by growing the variety Skyfall for which they were offered a premium. They achieved a reasonable yield, at all three sites and kept their costs down where possible. For a bread-making crop, they used a moderate Nitrogen regime totalling 185 kg/ha. They used a T1, T2 and T3 fungicide application, but where possible, reduced rates.

Come and speak to some of this year's participants and decide for yourself if their decisions could make them this year's champions.

EPH Innovate Project

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In the food and drink industry ethyl carbamate is a strictly regulated compound. A glycosidic nitrile (GN) precursor known as epiheterodendrin (EPH) is produced by barley and can sometimes lead to unacceptable levels of ethyl carbamate in the final distilled spirit. The Scotch whisky industry has therefore been active in ensuring that this does not become a problem that jeopardises whisky exports which are worth annually some £4 billion to the UK.

Fortunately there are barleys that do not produce EPH and the introduction of this trait into good quality modern spring barleys has been a recent success story with now over 50% of spring varieties on the current Recommended List being non producers. This success has been in part been due to the fact that selecting for the non producers has been made easier for the breeders by the development, some time ago, of a molecular marker by scientists at the James Hutton Institute that correctly identifies them prior to commercial development. However this marker is not perfect and is not amenable to the high-throughput methods of genetic fingerprinting now being used by the breeding companies.

The James Hutton Institute in Dundee and the Scotch Whisky Research Institute (SWRI) in Edinburgh have therefore teamed up to develop a new molecular marker that can be used by breeders to ensure all newly released commercial distilling barley varieties are EPH non-producers. This uses state-of-the-art sequencing approaches to develop a high throughput assay that can be fully integrated into commercial breeding programmes. Increasing the throughput of the assay will allow highly efficient screening, that should ultimately result in a greater number of suitable candidate barley varieties, with higher agronomical and processing qualities for malting and distilling industries.

International Barley Hub

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"Creating the world's leading centre of excellence in barley science supporting the supply chain through industry focused research, innovation and knowledge exchange"

Barley is indispensable to the UK economy, being vital to the distilling, brewing, and food industries as well as having potential for a host of emerging uses in the health, chemicals and energy sectors. The opportunity for an International Barley Hub, a centre of excellence, to be located in Scotland is an exciting one and will ensure the sustainability of our world leading agricultural, distilling and brewing sectors.

The International Barley Hub (IBH) is a project led by UK and International Industry and delivered principally by the James Hutton Institute (JHI) in partnership with the University of Dundee (UoD) and Scotland's Rural College (SRUC).

At a time of increasing uncertainty around barley supply due to the implications of climate change, increasing worldwide demand, evolving pest and disease risks and agronomic pressures, it is vital that the UK has access to a vibrant barley research community as proposed within the International Barley Hub. Sustainability is at the heart of everything we do and if this can be linked to innovation this will ensure the long term development of the barley value chain as a whole.

The Hub will comprise a new bespoke technical facility with the flexibility to adapt to future requirements, and a unique array of specialist equipment and test-scale processing installations. Accommodating over 100 Institute, industry and visiting research staff the Hub will be located at our Invergowrie campus, near Dundee. The benefits of co-locating staff from related disciplines and sectors are well-established: cross-fertilisation of ideas, synergies in the innovation process and faster development times. This is a key benefit of the International Barley Hub. SMEs and large companies will gain flexible access to unique facilities, expertise and collaborative research opportunities unavailable elsewhere or prohibitively expensive if undertaken in isolation.

In addition, the Hub will provide tailored training for industry, farmers and researchers and will be a portal for information and knowledge exchange.

£40m has been requested from the Tay Cities Deal to deliver IBH and we hope the new facility will be fully operational by 2021/22. Our scientists are currently working with industry to develop our research programme and deliver as much impact as we can in advance of this date.

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Centre for Sustainable Cropping

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The CSC is funded by the Scottish government and is a long-term experimental platform, providing an open access research facility to test and demonstrate economic and environmental trade-offs in arable ecosystems.

The platform comprises of 6 fields over 42 hectares. Each field is split in half to compare integrated ('sustainable') management directly against standard commercial practice. Impact is assessed according to environmental, economic and ecological indicators monitored in winter and spring barely, potatoes, winter wheat, oilseed rape and field beans.

Plant Health Centre

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The Plant Health Centre is a virtual centre of expertise funded by Scottish Government through RESAS (Rural and Environment Science and Analytical Services Division) to help tackle plant health challenges for Scotland.

Working with the Chief Plant Health Officer for Scotland, Professor Gerry Saddler from Science and Advice for Scottish Agriculture (SASA), the Centre brings the plant sectors for forestry, horticulture, environment and agriculture together to co-ordinate plant health knowledge, skills, needs and activities across Scotland. We work with Scottish Government, public bodies and stakeholders to provide scientific evidence to help them make important decisions about pests and pathogens that threaten Scotland the most. The Centre Directorate is headed up by the James Hutton Institute, and has sector leads from Scotland's Rural College (agriculture), Royal Botanic Garden Edinburgh (horticulture and environment) and Forest Research (forestry).

NOTES