

WGIN going from strength to strength: Highlights and the legacy so far



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Department
for Environment
Food & Rural Affairs

30th November 2017, 15th Stakeholder meeting, RRes, Herts

WGIN provides a research platform for the delivery of

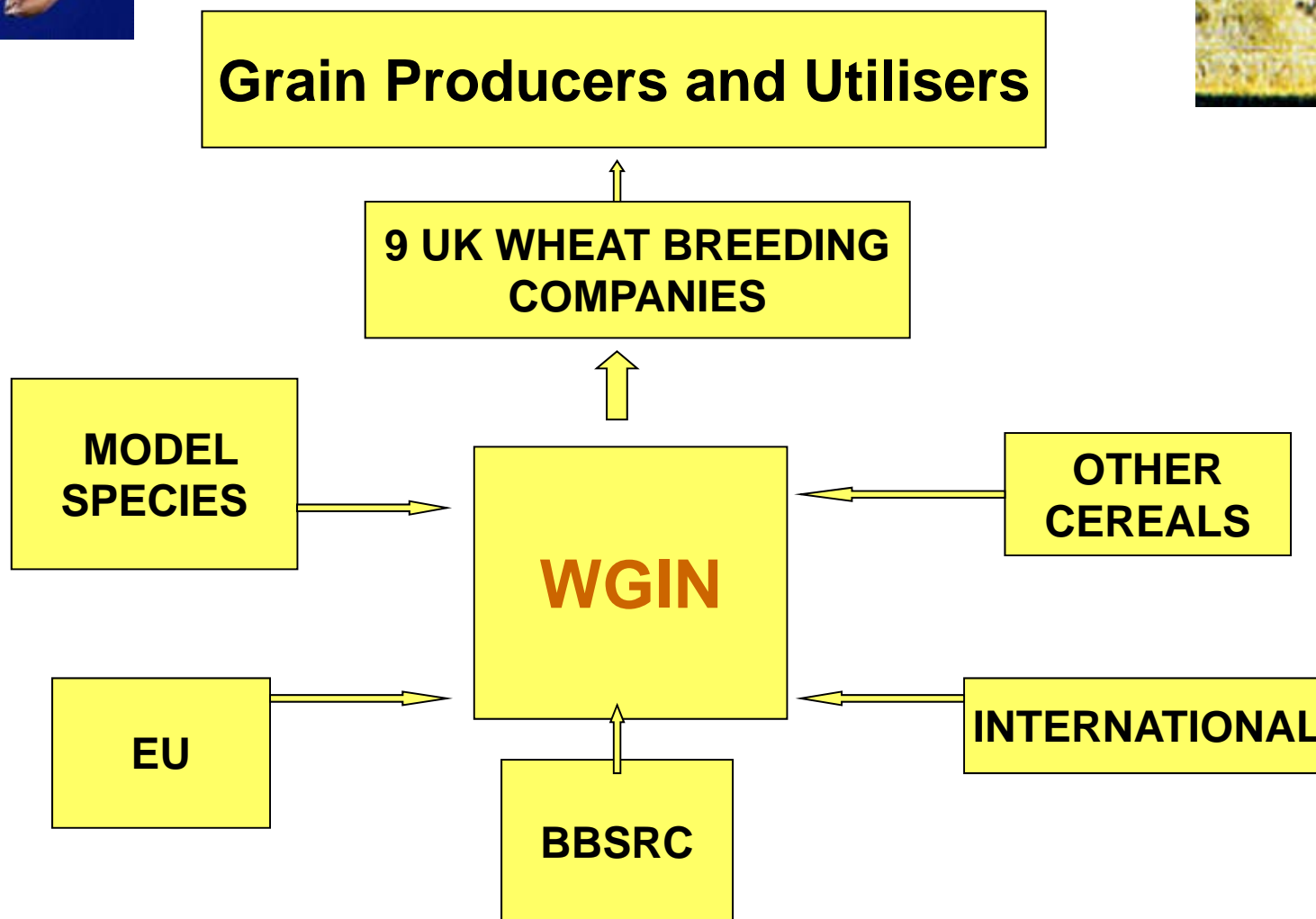
- tools
- resources
- bioinformatic information
- expertise for the identification of naturally occurring (useful) genetic variation in new traits

Yield and quality per se are excluded





The Defra WGIN



The modest WGIN funds would attract additional funds to wheat research by other sponsors

Projects of 5 years and 3 years duration

WGIN 1 (2003-2008) project

funded partners

John Innes Centre

Rothamsted Research

+ 2 pilot projects (2 yr)

WGIN 2 (2009-2014) project

funded partners

John Innes Centre

University of Nottingham

Rothamsted Research

+ 2 pilot projects (1 yr / 2 yr)

WGIN 3 project (2015-2018) – funded partners

John Innes Centre

Rothamsted Research

+ Bristol Genomics Facility, Univ. Bristol, UK

+ MYcroarray, Michigan, USA

Mission statement - WGIN 2003 to 2014

Improving the **environmental footprint** of farming through crop genetics and targeted traits analysis

Mission statement - WGIN 2015 to 2018

Improving the **resilience** of the wheat crop through genetics and targeted traits analysis

What has WGIN achieved ?

- **New genetic resources and tools**
- **Defining new traits for wheat improvement**
- **Maintaining and enhancing the public – private network**
- **Increasing funding into wheat research**
- **Training the next generation**

New resources / tools developed in WGIN

THE BIG FIVE

- A reference UK mapping population
Avalon x Cadenza (DH popⁿ, 203 lines + 584 lines)
- **Restoration of the AE Watkins wheat collection**
> 1200 lines from 31 countries
never previously used in modern breeding
- EMS mutagenised TILLING populations
Cadenza and Paragon (> 5000 lines + 1200C lines DNA)
- **A global collection of *T. monococcum* accessions (AA genome)** ~ 323 lines, 34K breeders array + 5 F₆ popⁿ
- Grain samples from WGIN cultivar diversity trials since 2003 (3 or 4 nitrogen treatments / all plots)

Trait identification

Consecutive years of field trials

1. Improved nitrogen use efficiency (NUE)
2. Grain quality (QTLs) linked to NUE
3. Improved water use efficiency (WUE)



Malcolm Hawkesford, RRes



John Foulkes, U Nott

Trait identification – RRes

2. Reducing pest and disease pressure

Aphids



***Septoria* leaf blotch**



Yellow rust



Take-all fungus

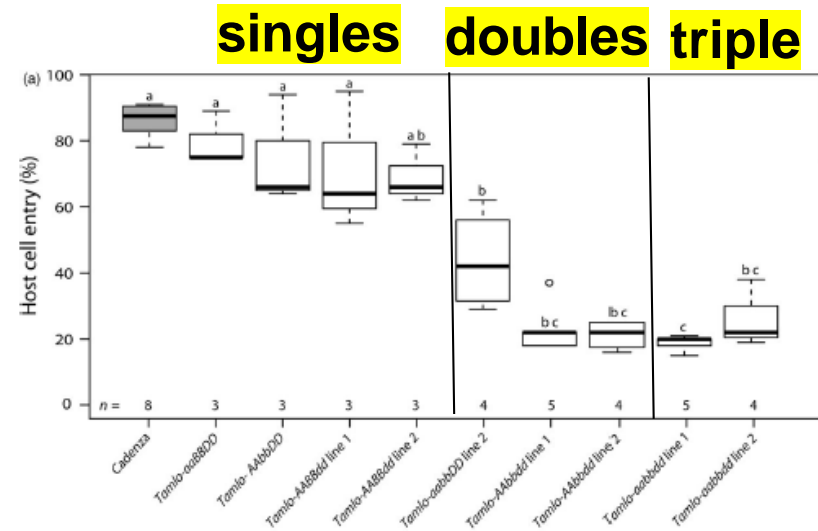


a major problem
for 2nd / 3rd wheat
crops

2nd wheat syndrome

annually all crops at high risk

TILLING wheat for *mlo* mediated mildew resistance



Initially WGIN funded

Plant Biotechnology Journal 2017

aab SEB Society for Biological Sciences

Plant Biotechnology Journal (2017) 15, pp. 367–378

doi: 10.1111/plbi.12631

mlo-based powdery mildew resistance in hexaploid bread wheat generated by a non-transgenic TILLING approach

Johanna Acevedo-Garcia¹, David Spencer¹, Hannah Thieron¹, Anja Reinstädler¹, Kim Hammond-Kosack², Andrew L. Phillips² and Ralph Panstruga¹*

Funders: German Federal Ministry of Food and Agriculture

Germany Society for the Advancement of Plant Innovation

The Networking objectives

**Maintaining and enhancing the
public – private network**

8 of the 20 activities

The Defra WGIN: Dissemination, Liaison and Communication

Annual “Stakeholders’ Forum” (Nov) 70-90 attendees
Focussed Workshop – 2009, 2013 ‘A x C mapping popⁿ’
2010 – DArT marker analysis

Workshops with overseas partner organisations:

Six in total funded by BBSRC

Web Site (www.WGIN.org.UK)

Electronic Newsletters

Scientific publications ~ 70 articles

Annual displays at ‘Cereals’

E. mail:wgin.defra@bbsrc.ac.uk



The WGIN legacy so far

Scientific publications - 72 peer reviewed articles

Helped in the training of 26 PhD students (5 since Oct 2015)

Ian MacKay (NIAB) – Quantitative Methods in Plant Breeding course is two weeks for 24 participants, 10th year ~ ½ industry, ½ public sector: ½ overseas, ½ UK
Avalon x Cadenza data to teach marker and QTL mapping

Prior to mid 2014

£4.52 million from defra has generated in excess of £41 million for 48 new wheat projects involving various sponsors

29 projects on new topics

£11.0 million lead by PIs not sponsored in WGIN

The WGIN legacy so far

Since 2014 – new funding

Designing Future Wheat (2017)

BBSRC Institute Strategic Programme Grant (2017-2022)

– combines six Institutes and two Universities

£19 million (PI Graham Moore, JIC)

£23.6 million for 15 new wheat projects involving various sponsors

11 projects on new topics

£22.5 million lead by PIs not sponsored in WGIN

Central storage of grain from the field trials

12 years of field trials (24-31 cultivars / 4 N regimes)

2003 to 2017

The stored samples - 500 g / 1 kg grain at - 20 C

~ 8,400 samples with associated metadata

**Key biological resources for new projects
and / or pilot studies**



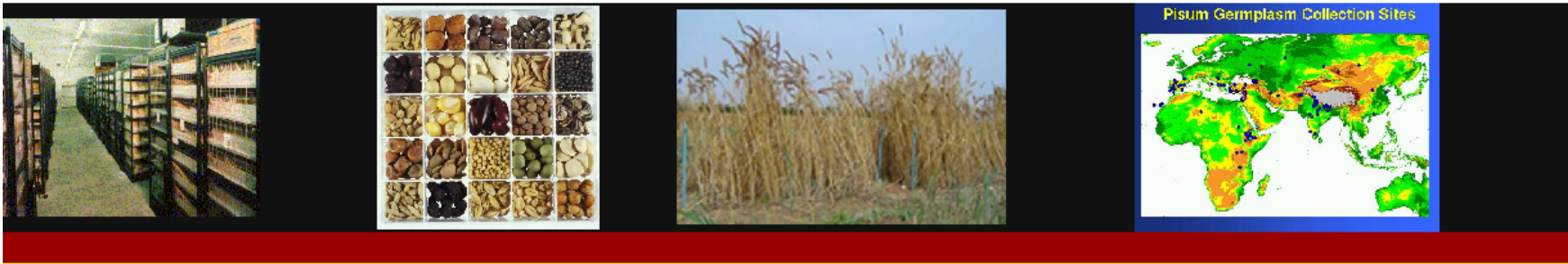
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for Environment
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Accessing the WGIN germplasm

Two routes:

RRes – by E. mailing directly to WGIN

**JIC - Genetic Resources Unit – National Capability
BBSRC**



Collections /
Databases

Genetic Resources Unit

What's New

The Centre is custodian of a number of key germplasm collections which serve academic, industrial and non-industrial groups both within the UK and internationally. They are the subject of research in their own right as well as being involved in a range of collaborative programmes. The collections housed within a purpose built facility maintained at 1.5 °C and 10%RH with some 600m³ of storage capacity.

People

GRU
Publications

Links

Material from the collections is available on request to research, academic and commercial communities subject to availability. A material transfer agreement is required before seed is released. Please email for details of the agreement.

Return to
Genetic
Resources

For further information relating to the collections please contact: Mike Ambrose
John Innes Centre, Norwich Research Park Colney Lane, Norwich, NR4 7UH.
TEL: +01603 450630 EMAIL: JIC.geneticresources@bbsrc.ac.uk

Defra

Martin Cannell, Giulia Cuccato and David Cooper

WGIN 3

RRes - Kim Hammond-Kosack
Peter Shewry
Malcolm Hawkesford
Vanessa McMillan
Kostya Kanyuka
Lesley Smart
Gia Aradottir
Michael Hammond-Kosack

JIC – Simon Griffiths
Clare Lister

UoN - John Foulkes

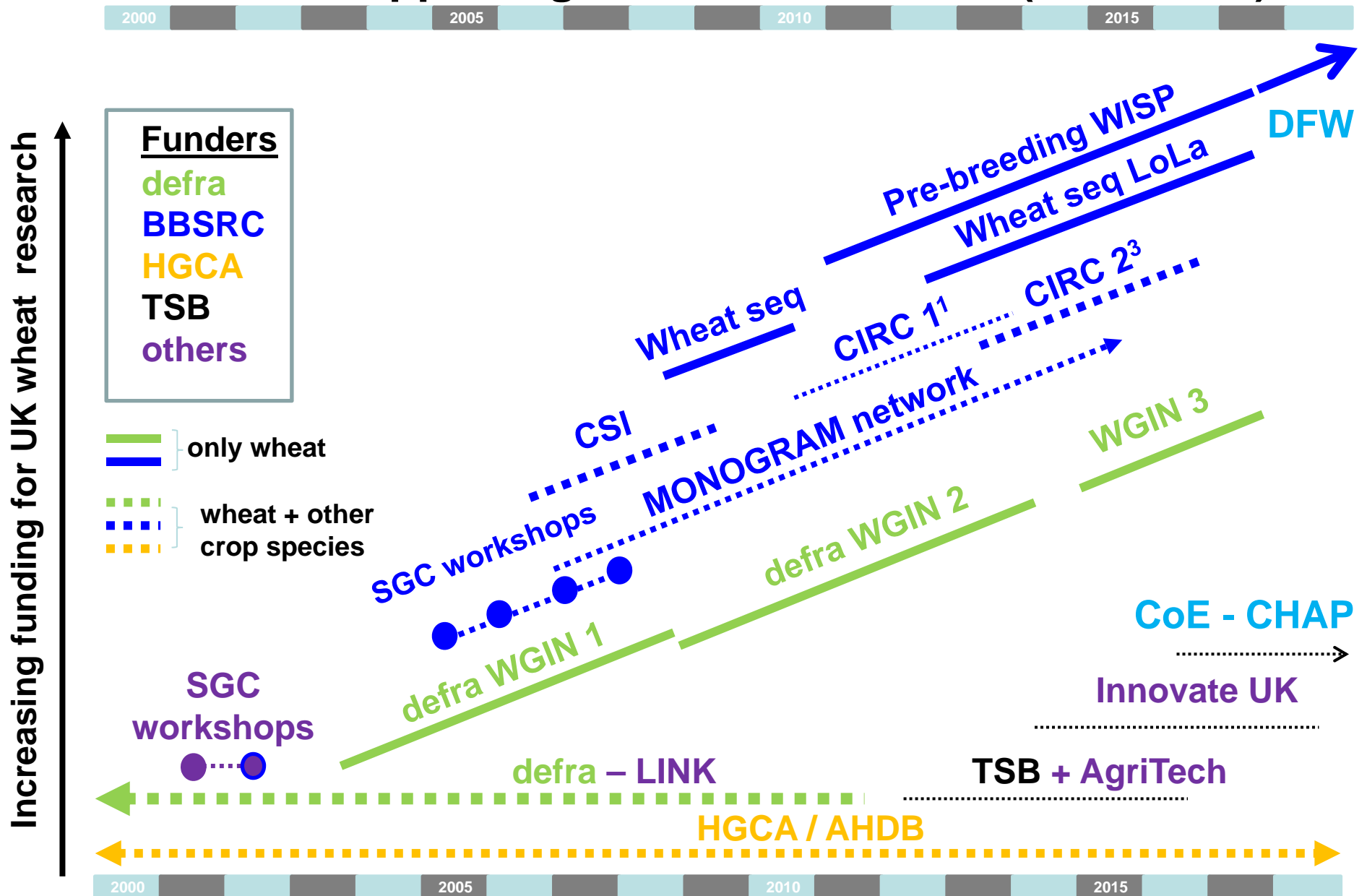
Bristol Genomics – Jane Coghill’s team
MYcroarray (Arbor Biosciences) – Michigan, USA

The Management team
The Plant Breeders (9)
ADAS
AHDB
Camden BRI
NIAB
Univ Bristol
Defra

The farm / trials staff at all the sites used



The relationship between WGIN and the **major funding initiatives** supporting UK wheat research (2000-2017)



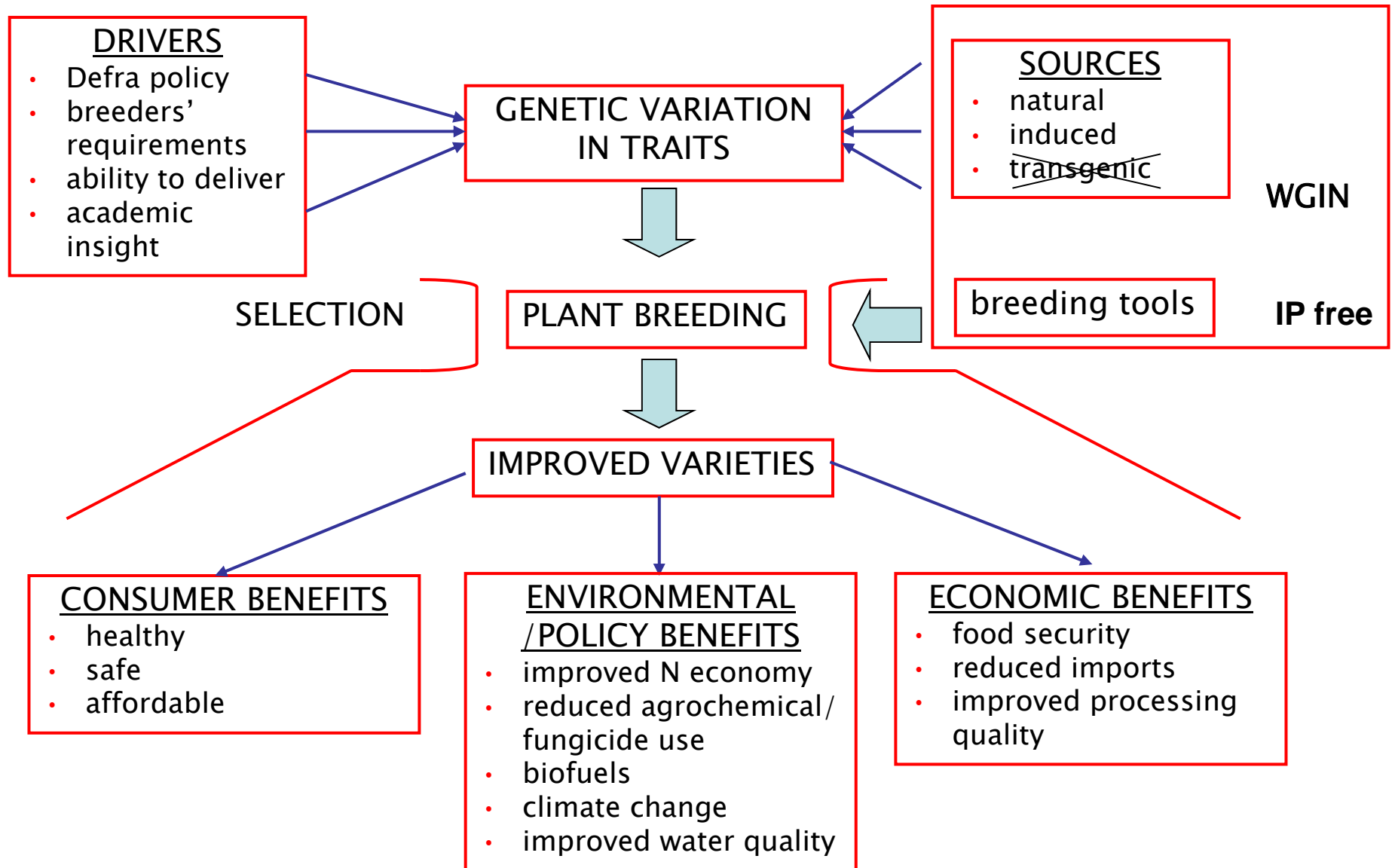
Royal Society Conference 'Science for Defra: Excellence in the application of evidence'.

30th March 2017

- **Wheat (WGIN) 2003**
- **Oilseed rape (OREGIN) 2003**
- **Pulse crops (PCGIN) 2005**
- **Leafy Vegetables (VeGIN) 2009**

Showcased - the top research achievements

WGIN in the wider context



Welcome to WGIN 3rd Phase (2015-2017)

Defra Wheat Genetic Improvement Network - Improving the resilience of the wheat crop through genetics and targeted trait analysis

WGIN 3 has been funded by Defra until January 2018

IMPORTANT:

1) The next WGIN Stakeholders' Meeting will be held at Rothamsted Research, Harpenden on

Thursday, 30th November 2017

[You can still register via Eventbrite by following this link.](#)

The full programme for the day is now available [here](#).

2) A joint GINs Stakeholders Event was held at JIC on February 22nd to highlight the decade of science done within all four Defra funded GINs - WGIN, OREGIN, VeGIN and PGIN. For an appraisal of the event by Defra's Giulia Cuccato and David Cooper please click [here](#). The agenda and GIN presentations can be found in 'meetings' under the 'Information' tab.

RECENT UPDATES

OLD Site - [The old site is still available here.](#)

Disclaimer: WGIN is a publicly funded project and the data and resources it generates are freely available to the research community, providing that the use of any WGIN data and resources are acknowledged.

wgin.defra@rothamsted.ac.uk



www.WGIN.org.UK

**Project assistant
1 day / week**

**All research
powerpoint
ppts available
from all meetings**

**Accessible via the
MONOGRAM
website**

**BSPB – British
Society for
Plant Breeders**

site guide

The site is grouped into the following four sections:

ABOUT - for general information about WGIN, including news items and contacts.

INFORMATION - for more detailed information about WGIN, including reports and information tools.

RESOURCES - for experimental resources and research related tools

STAKEHOLDERS - for information on the Stakeholders Forum

Please use our interactive dropdown menus, the side menus, or the link tracker to navigate the site.

--see [site-map](#) for overview