



# **Coordinating global research for wheat**

*Réunion du Groupe Céréales  
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# An international partnership for wheat improvement research

- A framework to **identify synergies and facilitate collaborations** for **wheat improvement** at the international level
- **Created in 2011 following endorsement by G20 Agriculture Ministries** to improve food security



# All countries and companies welcome!

16 countries, 9 private companies, 2 CGIAR Centres



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WHEAT INITIATIVE

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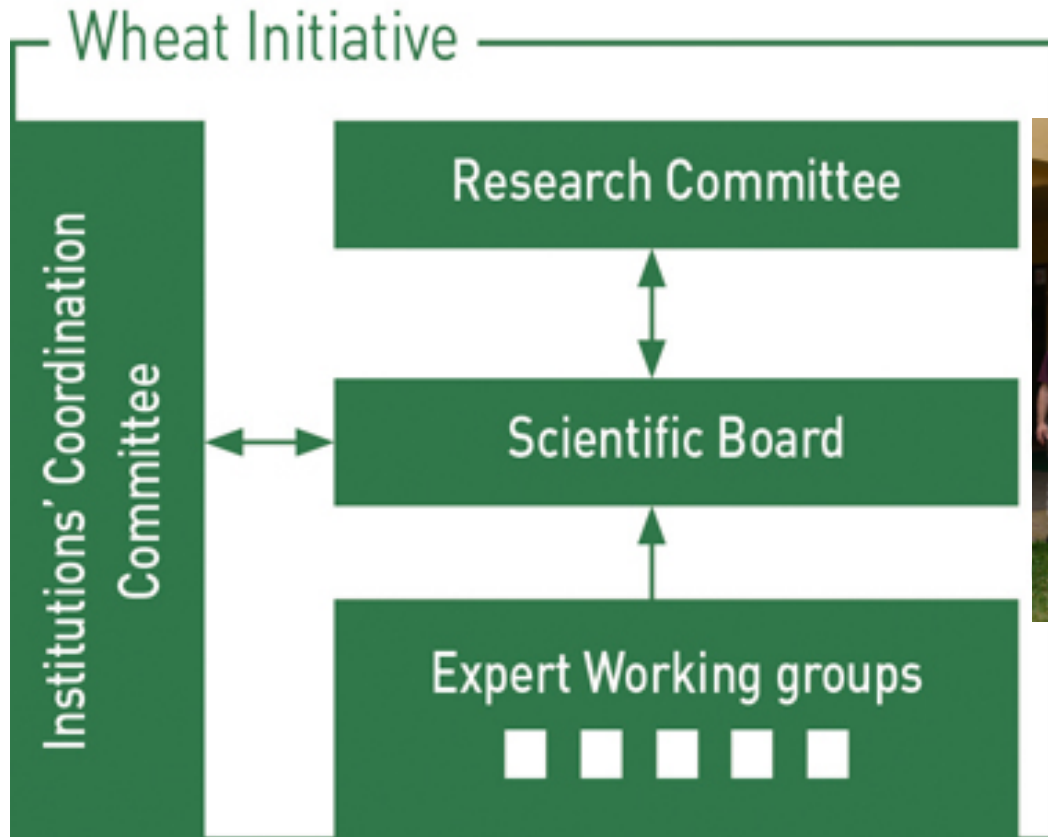


# Wheat Initiative Vision and Mission

- **Vision:** a vibrant global wheat research **community** sharing resources, capabilities, data and ideas to improve wheat land productivity, quality and sustainable production
- **Mission:** develop a global Strategic Research Agenda and support its implementation through **coordinated actions, knowledge and resource sharing and efficient investment**



# Facilitating delivery by leveraging synergies and collaborations



# Expert Working Groups

## Established

- Wheat Information System
- Genetics and Genomics of Durum Wheat
- Wheat Breeding Methods and Strategies
- Wheat Phenotyping to Support Wheat Improvement
- Wheat Plant and Crop Modelling

## Newly approved

- Control of wheat pathogens and pests
- Adaptation of wheat to abiotic stress
- Genetic resources
- Nutrient use efficiency

## Under development

- Quality and safety
- Agronomy

# EWG objectives

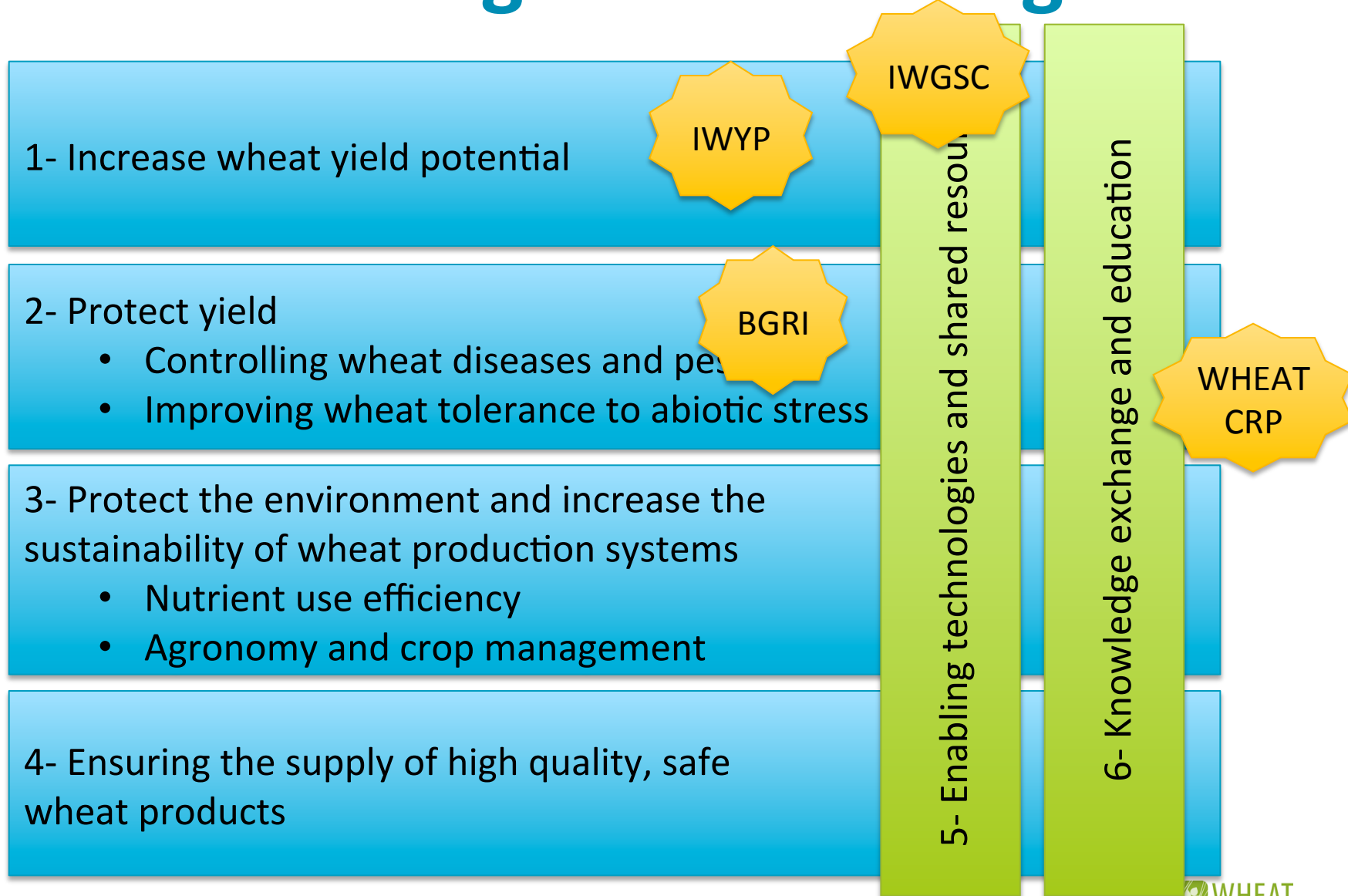
- Contribute to the SRA by gap analysis and recommendations (research priorities)
- Deliver position papers
- Stimulate and facilitate knowledge sharing
- Address a challenge/priority through a common programme
- ...

# **DEVELOPMENT OF A STRATEGIC RESEARCH AGENDA**

# From an international vision...



# ... to a Strategic Research Agenda



# SRA delivery calendar

- Draft prepared by SB, RC and EWGs in 2014
- Broad consultation (January-March 2015)
  - Country members:
    - Organised by ICC members, all wheat stakeholders consulted
  - Private members
    - Consulted through their RC representatives
  - Others
    - Consultation via Wheat Initiative website
- Revision of the SRA (April 2015)
- Launch
  - Presentation at EXPO 2015 (Milan) June 3<sup>rd</sup>
  - Official launch at G20-MACS (Turkey)

# Outstanding game-changers

- The richness of **wheat genetic diversity** will be accessible and understood by comparison with a fully assembled and aligned **wheat reference genome sequence**;
- Wheat data will be available to all via an **open information exchange framework** supporting the understanding of the interaction of genotype, environment and crop management on the phenotype to allow for prescriptive wheat breeding.
- **New combinations of desirable alleles in inbred or hybrid wheat varieties** will be created through increased deployment of natural and engineered genetic variability, via the characterisation of the existing germplasm as well as by the generation of new genetic resources by all available and emerging methods (including genome editing, control of meiotic recombination, use of wheat relatives, transgenesis).

# Underlying key priorities

- **Continued support for existing activities** aimed at yield improvement through conventional breeding methods, using existing germplasm and molecular technologies
- **Increased understanding of the genetic, molecular and ecophysiological basis of wheat key traits** (yield potential, interaction with pathogens and pests, tolerance to abiotic stress, nutrient use efficiency, quality)
- Deployment of **new breeding technologies** (genetics) and **integration with improved crop management** (agronomy) to develop sustainable growing systems
- **Coordinated public and private investment** and development of **global public-private partnerships**

# Core theme 2: protect yield potential

## Sub-topic 2.1 controlling wheat diseases and pests

- **Challenge: Protecting wheat from yield losses due to pests and disease.**
- **Aspiration: Wheat varieties with durable resistance to most major pests and diseases.**
- **Aims and objectives:**
  - Continued identification of novel sources of disease and pest resistance to broaden the genetic base of resistance against primary wheat pathogens and pests;
  - Development of diagnostic genetic markers to assist breeding programmes in the development of disease resistant varieties;
  - Deep knowledge on wheat---pathogen interactions and use of this knowledge for the development of new resistance strategies;
  - Monitoring of pathogen populations for their ability to overcome resistance genes;
  - Understanding the impact of climate change on pathogens in order to assess potential new epidemics;
  - Deployment of cis/transgenes to augment strategies towards durable disease resistance;
  - Coordinated efforts in pre---breeding and breeding programmes to optimise strategies for the efficient use of resistance genes in wheat and to ensure their sustainable deployment
- **Research needs:**
  - efficient collaboration between phytopathologists, geneticists, molecular biologists and breeders
  - pathogen surveillance and the identification of new sources of resistances in the wheat gene pool to develop novel wheat management regimes
  - development of molecular markers and the development of efficient strategies for marker---based introgression ideally as multiple gene combinations into adapted cultivars
  - resistance breeding at the allele level (durable resistance)
  - targeted editing of genes conferring susceptibility with the goal of generating novel resistant phenotypes
  - deeper understanding of wheat pathogens biology and evolution with respect to wheat---pathogen---interaction, effector diversity and the epidemiology of diseases.
- **Priority actions :**

Research objectives	Delivery Timeframe	On---going International Actions	Wheat Initiative Actions
<p>Identification and characterisation of novel sources of resistance to the main wheat diseases</p> <p>Exchange germplasm and markers associated with resistance loci</p>	Short---term (1---5 years)	<ul style="list-style-type: none"> <li>• Borlaug Global Rust Initiative – Wheat Rusts</li> <li>• CGIAR Research Program on WHEAT, Flagship Project 3</li> <li>• National programs (public and private) targeting regionally important diseases and pests</li> </ul>	<ul style="list-style-type: none"> <li>• Coordinate research in the area by: <ul style="list-style-type: none"> <li>--- Developing the EWG – Control of wheat pathogens and pests</li> <li>--- Linking with the EWG</li> </ul> </li> <li>– Wheat Germplasm Conservation and Use Community</li> </ul>
<p>Genomics-based surveillance of pathogen populations and epidemiology in routine use</p> <p>Novel resistance mechanisms identified</p> <p>Durable resistance to several diseases present in many varieties</p>	Medium---term (5---10 years)	<ul style="list-style-type: none"> <li>• ENDURE EU network (Fusarium)</li> <li>• International Fusarium and Fusarium Genomics Workshops</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitate access to technologies</li> <li>Support the BGRI as an Associated Program</li> </ul>
<p>Comprehensive understanding of genetic networks of resistance against primary pathogens</p> <p>Deployment of durable resistance to multiple pests and diseases</p>	Long---term (>10 years)		<ul style="list-style-type: none"> <li>• Support the development of an international program on necrotrophic pathogens</li> </ul>



**[www.wheatinitiative.org](http://www.wheatinitiative.org)**

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