

Research to Deliver Wheat for the Future

International Wheat Yield Partnership



Impact of Wheat on Food, Nutrition and Health



Wheat is essential to global food and nutritional security

Wheat is the most widely grown of any crop globally (230m + ha) and accounts for:

- Over 21% food calories
- ~ 20% daily protein





The Problem – Urgent Need to Increase Wheat Yields to Feed 9+ Billion People by 2050





Will require a 60+ % increase in wheat production to meet food demands by 2050





Before IWYP, there wasn't a mechanism internationally that enabled a system (for wheat or other crops) where the ouputs of collaborative research could be leveraged into new germplasm and products for global benefit

IWYP was conceived and operates as:

 An Associated Programme of the Wheat Initiative and the lead on delivering against Core Theme 1 of its Strategic Research Agenda

IWYP is a <u>partnership</u> between:

- Funding agencies in different countries
- Science teams in different countries
- Different research projects
- The public and private sectors

IWYP Research and Funding Partners (14)











Grains Research & Development Corporation





United States Department of Agriculture National Institute of Food and Agriculture



United States Department of Agriculture

Agricultural Research Service

syngenta foundation for sustainable agriculture







Department of Biotechnology Ministry of Science & Technology Government of India



Agriculture et Agroalimentaire Canada











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IWYP Founders Sought to:



- Do things differently
- Operate with own / separate governance
- Accept high risk / high reward science seek breakthroughs
- Take advantage of new technical opportunities
- Align and partner with other funded projects
- Focus on outputs that will have application to benefit farmers and consumers
- Take discoveries down the product development path (via links with CIMMYT and others) and deliver, exploit





To increase wheat yield potential by up to 50% by 2035 by:

- Deploying new model for funding, collaboration, coordination and development
- Linking with the private sector
- Capitalizing on state-of-the art technologies
- Making step-changes in genetic yield potential
- Focusing on delivery with a high degree of urgency
- Pursuing specific scientific targets, strategic sharing, building on and integrating the discoveries

IWYP Investments in Program Areas to Date



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International Wheat Yield Partnership

IWYP Science Program - Designed for Impact



Research to Deliver Wheat for the Future

Technology based



Trait and solution oriented







Product focused







IWYP Strategy



Enhance Photosynthesis to Drive Yield Increases



The IWYP Science Program

Our strategy to:

- Facilitate the sharing and integration of research, project outputs
- Time material inputs, manage capacities
- Realize synergies and generate added value
- Deliver traits and germplasm

IWYP is a Frontier Program for Making Breakthroughs in Wheat Yield Potential via:

- Discovery or creation of genetic variation in wheat that boosts the fixation of carbon into biomass for subsequent transfer to grains
- Maximizing grain yields from enhanced carbon capture and biomass through optimizing plant phenology
- Building elite lines for dispersal to other breeding programs
- Taking advantage of discoveries coming from other species
- Breakthrough enabling technologies to transform cereal breeding







Evaluation of Know Genes on Key Traits





Finding New Genes and Markers for Breeding





P-Values by Chromosome for HI



Finding Optimized Traits in Wheat Germplasm





Tools and Protocol Development













- IWYP Science Program is made up of 35 "hand-picked" overlapping and / or complementary research projects, conducted by top international scientists, working collaboratively to create pre-products:
 - 1st IWYP Call Projects (8)
 - NIFA-IWYP Call Projects (6+1 CAP)
 - IWYP Aligned Projects (9+5)
 - 2nd IWYP Call Projects (6)
 - AAFC Call 3 potential new projects

Number of Projects	35
Number of Countries	14
Number of Institutions	58

IWYP is a Long Term Continuous Program with Multiple Research Components



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	etc.
WYP Aligned Projects	3	3	2	1	etc.							
IWYP 1st Call		8										
NIFA - IWYP Call			6+1									
IWYP 2nd Call				6								
Aligned Calls					4 - 8							
IWYP 3rd Call						4 – 8?						
Etc.							etc.					
IWYP Hub(s)												

IWYP Scope Areas in Current Portfolio



Distribution of Major Research Areas in IWYP Portfolio (30 Projects)

Enhancing photosynthetic pathways Increasing carbon capture before flowering Increasing plant biomass Specific changes in plant architectures Increasing carbon flow into grains Optimizing harvest index Traits and markers for yield components Modifying phenology Enabling technology development Hybrid wheat development Root structure and growth Faster/alternative breeding methods Modelling to define optimal trait combinations



Current IWYP Global Research Network





IWYP HUB – Validation and Development





HUB Platform approach for Translation

- Brings all discoveries into a single central source to compare and combine to seek synergies and generate added value
- Trait validation
- Precision phenotyping
- Field evaluation
- Prebreeding
- Trials and distribution (via IWIN, directly)
- Enables IWYP to drive the discoveries/traits toward the market



IWYP Sorts, Assembles and Scales the Trait / Marker / Tool Outputs to Maximize Impacts



International Wheat Yield Partnership



Combining Optimized Traits by Design to Build Higher Yielding Wheats



Sink Traits



Source Traits

- **Phase I** Discovery Research Focused coordinated research in the best wheat laboratories and field plots of the world to develop breakthroughs for crop improvement
- **Phase II** Development of New Genetic Resources Collation of the results and their translation into prebreeding in commercially relevant environments in Mexico, USA and Europe
- **Phase III** Delivery of Higher Yielding Germplasm Deployment of improved pre-products to NARS organizations and public or private seed companies for them to select the most locally adapted high yielding line to breed with or submit directly for commercialization



Internation

The IWYP R&D Pipeline – Organization, Tracking, Decision Making and Delivery Scheme



IWYP STAGE GATE PROCESS







IWYP Development and Delivery Timeline





Outcomes and Impacts



- Improvements based on:
 - Environmentally sound principles
 - Lower inputs with higher yields
 - Less land requirements
 - More efficient designs
 - Mitigation of climate change impact on yields
- Designed to meet food and nutritional security needs of planet with more people and less land
- Seeks to make wheat farming more economically sound

Learn More About IWYP



Go to the IWYP website <u>www.iwyp.org</u>

- IWYP Strategic Plan 2017-2022 (Full and Summary versions) published on the IWYP website
- IWYP Annual Reports published on the IWYP website::
 - 2015/16
 2016/17
 2017/18



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Thank You

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