

International Wheat Yield Partnership (IWYP)

Research to Deliver Wheat for the Future

www.iwyp.org

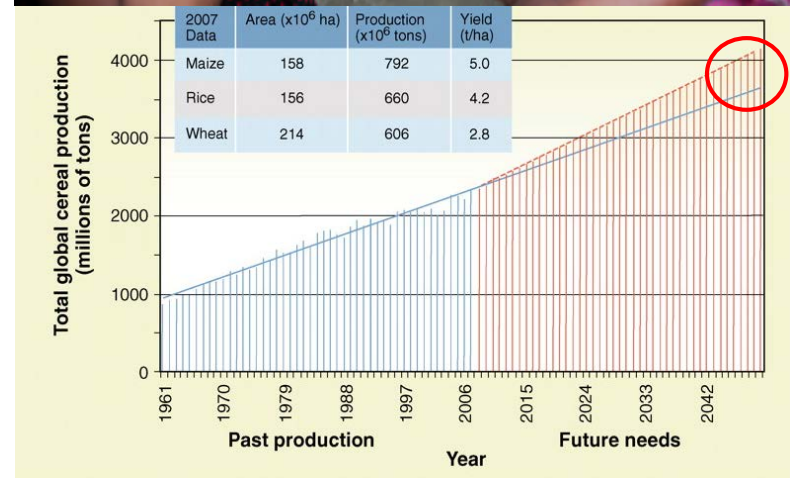
Background and Creation of IWYP

- 1996 - First Wheat Yield Potential Workshop was held in at CIMMYT
- 2009 - Wheat Yield Consortium (WYC) meeting
- 2011 - The 1st International Workshop of the Wheat Yield Consortium held at CIMMYT
- 2012 - Wheat Initiative (WI) organized following endorsement from the G20 Agricultural Ministries in 2011
 - IWYP addresses a pillar of the WI as a SRA for genetic yield potential
- 2014 - IWYP launched at the Borlaug 100 Summit in CIMMYT
- 2015 - IWYP becomes operational



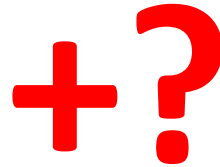
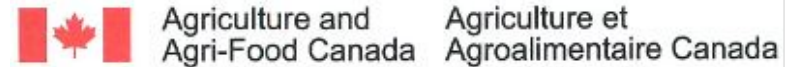
The Global Challenge

- Wheat provides 20% of all calories consumed by people globally
- Primary source of protein (20%) for humans and significant source for animal feed
- Human population estimated to reach more than 9 billion by 2050 (34 years)
- Global wheat production needs to increase +60% by 2050 to meet demand
- Global rate of wheat yield increase has slowed since 1990
- We will be unable to meet this demand without a **step change** in wheat breeding
- ...**AND** against a backdrop of climate change



Tester and Langridge. 2010. Science 327:818

IWYP is a Global Partnership



सत्यमेव जयते
Department of Biotechnology
Ministry of Science & Technology
Government of India

- Manage, fund, coordinate and integrate the world's top wheat scientists into a holistic research program

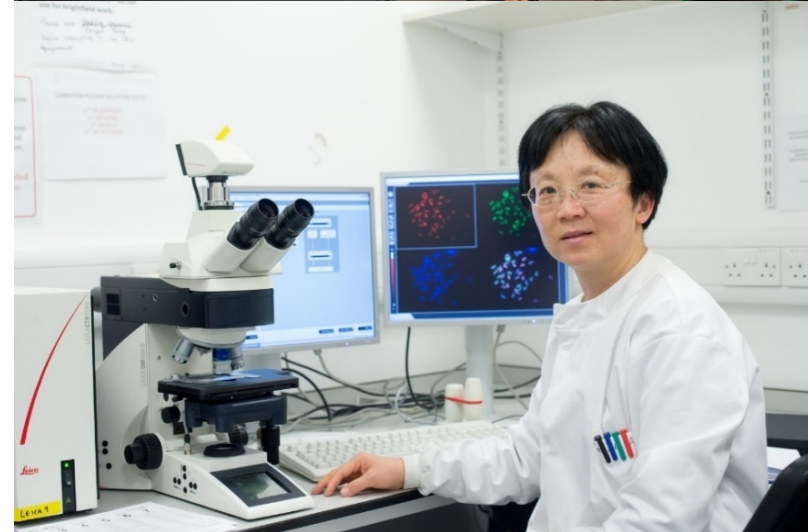


IWYP Goal

**To increase the genetic
yield potential of wheat
by 50% in 20 years**

Achieving a Step Change in Yield

- Purposely set a highly demanding research goal
- Research must be creative, forward-looking and driven to discover approaches to **substantially** increase the genetic yield potential of wheat
- Breakthroughs in genetic yield potential beyond what is expected to occur in ongoing breeding programs
- Requires new or different approaches and/or novel techniques with a relatively high degree of risk
- Discoveries that are as durable and portable as possible



IWYP Research Areas

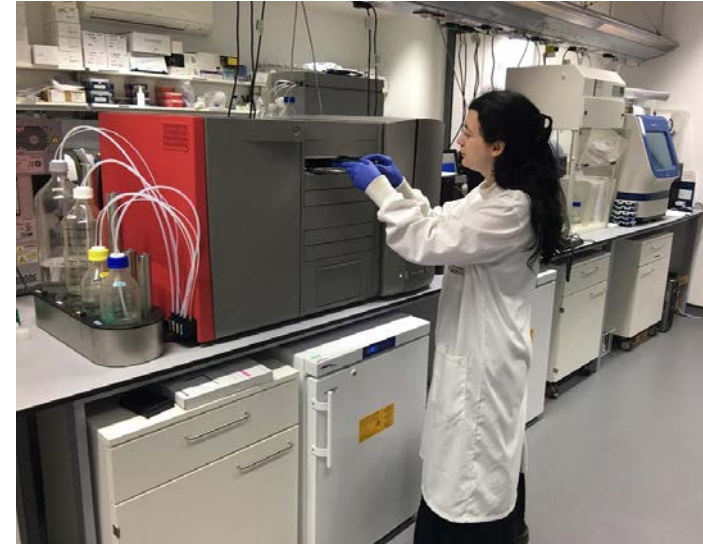
- Discovery / creation of genetic variation in wheat that boosts the fixation of carbon into biomass for subsequent transfer to grains
- Maximize grain yields from enhanced carbon capture and biomass through optimizing plant phenology
- Build elite lines for deployment to other breeding programs
- Exploit discoveries coming from other species
- Utilize breakthrough enabling technologies to transform cereal breeding



Tactic for Delivering Impact

IWYP Science

- Targeting the best scientists / ideas / institutes etc.
- Total value of the funded research ca. US \$20 million
 - BBSRC, GRDC, USDA, DBT, USAID
- Involves various institutions & research teams in:
 - UK, AUS, USA, MEX, IND, ARG, ESP
- Science areas of the funded research projects:
 - Finding and employing traits and genes to increase photosynthesis
 - Gene discovery to boost spike development
 - Reducing respiration and thereby enhancing photosynthetic efficiency
 - Optimizing canopy architecture to increase carbon capture and conserve nitrogen
 - Using selected genes to increase biomass and yield
 - Optimizing phenology leading to increased harvest index



IWYP Funded Research Projects



Realizing Increased Photosynthetic Efficiency to Increase Wheat Yield



Molecular Dissection of Spike Yield Components in Wheat



Improving Wheat Yield by Optimizing Energy Use Efficiency



Next Generation Genetic Approaches to Exploit Phenotypic Variation in Photosynthetic Efficiency



Maximizing Harvest Index by Controlling the Duration of Developmental Phases



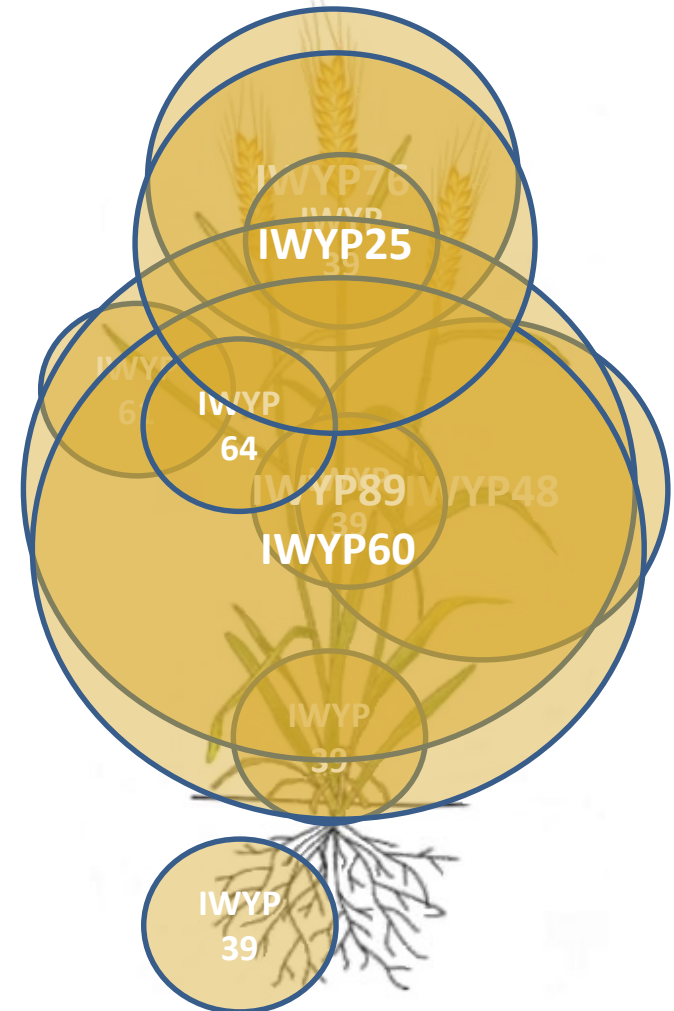
AVP1, PSTO1 and NAS - Three High Value Genes for Higher Wheat Yield



High-Throughput Phenotypic Exploration of Novel Genetic Variation for High Biomass and Yield in Wheat



Increasing Carbon Capture by Optimizing Canopy Resource Distribution



IWYP Aligned Projects

- Expand IWYP research base
- Engage formally with externally funded relevant research
- Be inclusive as possible and potentially gain some “early wins”
- 5 IWYP Aligned Projects
 - CIMMYT
 - NRC Canada
 - CSIRO
- More details about benefits of membership and application form available from IWYP website



USDA NIFA-IWYP Research Projects

- Seven projects selected by reviewers for funding
- Topic areas aligned with IWYP
- Announcement of awards to be made very soon



USDA NIFA

NATIONAL INSTITUTE OF FOOD AND AGRICULTURE

Tactic for Delivering Impact

Technical Platform for Validation and Prebreeding

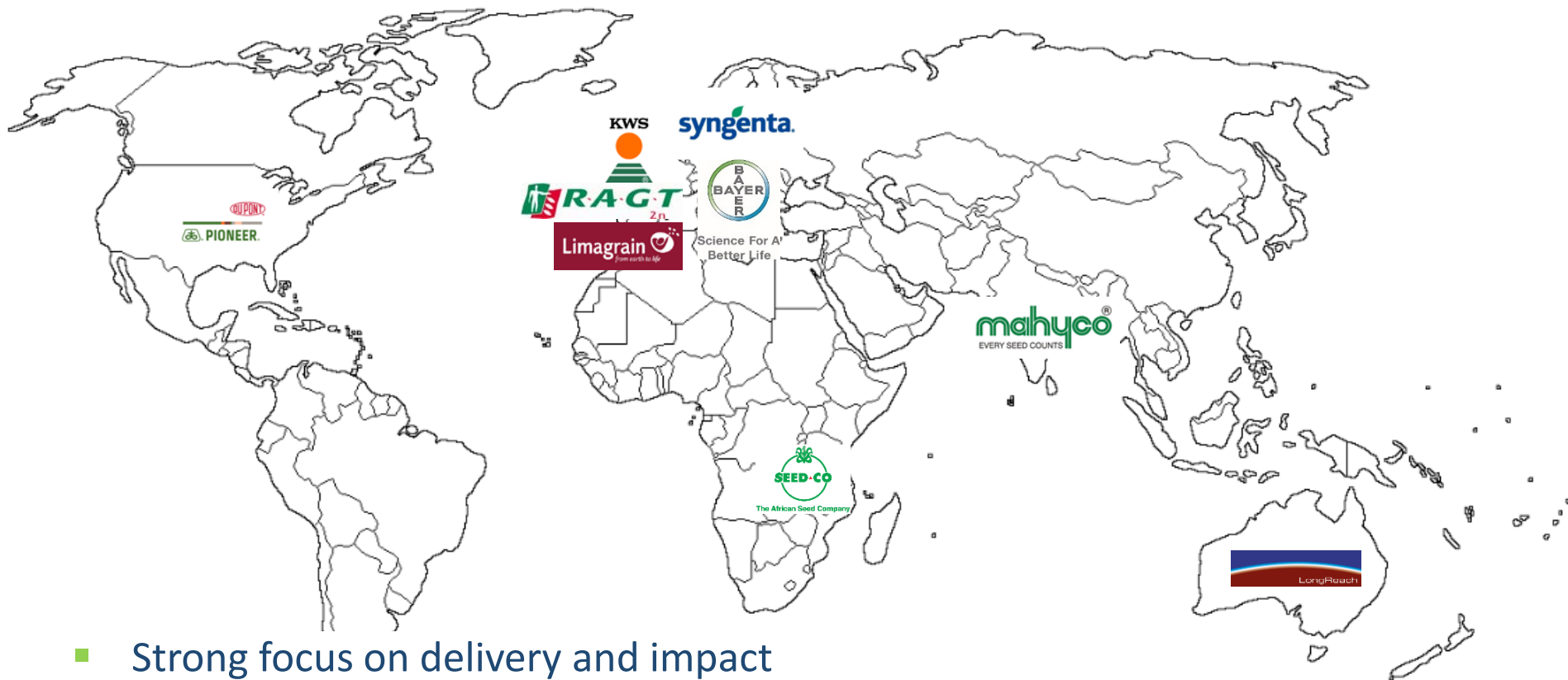
IWYP HUB at CIMMYT

- A unique feature that makes IWYP different to other initiatives
- Represents the major wheat production environments
- Bring all research discoveries into a single location for validation
- Integration of validated combinations of traits into elite backgrounds
- Leverages CIMMYT expertise in rapid release to worldwide breeding programs
 - International Wheat Information network (IWIN)
- Formally began operating autumn 2015
 - Existing traits and germplasm from Aligned Projects originating from former WYC and contributed by CIMMYT



Tactic for Delivering Impact

Public Private Partnerships

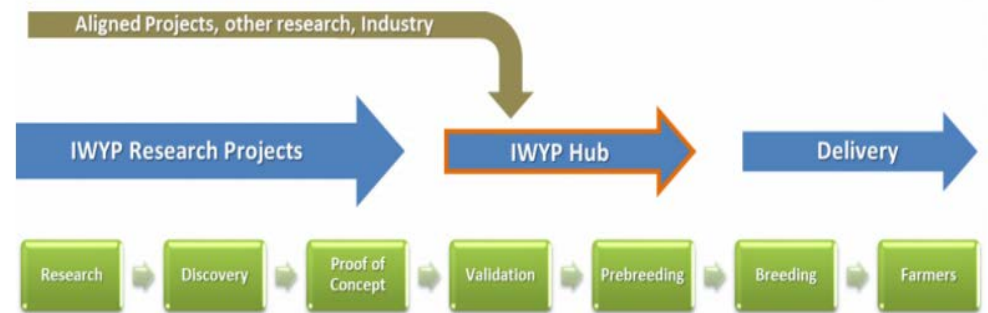


- Strong focus on delivery and impact
- Best practice in project and portfolio management
- Enable opportunities to share know-how and assets in order to develop a break-through in the grain yield

IWYP Science Program

Strategy for Success

- Coordinate the research projects
 - IWYP Research projects
 - IWYP Aligned Projects
 - Private Partners
 - IWYP Hub
 - CIMMYT
 - Other relevant research
- Integrate researchers and results
- Combine outputs to generate added value



Combining IWYP outputs

- IWYP Research will deliver over the next few years
 - Germplasm with traits – new ideotypes incorporating different physiological target traits
 - Not forgetting the base set of traits required for deployment (e.g. rust resistance)
 - Trait correlated markers
 - Tools / Software
 - Phenotyping protocols / methodologies



Colin Malcolm Donald
The breeding of Crop
Ideotypes, 1968

IWYP Scientific progress Year 1

Some examples

- Bespoke tool development for high throughput and accurate screening of photosynthetic capacity
- > 25 physiological traits screened in 1400 lines to support IWYP research projects (identify correlated markers and best lines)
- Detailed characterization of photosynthetic rate in hundreds of newly created germplasm lines
- Advanced outputs moved into CIMMYT germplasm for validation and stacking at the IWYP Hub
- Evaluating the effect in the field of non-native genes in wheat



Looking Forward

- Continue to coordinate and integrate research projects and discoveries (IWYP funded and IWYP Aligned)
- Integrate new funded projects into the IWYP Science Program
 - USDA NIFA-IWYP Research Projects
 - Possible 2nd IWYP Competitive Call later this year
- Increase our science team with more IWYP Aligned Projects
- Increase number of funding partners, more research
- Continue to build and capitalize on public-private partnerships
- 2nd IWYP Conference (Program Meeting) in March 2017

Thanks!

For more information

- IWYP brochure and Annual Report here today
- Website - <http://iwyp.org/>
- Twitter (<https://twitter.com/iwyp2015>)
- Facebook - <https://www.facebook.com/IWYPnews/>
- LinkedIn – International Wheat Yield Partnership

