

# **WGIN 1 Overview – concepts and achievements**

**Kim Hammond-Kosack**

**Rothamsted Research**



**6<sup>th</sup> WGIN Stakeholders Meeting 14<sup>th</sup> November 2008**

**To improve the effectiveness of UK genetic science for crops through novel, integrated networks of research**

**Kim Hammond-Kosack**  
**Rothamsted Research**



**6<sup>th</sup> WGIN Stakeholders Meeting 14<sup>th</sup> November 2008**

# The Defra Crop Genetic Improvement Networks

Announced July 2002

**Dr Donal Murphy-Bokern**

**Arable Crop Sciences & Pesticide  
Safety Unit**

**Science Directorate**

**Defra**



# Overall Objectives

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- **Each Crop Genetic Improvement Network =**  
**Virtual Plant Breeding Institute**
- **To use crop breeding for the sustainable development of the arable sector**
- **To connect public sector science to the private sector**

**To recreate the best of the past**

# Where was Defra coming from?

- **Public research - £43 m pa**
  - > £16 m on named crop species
  - > £5 m on targeted research
  - > Little use of LINK
  - > Project based
  - > Pre-competitive
- **Public R&D is only effective in supporting defra if it results in better varieties**

# Networks established

- Wheat (WGIN)
- Oilseed rape (OREGIN)
- Short rotation coppice (BGIN)
- Pulse crops
- Miscanthus
- Oats



## The longer-term vision

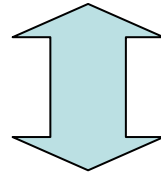
- A strong crop breeding sector deploying the best technologies science can offer
- A strong strategic and applied research base competing effectively for resources
- A strong base for international partnerships
- More resource efficient and productive crops

# The Defra Genetic Improvement Network Comprises Several Parts

**WGIN**

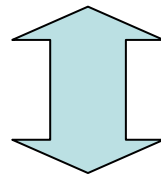
**LINK projects**

**£300K**



**Satellite Projects**

**£300K**



**Core Project**

**£300K**

**5 years**

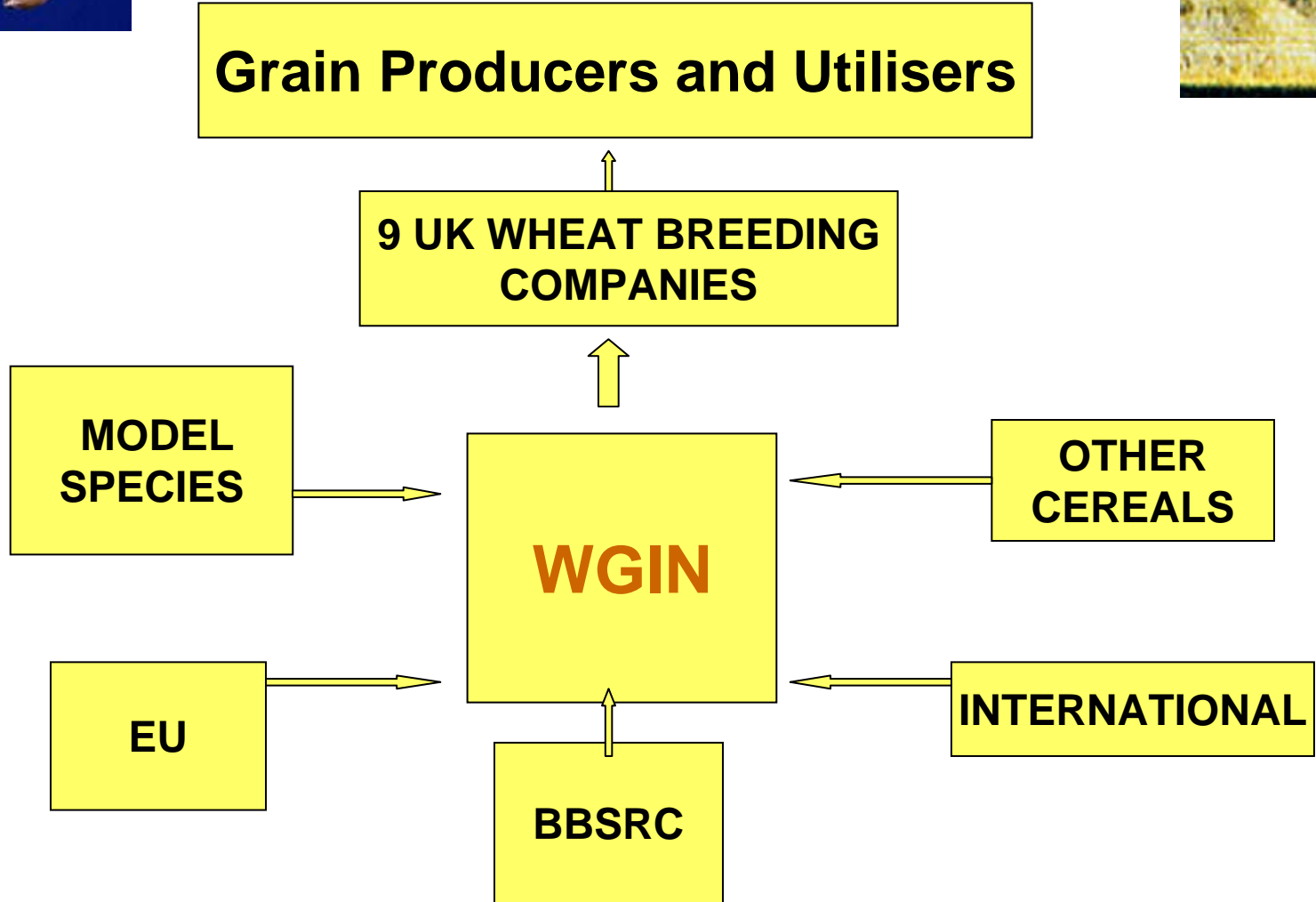
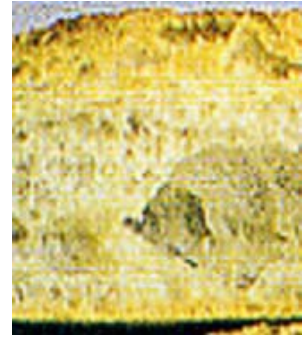
**UK-based breeding companies**

**9 for wheat**





# The Defra WGIN



# The Defra WGIN Core Project

## Aims:

**To Underpin Wheat Improvement by Plant Breeders**

## Approaches:

- 1. Characterisation and provision of genetic resources**
- 2. Genetic mapping and marker development**
- 3. Trait identification**
- 4. Identification and generation of novel variation in key traits : using non-GM approaches**
- 5. Central storage of grain from field trials**
- 6. Liaison and communication**

## Funded research partners:

**Rothamsted Research and John Innes Centre**

**some funds for one sub-contractor project**

# Characterisation and provision of genetic resources

## EMS populations for hexaploid wheat

Paragon (JIC) – M<sub>6</sub> individuals for 6,500 lines

Cadenza - M<sub>3</sub> individuals for 4,200 lines  
+ phenotyping data from Hungary

+ Gamma irradiated Paragon population

+ ion beam irradiated Cadenza populations

+ many resources for the diploid wheat

*Triticum monococcum*

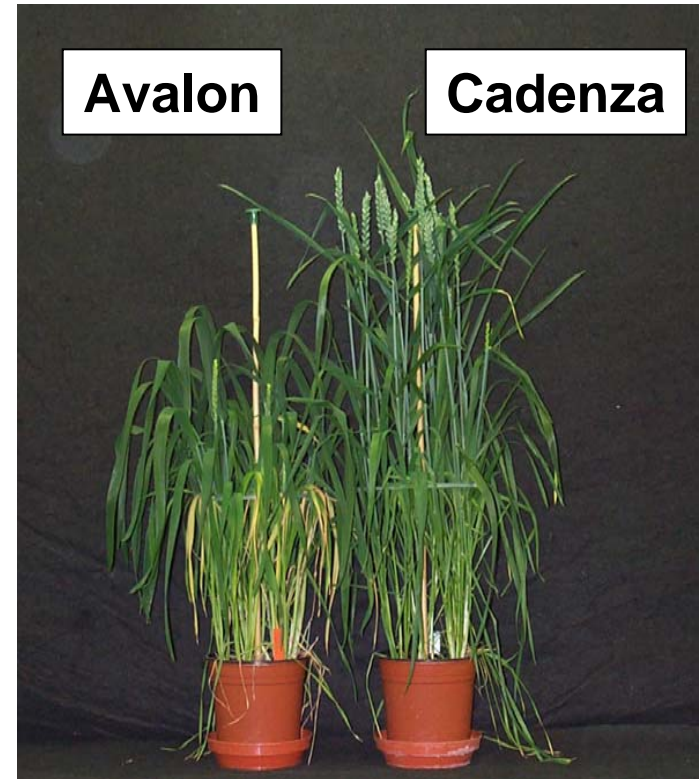
March 2007 WGIN newsletter – special issue resources

Seed is available via the JIC Genetic Resource Unit

# Genetic mapping and marker development

- Establish a reference UK mapping population

**Avalon x Cadenza -  
203 double haploid lines**



- Switch to 'within the gene' molecular markers

**> 500,000 wheat ESTs available**

# **Avalon x Cadenza DH population**

**Segregates for the following traits**

**Height**

**Canopy architecture**

**Septoria resistance – *Stb6* locus (Chr 3A)**

**Soil borne virus resistance – *Sbm1* locus (Chr 5DL)**

**Take-all inoculum build up in the soil**

**Nitrogen Use Efficiency**

**Provides a baseline of key data for others to use  
+ sufficient seed for other field experiments**

**Traits A x C workshop planned for 2009  
(co-organisers: Simon Griffiths and Neil Paveley)**

**Using non-WGIN RRes funds the A x C population will  
in 2009 be expanded to > 900 DH lines**

# Characterisation and provision of genetic resources

The **Watkins** winter wheat collection (JIC)

1930s collection from markets in 32 countries

Seed now available for 814 'purified' lines

**Represents germplasm never used in  
UK wheat breeding programmes**

# Trait identification

1. Nitrogen use efficiency (NUE)

2. Reducing disease pressure

***Septoria* leaf blotch**



**Take-all fungus**



3. Grain quality

**5 years of field trials**

**Sub-contractor project  
2<sup>nd</sup> wheat syndrome  
(ADAS and NIAB)**





2007

A x C

NUE

Diversity

Trial

RRes



# **Central storage of grain from the 5 years of field trials**

**The stored samples are 1 kg grain at - 20 C**

**Diversity trial – for all years and all plots**

**Avalon x Cadenza - for all years and all plots**

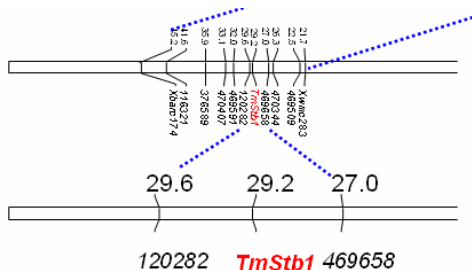
**~ 4,500 samples with associated metadata**

**A key biological resources for new projects  
and / or pilot studies**

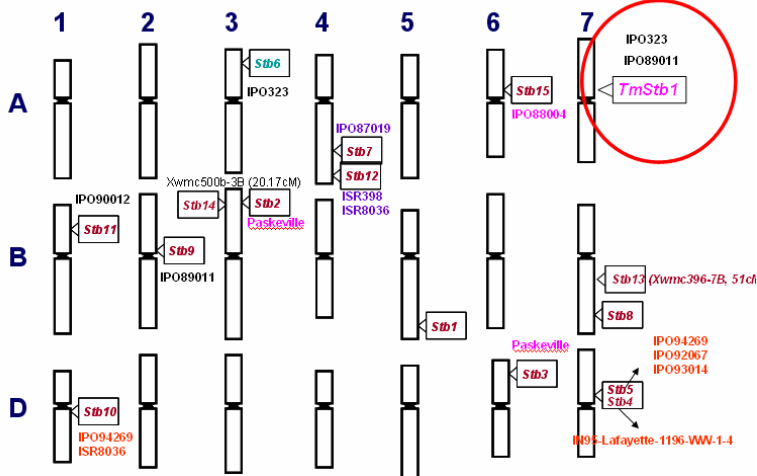
# Septoria resistance



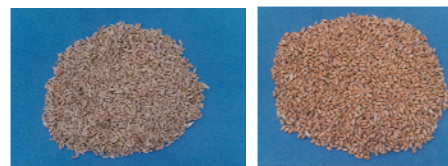
Field assessment over 5 years



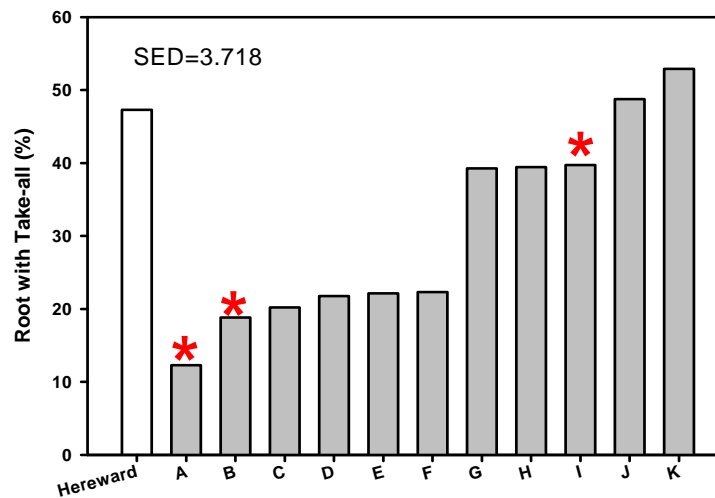
Combined  
DARt +SSR  
marker map



# Take-all resistance in *T. monococcum*



infected roots



Two mapping populations generated and  
F<sub>3</sub> seed now available for screening

# Identification and generation of novel variation in key traits

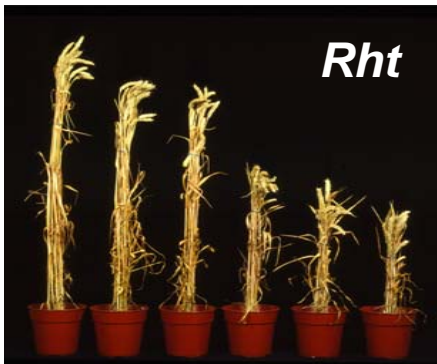
**PCR TILLING technique on**

- EMS mutagenised populations
- Diverse germplasm collections

**Diploid (*T. monococcum*) and Hexaploid wheat**

- exploring allele diversity
- two demonstration projects

**crop height**



**defence signalling**



**The Vavilov  
Institute,  
St. Petersburg  
Russia**

# Management of the Defra WGIN : The Management Team

**Defra**

**Funded partners.**

Rothamsted Research

John Innes Centre

**Other Partners \***

ADAS

University of Nottingham

NIAB

University of Bristol

**BBSRC\***

**UK Wheat breeders\***

**HGCA\***

**(\*Ex-Officio Members)**

**Three meetings per year – rotated the location Total 18**

**All meeting minutes and ppts in the public domain**

# **Management of the Defra WGIN : The Stakeholders**

Millers and Bakers

Brewers and Distillers

CCFRA

Livestock Feed Producers

Food processors

Agrochemical/Biotech Companies

Wheat Researchers

Field Trials Contractors

# The Defra WGIN: Dissemination, Liaison and Communication

Annual “Stakeholders’ Forum” (Nov)

A “Cereal Genetics and Genomics Workshop”

A “Traits Workshop”

Workshops with overseas partner organisations:  
CIMMYT, INRA

Web Site ([www.WGIN.org.UK](http://www.WGIN.org.UK) )

Six Monthly Electronic Newsletter

Scientific publications

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







[www.WGIN.org.UK](http://www.WGIN.org.UK)

- Home
- Project Outline
- Forthcoming Events
- Newsletters
- Feedback
- Contacts
- Peer Reviewed Publications
- The Other Defra Networks
- Site Map

Home    Research Activities    Resources    Stakeholders

**Home**

**WGIN - a project supported by Defra**

Search the WGIN site

Search website

Recent Additions



WGIN field trials in Norwich (John Innes Centre) in 2007

Next stakeholder meeting - 14 November at Rothamsted Research Programme

Printer friendly page

### Recent Additions To The WGIN Website:

#### 2008

- 04.11.2008: [Associated Documents Management Meeting October 2008](#)
- 29.10.2008: [Programme - WGIN stakeholder meeting 2008](#)
- 29.10.2008: [WGIN Stakeholder Newsletter October 2008](#)
- 29.10.2008: [Minutes - Management meeting June 2008](#)
- 21.10.2008: [Presentation Management Meeting October 2008 - Kim Hammond-Kosack: WGIN Phase II](#)
- 21.10.2008: [Defra Wheat Projects](#)
- 30.09.2008: [Watkins Collection - Foliar Disease Data from the 2008 Rothamsted field trial](#)
- 06.08.2008: [Second Wheat Syndrome Project Report](#)
- 06.08.2008: [Presentations from June 2008 Management Meeting](#)
- 09.03.2008: [Presentations from February 2008 Management Meeting](#)

#### 2007

- 19.12.2007: [Presentations from November 2007 Stakeholder Meeting](#)
- 19.12.2007: [Presentations from November 2007 Management Meeting](#)

**maintained by  
Elke Anzinger  
project assistant**

**Unlike LINK projects  
the WGIN data goes  
straight into the  
public domain**

# Many Additional Outreach Activities

Cereals 2007 and 2008 RRes and JIC demonstration plots



With assistance from RRA, NIAB and Velcourts



# Economic impact of WGIN

## Special focus Newsletter May 2008

The cost of WGIN 1 was £1.8 M over 5 years

### What was the return ?

Defra commission SAC in 2007 to find out

~ £16.7 M for all the GINs ( after 4 years)

### WGIN (as of April 2008)

1. Funded BBSRC projects using WGIN data and resources - £ 3.0M  
n = 6
2. Funded projects using WGIN data in the application - £ 4.3M  
(BBSRC, EU-FP6, HGCA, Link, RIF)  
n = 15

# Establishing new wheat projects

**Hagberg Falling Number – BBSRC, Defra, HGCA  
Univ of Nottingham, Harper Adams, JIC, RRes  
UK / European Wheat Breeders / CCFRA / SWRI**

**Nitrogen Use Efficiency - BBSRC-INRA initiative  
Univ of Nottingham, JIC, INRA Clermont-Ferrand**

**Yield / Quality / Grain Shape / Insect Resistance  
- Crop Science Initiative – BBSRC  
4 Projects: JIC/RRes, IGER and partners**

**EU FP 6 Healthgrain and Bioexploit - RRes**

**Tools and Resources (1 year duration) - BBSRC  
Marker development JIC; Lightscanner RRes**

## **Defra**

**Donal Murphy-Bokern**

**Bruno Viegas**

**Kath Bainbridge**

## **WGIN (present)**

**RRes - Peter Shewry**

**Andy Phillips**

**Kim Hammond-Kosack**

**Hai-Chun Jing**

**Elke Anzinger**

**JIC – John Snape**

**Simon Griffiths**

**Simon Orford**

**Leodie Alibert**

**James Simmonds**

**Michelle Leverington**

## **WGIN (past)**

**RRes - Katie Tearall**

**Carlos Bayon**

**Sam Irving**

**JIC - Robert Koebner**

**Christian Rogers**

**Pauline Stephenson**

**Sub-contactors**

**ADAS – Neil Paveley**

**NIAB – Rosemary Bayles**

**The farm / trials staff at all the sites used**

**The Plant Breeders**

**The Management team**

**[www.WGIN.org.UK](http://www.WGIN.org.UK)**



# WGIN in the wider context

