CGIAR Research Program on Wheat

Annual Report

for the CGIAR System

2016

RESEARCH PROGRAM ON Wheat

CGIAR

Acronyms and abbreviations

ACIAR	Australian Centre for International Agricultural Research
ANEP	Agriculture, Nutrition and Extension Project
BARI	Bangladesh Agriculture Research Institute
BGRI	Borlaug Global Rust Initiative
BISA	Borlaug Institute for South Asia
BMGF	Bill & Melinda Gates Foundation
BMZ	Federal Ministry for Economic Cooperation and Development, Germany
BTF	Borlaug Training Foundation
CA	Conservation agriculture
CCAFS	CGIAR research program on Climate Change, Agriculture and Food Security
CENEB	Norman E Borlaug Experimental Station
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CRP	CGIAR Research Program
CSISA	Cereal Systems Initiative for South Asia
DArTseq	Diversity Arrays Technology
DGGW	Delivering Genetic Gains in Wheat
DFID	Department for International Development, UK
EIAR	Ethiopian Institute of Agricultural Research
FACASI	Farm Mechanization and Conservation Agriculture for Sustainable Intensification project
FAO	Food and Agricultural Organization of the United Nations
FP	Flagship projects
GFSF	Global Futures and Strategic Foresight Project
ha	hectares
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDOs	Intermediate development outcomes
IFPRI	International Food Policy Research Institute
IMPACT	International Model for Policy Analysis of Agricultural Commodities and Trade
INAT	National Agronomy Institute of Tunisia
INIAF	Bolivia National Institute for Innovation in Agriculture and Forestry
ISPC	CGIAR Independent Science and Partnership Council
IWIN	International wheat improvement network
IWYP	International Wheat Yield Partnership
JIRCAS	Japan International Research Center for Agricultural Sciences
KALRO	Kenya Agricultural & Livestock Research Organization
KASIB	Kazakhstan-Siberian Network on Wheat Improvement
KSU	Kansas State University
MC	Management committee
MEL	Monitoring, Evaluation, and Learning
PEP	Partnership for Economic Policy
PIM	CGIAR Research Program on Policies, Institutes and Markets
R4D	Research for development
SAGA	Genetic Analysis Service for Agriculture
SAGARPA	Mexico's Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food
SARD-SC	Support to Agricultural Research for Development on Strategic Commodities of the African Development Bank
SeeD	Seeds of Discovery
USAID	U.S. Agency for International Development
USDA-ARS	United States Department of Agriculture - Agricultural Research Service
WIT	Jeanie Borlaug Laube Women in Triticum Early Career Award
WHEAT	CGIAR Research Program on Wheat
W-ISC	WHEAT-Independent Steering Committee
ZT	Zero tillage

Contents

Part I – Technical report

A. **Key messages** (underlined phrases provide hyperlinks)

A.1 Progress and challenges in 2016

WHEAT maintained its strong relationships with NARS public and private sector partners (see E), as evidenced in variety release and adoption (see C.2) and climate-smart sustainable intensification in the Ingo-Gangetic Plains and Mexico (see C.1 FP4). WHEAT provided a bilaterally-funded emergency response in Ethiopia and deployed CGIAR Fund W1&2 to leverage bilateral support to fight wheat blast (see C.1 FP3). Further progress, though slower than planned, was made on the discovery research front (see C.1 FP2&3). Gender research capacity has reached critical mass and delivered break-through findings.

Due to lower W1&2 funding than asked for in the Extension Period Proposal, there were no new WHEAT partner grants, no further expansion of precision phenotyping platforms, less ex ante and ex post impact assessment research and no improvement of web-based information products, such as the Wheat Atlas.

Phase II proposal development ended in November. In its final of three reviews, the ISPC rated WHEAT A- (e.g. midrange) and listed five issues for follow up in 2017. The ISPC and CGIAR Funder-led working group differed in their review of the WHEAT proposal, the latter judging it the top-ranked CRP.

A.2 Two most significant achievements: Long-term regional collaboration and gender research

Long-term regional research collaboration pays: Central Asian farmers adopt improved varieties

Food insecurity remains a challenge in Central and West Asia, despite major social and economic advances since 1992 (FAO, 2016). Wheat-based food is a major staple in those countries (Famine Early Warning Systems Network, 2016). In 1990 Turkey (TAGEM), CIMMYT and ICARDA established the International Winter Wheat Improvement Program (IWWIP), possibly the largest winter wheat program in the so-called South. This program develops facultative and winter wheats adapted to Central and West Asia, covering more than 20 million hectares, and distributes germplasm to more than 50 countries and 100 cooperators. IWWIP facilitates the exchange of elite wheat germplasm among winter wheat breeding programs worldwide and provides breeding programs in low- and lower-middle-income countries with access to elite materials from strong breeding programs in Europe and the USA. IWWIP has contributed to the development and release of 61 varieties (36 in Central and West Asia and North Africa; 25 in Turkey) sown on some 1.8 million hectares, as of 2016. Based on a 2014 survey, around 40% of all crosses made by programs in the target region have involved IWWIP parents. IWWIP also generates sources of improved traits for spring wheat breeding.

Country	Number of varieties	Area sown, 2016 (hectares)	First year released
Afghanistan	5	180,000	1995
Armenia	4	35,000	2006
Azerbaijan	2	60,000	2010
Georgia	6	30,000	2005
Iran	2	90,000	1996
Kazakhstan	2	4,000	2007
Kyrgyzstan	6	158,000	2004
Tajikistan	6	40,000	2005
Turkey	25	950,000	1996
Turkmenistan	1	80,000	2004
Uzbekistan	2	175,000	2002
Total	**61**	**1,802,000**	

Highest-rated agricultural innovation by women and men: Improved wheat varieties

As part of the GENNOVATE project, facilitators discussed new agricultural technologies with focus groups. Amid diverse innovations identified, improved wheat varieties emerged overwhelmingly as the most favored, followed by conservation agriculture-based improved practices. Across 43 wheat studies in Afghanistan, Bangladesh, Ethiopia, India, Morocco, Nepal, Pakistan, and Uzbekistan, 61% of men and 32% of women ranked improved wheat varieties among the top two, citing benefits such as increased yield, profitability, collaboration with external partners, and decreased work burden. (The difference in response percentages reflects rural men and women's highly gendered contexts and the way that agricultural R&D interventions are designed and delivered.)

Action research raises women's profile in wheat farming in Nigeria and Sudan

Agricultural feminization in Sub-Saharan Africa is growing, in particular in low-income countries for which data is available (IMF, 2016, World Bank, 2015). Action research to integrate women beneficiaries into the ICARDA-led SARD-SC project in Sudan and Nigeria has helped to identify actions and approaches for more widespread application in wheat production systems. With WHEAT support, the initiative employed context-specific interventions to grow wheat, demonstrate technologies, add value, and improve access to microcredit. Women's involvement (65% in Sudan and 12% in Nigeria) was facilitated by gaining the trust and approval of male kin and better institutional support. The incomes of women participating in value addition (1,143 in Sudan and 84 in Nigeria) have increased by up to 50%. Through adopting improved wheat varieties, 24 women in Sudan and 300 women in Nigeria increased their wheat yields by 62% and 28% respectively. Workloads and drudgery have diminished due to mechanization (thresher, harvester) and improved access to key inputs such as pesticides. Women's decision-making power increased through participation in training and field days. 2,500 women in Nigeria and 783 women in Sudan gained access to microcredit, providing them more sustained control over income-generating activities. To scale up, the project is linking with policy makers and gender-progressive institutions. Similar activities are under way in Ethiopia.

For examples of long-term bilateral national program/CGIAR collaboration, see sections C3 and E.

A.3 Financial summary, 2016 ($ millions).

	As per ExtPeriod PIA* (2014)	CGIAR-FP'16 budget (Dec 2015)	L-Series reported budget**	Actual spent**	Spent on gender	Spent on partners
W1&2	20.42	12.60	12.14	11.89		
W3	Part of bilateral		26.64	15.73		
Bilateral	30.9	52	21.75	17.36		
Total	51.3	64.6	60.53	44.98	6.22 (13.8%)	8.13 (18.4%)

* Refers to WHEAT Extension Period Proposal budget; Program Implementation Agreement (PIA) extension signed with CGIAR Consortium.

** Columns based on L-Series reports and incorporating ICARDA decentralization funding ($243,000).

Under subsequent CGIAR 2016 Financial Plans, all CRPs, including WHEAT, absorbed a 19% 'W1&2 combined' budget cut (16.6M to 13.5M). Finally, the WHEAT-POWB2016 assumed a W1&2 budget of $12.6M, based on the CB-approved Financial Plan 2016 (15/12/2015). WHEAT received a performance-based allocation, as one of two top-rated CRPs. In December of the reporting year, WHEAT and other CRPs suffered a W1&2 budget reduction of $2.3M, due to lower than predicted income from DFID, that was buffered by unspent and carry-over funds. Since 2014, WHEAT W2-only income has grown from 50% to 90% of W1&2 total. W1 income has dropped below $2M. Bilateral/W3 income is at 80% of total.

A.4 Gender

Understanding wheat-based livelihoods

The BMZ funded "Understanding gender in wheat-based livelihoods for enhanced WHEAT research for development (R4D) impact in Afghanistan, Pakistan and Ethiopia" project finalized case studies in all three countries in 2016 with help from the recruitment and onboarding of new project leader, Kristie Drucza. Currently researchers are developing a reverse-engineering methodology[1], drafting a policy analysis and preparing for a stakeholder analysis.

GENNOVATE researchers have completed data collection and summarized key findings (see D).

A.5 CRP governance and management

The WHEAT-Independent Steering Committee (ISC) is led by independent Chair Tony Fischer since December 2014, whilst Hans-Joachim Braun continues as CRP Director since January 2015. There have been no significant changes in the setup or operation of WHEAT governance and management. Three new ISC members were welcomed in 2016: Ximena López, as South American representative; Aly Abou Sabaa, the new Director General of ICARDA; and Ron DePauw from Canada. We thank departing members Nora Lapitan and Emilio Ruz for their service to WHEAT.

The ISPC conducted three reviews of all Phase II (2017-22) proposals: One at the pre-proposal phase and two reviews of the full proposal. WHEAT responded to all recommendations and the Full Proposal was approved by the System Management Board to go to the System Council in November 2016. The final ISPC review stated that "the proposal provides a clear, persuasive and evidence-based argument that the Wheat CRP will contribute significantly to delivery of CGIAR outcomes at the system level."

WHEAT communications. In addition to producing, sharing and promoting the well-received 2015 general interest annual report for WHEAT, the team edited and produced the study, Impacts of International Wheat Improvement Research: 1994-2014, as well as publicizing the significant results it presents. The communications team prepared 5-page brochures outlining important achievements due to funding of Canada and DFID, at the request of those donors. The CIMMYT50 celebration and conferences in September brought together more than 500 leading scientists, government officials, farmers and members of the international agriculture-for-development community, presenting an excellent opportunity to raise awareness of WHEAT achievements, partnerships, and challenges.

Routine 2016 communications products included the quarterly WheatWire Newsletter sent to 300 stakeholders, with an average 30% open and 13% click rate; a continuous revamp of the WHEAT website; and 22 stories published on http://wheat.org and other online channels. Initial efforts to better use social media are encouraging: The WHEAT Facebook page increased its follower base by 65%. Its main use is to share WHEAT and research partner stories. Communications worked in close collaboration with ICARDA, DGGW, CCAFS and other partners and donor agencies.

B. Impact pathway and intermediate development outcomes (IDOs)

Full Proposal development and inter-CRP collaboration on developing a System-wide MEL Framework provided the opportunity to further develop WHEAT impact pathways and theories of change. The ISPC recommended that WHEAT work on a more coherent concept of the wheat "agri-food system" and, related to this, detail its theory of change and impact pathway. At the same time, in its Synthesis Report

[1] A 'reverse-engineering' approach is applied to specific agricultural R&D interventions that have successfully integrated gender considerations in a context characterized by strict gender norms, to trace back through the critical path of the intervention in question and paying particular attention to how problems or points of contestation between different parties along the way were negotiated.

the IEA concluded that "the direct translation of ToC – a tool developed for development projects – to the CRPs needs much more thought."

C. Progress along the impact pathway

C.1 Progress towards outputs

For an overview of the strong and diverse science products underpinning WHEAT's research-for-development portfolio, click here to access a pdf listing 188 WHEAT-co-funded journal articles. Of those, CIMMYT global wheat program scientists (FP2&3) published 99 papers in refereed journals; 29 as senior author and 43 in journals with an impact factor greater than three.

FP1 -- Enhancing WHEAT R4D strategy for impact

Foresight research to strengthen WHEAT impacts. The foresight, ex-ante impact assessment and targeting team worked with diverse partners in 2016 to model and understand plausible and probable futures. In collaboration with IFPRI, IMPACT (the International Model for Policy Analysis of Agricultural Commodities and Trade) was used to assess opportunities and challenges for wheat under different scenarios. A collaboration with the Partnership for Economic Policy (PEP) is modeling the general equilibrium effects of wheat technologies in the Pakistan economy. Finally, a workshop on biotic stress and crop growth models, organized in Ethiopia by CIMMYT in June 2016 with support from MAIZE, WHEAT and PIM, found that "soft coupling" of crop models with models for biotic stresses, such as wheat blast disease, is a good short-to-intermediate term approach to predict disease outbreak impacts, including economic effects and farmers' responses, when coupled with bio-economic models.

With regard to **Wheat-for-Africa (W4A)**, the University of Pretoria's Bureau for Food and Agricultural Policy (BFAP) presented its study findings about 'Research and policy implications of increasing consumption and potential production in Sub-Saharan Africa' at the FARA Science Week. In three out of four scenarios to 2024, consumption and wheat imports will grow, pointing to the need for major wheat production and productivity growth. The BFAP/ReNaPRI model estimates that wheat prices in the five countries studied will remain stable. Wheat area will decline in South Africa and increase in Tanzania and Zambia and significant yield growth rates are achievable, which however require research-for-development and policy interventions.

Value chains and other factors constrain small-scale farm machinery adoption in Bangladesh. There is strong advocacy for scale-appropriate machinery to increase returns to the land and labor of smallholder farmers in South Asia, but the substantial investment required can preclude smallholder ownership. Analyzing recent Bangladesh census data from more than 800,000 farm households, the authors of this work identified variables associated with machinery adoption and confirmed that in addition to short-term efforts to promote the adoption of machinery, a sustained emphasis is needed by donors and policy makers to improve physical and civil infrastructure and services, as well as credit availability, and thereby create an enabling environment for investments in machinery. The research and its publication in *the Journal of Rural Studies* were supported by the Bill & Melinda Gates Foundation and USAID through CSISA.

FP2---Novel diversity and tools

An update of major challenges that WHEAT FP2 and FP3 face was published in Frontiers of Plant Science.

The CIMMYT-led Seeds of Discovery project is mobilizing useful genebank diversity for drought and heat tolerance through wheat pre-breeding work. As of 2016, more than 1,000 landraces and synthetic wheats had been crossed with elite wheat lines, improved by pre-breeding, and shared with wheat

researchers in Mexico, India, Pakistan, Iran, United Kingdom and Australia. Recognizing the value of the enhanced use of genetic resources, the government of Punjab state, India, is supporting this work at the Borlaug Institute for South Asia (BISA) at Ludhiana. In related work and as reported in a *Nature Scientific Reports* article, a research team from China, India, Mexico, Uruguay, and the USA genetically characterized a collection of 8,400, centuries-old Mexican wheat landraces adapted to varied and sometimes extreme conditions. The team used genotyping-by-sequencing technology to create unique sets of the collections that together capture nearly 90% of the rare alleles. Useful data and DNA markers are available as part of the "Seeds of Discovery" project section of the CIMMYT Research Dataverse.

Genomic selection for wheat quality traits. Genomic selection is being applied at CIMMYT to predict the processing and end-use quality traits regularly tested in the spring wheat breeding program, as reported in Applied & Translational Genomics and in work involving researchers from Syngenta and Kansas State University. Quality traits have variable levels of prediction accuracy, but the results show that the most expensive traits to measure — dough rheology and baking final product — can be predicted with a high degree of confidence. Research will now seek to combine phenotypic and genomic selection for the most efficient genetic improvement of quality traits in CIMMYT spring wheats.

FP3---Global partnerships to accelerate genetic gain in farmers' fields

Global precision phenotyping network. With national co-investment and as part of a global network, precision field-based wheat phenotyping platforms in Bolivia, Tunisia, and Uruguay are supporting faster and more effective breeding for yield and traits like disease resistance and heat tolerance, as well as offering excellent settings for capacity building and diverse national-international linkages.

- *Bolivia (wheat blast).* Crucial to efforts to combat this deadly and expanding disease, CIMMYT's longstanding partner Bolivia is endemic for blast and the country's researchers have great experience working on it. 1,849 wheat accessions were evaluated in Bolivia in 2016 under natural infections of *Magnaporthe oryzae*, the causal fungus, and the resistance of promising lines is being checked in the field in Bolivia and in greenhouse conditions in the USA (detailed report below).
- *Tunisia (Septoria tritici blotch in durum wheat).* The Platform became fully operational. More than 5,000 durum wheat accessions from Tunisia, CIMMYT, ICARDA, INRA-Algeria, INRA-France, University of Bologna-Italy, John Innes Center-UK, and USDA-US were screened and both highly-susceptible and highly-resistant lines identified. Laboratory activities included characterization of *S. tritici* populations, training for 15 research assistants, biotechnology, breeding, and pathology workshops and field visits with 150+ participants, and support for research by 4 Ph.D. students.
- *Uruguay (leaf rust, Fusarium head blight, and S. tritici blotch)*. Drawing on diverse materials from CIMMYT-Mexico, national programs (Argentina, Brazil, Chile, Paraguay and Uruguay), and seed companies, 1,844 accessions were evaluated under artificial inoculations; 9-25% of the lines were found to be highly-resistant to a single disease. From this group, 5% of the lines were resistant to two diseases and around 2% were resistant to all three diseases screened. This platform may well become a hub for evaluating regional nurseries and sharing knowledge and germplasm.

Disease discovery science: Spot blotch and wheat blast

Plant hormone signaling in wheat under spot blotch attack. The fungal disease spot blotch (*Cochliobolus sativus*) is a critical threat to wheat in warm and humid climates where temperatures remain above 15°C during the coolest month of the cropping season, as occurs with increasing frequency in many wheat areas of densely populated South Asia. In a study on spot blotch-wheat interactions reported in *the Plant Journal*, researchers identified 18 critical genes belonging to five defense-related signaling pathways, for possible use in resistance breeding programs. The work was

conducted by a team from two leading Indian research institutes and CIMMYT and combined comparative genomics, bioinformatics, molecular biology, analytical chemistry, plant pathology and field experimentation.

Wheat blast disease: Racing to respond to the threat and its spread. After its sudden emergence in Bangladesh in 2016, where it caused average 25-30% losses on 15,000 hectares of wheat, this little-understood South American wheat disease is poised to spread quickly through the warmer and humid wheat regions of South Asia. No varieties sown in the region are resistant. WHEAT partners are at the center of an urgent global response to monitor, characterize and control blast and, especially, to develop and deploy wheat varieties that possess durable resistance. Cultivars derived from the CIMMYT line Milan appear to have field resistance to blast and reports point to the 2NS translocation (present in Milan) as playing a role. CIMMYT is seeking funding to scale up the search for additional resistance sources and to screen for resistance. A two-week workshop planned for Bangladesh in early 2017 will bring some 40 wheat pathologists, breeders and agronomists from Bangladesh, India and Nepal for field surveillance exercises and molecular analyses of the fungus. CIMMYT and other partners have stepped up information and communication activities. Partners in blast research include the Australian Center for International Agriculture Research (ACIAR), the US Agency for International Development (USAID), the Bangladesh Agriculture Research Institute (BARI), WHEAT, the Delivering Genetic Gain in Wheat (DGGW) project led by Cornell University, Kansas State University (KSU), the University of Kentucky, the U.S. Department of Agriculture (USDA), and Instituto Nacional de Innovación Agropecuaria y Forestal (INIAF), Bolivia.

FP4 -- Sustainable intensification of wheat-based cropping systems

Research-for-development on sustainable intensification in the Indo-Gangetic Plains, the breadbasket of four countries, has focused on sustainably improving yields in cotton-wheat cropping systems, occupying 4.5 million hectares, through scalable technology packages, including an innovative planter, with the potential to increase wheat yields by 0.5 tons per hectare and with economic returns on the order of $250-350 per hectare. Other applied research addressed water and energy efficiency in rice-wheat systems, showing that conservation agriculture practices linked with micro-irrigation (permanent sub-surface drip powered with solar energy), produce the same yields with yearly water savings of 850 millimeter -per-hectare, half the energy use and $185 more income per hectare. Similar results were documented for maize-wheat systems.

In Pakistan, using the “urea calculator” cell phone application developed by CIMMYT and the Borlaug Institute for South Asia (BISA) and the Green Seeker handheld crop sensor, farmers can quickly assess crop vigor and arrive at an optimal recommendation on the amount of nitrogen fertilizer the wheat crop needs. Tests with the crop sensor/calculator combination on more than 35 farmer fields during 2016 in Pakistan, a country whose farmers grow 9 million hectares of wheat, showed savings of 35 kilograms of nitrogen per hectare with no yield penalty. Similar applications have been scaled out in Mexico and India.

FP.5. Human and institutional capacities for seed systems and scaling-out

Tunisia wheat scientists access new learning. Organized in a collaboration among CIMMYT, the National Agronomy Institute of Tunisia (INAT), and the Borlaug Training Foundation, a training course on biotechnology in Tunisia in April drew 53 participants, with over half (38) being female. The course was followed by training on breeding and screening for resistance to Septoria tritici blotch through the phenotyping platform in Tunisia.

The CIMMYT Academy. In 2016 CIMMYT began laying the groundwork for the CIMMYT Academy, an institutional hub intended to improve the coordination, implementation and effectiveness of maize and

wheat capacity development and training activities, thereby involving a larger and higher quality pool of graduate student researchers in research activities, strengthening the global network of partners, and creating an advanced digital platform for diverse forms of learning. The Academy continues the long tradition of field-based training for wheat scientists from national agricultural research systems worldwide, begun by Norman Borlaug to expand the knowledge and use of semi-dwarf wheats and more productive cropping systems. WHEAT is helping to fund Academy development and will benefit in various ways, not the least being improved alignment of its capacity development strategy with its theory of change and impact pathways.

During 2016, MAIZE and WHEAT engaged a Lead for a "capacity development strategy and innovation". This BMZ-CIM-co-funded expert is helping to coordinate development of the CIMMYT Academy. Also, in preparation for Phase II, WHEAT turned capacity development into an independent Cluster of Activities, rather than having a separate Flagship Project (FP5). Starting 2017, the CapDev-CoA will collaborate in particular with FPs 3.8 (seed systems innovation) and 4.4 (Networking for scaling-out).

Building capacity and addressing climate change in South Asia. Carrying on a seven-year tradition of bringing prominent researchers together with next-generation specialists in climate-smart agriculture for South Asia, in November 2016 the CIMMYT-led Borlaug Institute for South Asia (BISA), under the aegis of WHEAT and CCAFS and in collaboration with the India Council of Agricultural Research (ICAR) and Punjab Agricultural University, held the 7th Advanced Course on Conservation Agriculture for Asia. The two-week event attracted 25 participants from Afghanistan, Bangladesh, Nepal, India and Iran. Participants practice the use of field machinery, learn about sustainable tools and methods such as precision land levelling and soil nutrient management, study farming system typology, business models, and crop modelling, and visit farmer cooperatives and climate-smart villages. Institutional support this year came from the International Plant Nutrition Institute and the Fertiliser Association of India. Over its history, the course has benefited 135 participants from nine countries.

C.2 Progress towards the achievement of outcomes

Varieties and lines released by WHEAT partners. A total of 48 bread wheat, 10 durum wheat and 1 winter wheat varieties released by partners in 18 developing countries in 2016 were either CIMMYT or ICARDA breeding lines or direct crosses with such lines. View 2016 variety releases in the Wheat Atlas (choose "2016" in the search field for a complete listing for that year). In 2016, CIMMYT alone distributed 14.5 tons of seed of experimental wheat lines in 306 shipments to 284 partners in 83 countries.

Zinc-enhanced wheat varieties for healthier diets in South Asia. Years of biofortification research and breeding are bearing fruit in the form of three new varieties released to farmers in South Asia. In Pakistan, the new wheat variety Zincol 2016 was developed using the genetic background of NARC 2011, a popular, high-yielding, rust resistant variety. Some 2,000 tons of seed will be made available to farmers over the 2016-17 cropping season and outreach is being conducted in partnership with HarvestPlus. In India, one new high-yielding, biofortified wheat variety was developed using synthetic parents crossed onto WH1105, a CIMMYT-derived high-yielding variety grown in India's Northwestern Plain Zone. The new variety out-yields other popular varieties by as much as 8% and has 20% higher zinc content, as well as good resistance to yellow rust. The other new Indian variety, Zinc Shakti, has 40% greater grain zinc content and is being marketed by the private sector.

Fast-track varietal release policies in Ethiopia, Kenya and Nepal. Following longstanding recommendations from WHEAT scientists and a national action plan to eradicate hunger by 2025, in 2016 Nepal authorities implemented new policies to speed farmers' access to promising new wheat varieties. In one case, a variety already certified in another country can now be registered for marketing,

after only two years of successful multi-location testing. This saves 3-4 years of additional testing. Another new policy allows the pre-release multiplication and marketing of seed of a variety that has been identified for release by relevant authorities. Previously, seed multiplication began only upon official release of the variety, normally 2 years after identification. The new policy means that sufficient volumes of seed are available immediately upon official release of a new variety and follows a successful practice piloted as part of the CIMMYT-led USAID Famine Seed Project (2009-12). WHEAT partners are working with authorities in Ethiopia and Kenya to foster similar policy changes.

FP3 Strong partnerships and a quick response to drought-caused seed shortage. CIMMYT and ICARDA helped EIAR to provide seed of improved varieties to 30,000 Ethiopian farmers. As part of an emergency response funded by USAID and its Office of U.S. Foreign Disaster Assistance, CIMMYT rapidly procured emergency supplies of maize and wheat seed for free distribution to more than 226,000 households in 67 drought-affected counties of Ethiopia, benefitting more than 1.35 million people who had lost their seed from the lack of rains. Needy farmers have received enough seed to sow from ¼ to ½ hectares of land — a quarter or more of the typical farmer's landholding— along with instructional materials about the varieties and best farming practices. The work built on previous efforts to strengthen Ethiopia's maize and wheat seed production / distribution systems.

C.3 Progress towards impact

FP1 Learning from ex post impact assessment in Morocco, ICARDA. The results of an important study completed in Morocco on the adoption of improved wheat varieties and an analysis of its seed system were recently presented at a national workshop in Rabat. A key finding was that wheat research can achieve large-scale impacts on food security and poverty reduction, but only if adoption of improved varieties and associated technologies and innovations is achieved at scale. This presupposes a robust national seed system, which provides timely availability of sufficient high-quality seed at affordable prices. The study was part of a research series undertaken funded by WHEAT and the Wheat-Legume Cropping Systems project in West Asia and North Africa, funded by the EU and IFAD. Other partners included INRA, ONSSA, SONACOS, and MAPM.

FP1&FP4: Advice for India's rice-wheat farmers: Put aside the plow, save straw to fight pollution. Researchers and policymakers (CIMMYT-CSISA, the Borlaug Institute for South Asia, CCAFS, Punjab Agricultural University, ACIAR, state agencies in Haryana and Punjab) are actively promoting the expanded use of zero tillage and direct seeding implements (Turbo Happy Seeder) to sow wheat directly into unplowed soils and unburnt rice residues, helping to combat pollution in New Delhi. Burning rice residues depletes soil nutrients—with estimated yearly losses in Punjab alone of 3.9 million tons of organic carbon, 59,000 tons of nitrogen, 20,000 tons of phosphorus and 34,000 tons of potassium—and adds to Delhi's noxious seasonal pollution. Zero tillage to sow wheat after rice harvest is already used on 1.8 million hectares in India, with multiple economic and environmental benefits. [2]Recent meetings organized by the Haryana state government to scale up this technology drew some 3,000 farmers, industry representatives, service providers, scientists and extension agents, as well as ministers and policy planners.

Impacts of a centralized WHEAT breeding program with long-term NARS partnerships. In research funded since 2012 by the World Bank and the Danish and Swiss Cooperation Agencies, collaboration between Bolivia's National Institute for Innovation in Agriculture and Forestry (INIAF) and CIMMYT is delivering improved wheat varieties and bigger harvests to farms across the country. A World Bank blog mentions 4 new varieties adapted to Bolivian wheat ecologies and yielding 75% more than traditional varieties. The article stated that by 2020 the new varieties would cover 10% of Bolivia's wheat area and

[2] Approximate total wheat area in the Indo-Gangetic Plains is some 12 million hectares.

generate more than $7 million of incremental value—more than 3 times the cost of the program. The blog opens with the advice of a visiting Bhutanese breeder to his Bolivian peer: "Don't waste your time in local breeding programs if someone else can improve the seed for you." The Bolivia-CIMMYT partnership dates back to the early 1979.

On a global scale, wheat cultivars derived from lines developed by CIMMYT and ICARDA are grown on more than 70% of the area in South Asia, Sub-Saharan Africa, West Asia and North Africa. 50% of all released wheat varieties are direct CGIAR selections or have a CGIAR immediate parent. In addition to representing a gain in efficiency, as described by the Bhutanese researcher, the scale and cost advantages of a strong, centralized breeding program make possible the widespread and rapid dissemination of globally beneficial traits, such as enhanced levels of micronutrients, through its long-term NARS partnerships.

FP4 Sustainable intensification practices transform Kazahkstan wheat production. Work on adoption of conservation agriculture technologies in Kazakhstan (zero/minimum soil tillage, leaving crop residues in the fields, direct seeding with narrow chisel and disk openers) was initiated by CIMMYT in 2000. Thanks to the joint efforts of national scientists and farmers, government, cooperation with FAO, World Bank and other international organizations, the area under zero tillage increased from virtually none in 2000 to 2.3 million hectares in 2016 and expansion continues. Use of CA-based technologies has become an official state policy in Kazakhstan agriculture. Since 2008, the government has subsidized farmers who adopt conservation agriculture, and Kazakhstan is among the world's top-10 countries for area under zero tillage. CIMMYT, FAO and the World Bank experts analyzed the state of CA adoption and wheat production and found that spring wheat yields are as much as 58% higher under zero tillage than with conventional technologies. The advantages are particularly evident in drought years and, under drought, provided an incremental wheat production of some 0.72 million tons, equivalent to $200 million dollars per annum, with an estimated $580 million incremental income and meeting the yearly cereal requirements of about 5 million people. Last, but not least, through this practice Kazakhstan wheat production contributes to annual sequestration of about 1.3 million tons of carbon dioxide.

D. Gender research achievements

The gender performance self-assessment (Annex 1) advanced to "Meets requirements."

D.1 Selected gender research achievements

GENNOVATE datasets complete and ready for further analysis. The GENNOVATE study completed its data collection in 2016 and coded data for 137 case studies on 7,000 rural men and women in 26 countries. Involving 11 CGIAR Research Programs, GENNOVATE explored how gender norms affected agricultural innovation and technology uptake. WHEAT-supported research focused on 43 villages in Afghanistan (4), Bangladesh (6), Ethiopia (4), India (12), Morocco (3), Nepal (3), Pakistan (12), and Uzbekistan (4). With support from the Bill & Melinda Gates Foundation, GENNOVATE continues to foster capacity building and knowledge sharing across an institutionally-diverse community of gender researchers of different disciplinary backgrounds and experience.

Men's temporary migration can open space for women's development. GENNOVATE found that men's increasing out-migration from rural areas to find work opens rural women's access to training and education opportunities, as well as encouraging them to adopt more assertive household and community roles. The report gives the example of Pekadi, a community in southern Nepal, with a high male out-migration and where more than half the women own land and lead their households, while over 80 percent do most of the farm work.

A separate 2016 ICARDA study on rural-rural migration to the intensified agricultural sector of Saiss, Morocco, found that men should be sensitized on gender equality and the importance of women's participation in decision-making, particularly with regard to assets, and that a sustained focus on women's ownership and control over assets such as housing is needed. The study, which involved 179 female and 221 male migrant workers, applied gender analysis and a logistic regression model framework and political ecology approach. It will be published in *the Economic Research Forum*.

More empowerment for both genders is beneficial. A GENNOVATE case study in Gabado, Ethiopia, found that training and other interventions of the external entity, "Community Conversations," led husbands to discuss important business more with their wives, driven by a perception that, as a result, the overall quality of life and food security in their homes had improved. According to the study, although many men in various countries are now seeing the advantages of involving women in farm decisions, women of all ages still lack equal access to education or training.

E. Partnership building achievements

The WHEAT-MC manages a dedicated partner budget to fund commissioned and competitive grants to non-CGIAR partners. It is a critical resource for innovation in partnerships, filling research gaps and inter-CRP initiatives, which involve non-CGIAR partners, such as the BNI Consortium.

E.1. Selected partnership-building achievements

Biological nitrification inhibition (BNI): Consortium advances. Convened by The Japan International Research Center for Agricultural Sciences (JIRCAS) in 2015, the Consortium on Biological Nitrification Inhibition (BNI) Research for Sustainable Development met in September 2016, with 40 participants discussing the potential of BNI-enabled food crops and *Brachiaria* spp. to reduce N_2O emissions and foster more efficient nitrogen cycling and use in cropping and livestock systems. Participants included scientists from three CGIAR Centers and five CGIAR Research Programs - CCAFS, Dryland Cereals, Livestock and Fish, Maize, and Wheat, and several Japanese organizations. This year, the Consortium welcomed new non-CGIAR members: the Institute of Ecology and Environmental Sciences, University of Paris; , Diderot, France; the Center for Ecology, Evolution and Environmental Changes, University of Portugal; Nanjing Agricultural University, China; the Indian Institute of Millet Research (IIMR), Hyderabad; the Department of Crop Production and Ecology, SLU, Uppasala, Sweden; the Advanced Analysis Center and the Hokkaido Wheat Research Station, both of NARO, Japan; and the National Institute for Agro-Environmental Sciences (NIAES), Japan. In wheat, synthetic derivatives developed via crosses of a model wheat line with the wild grass *Leymus racemosus,* which carries BNI genes, are being tested for yield and BNI expression in soils of varying nitrogen fertility levels. Work is also underway to transfer the BNI trait to elite wheat lines via crosses with synthetics and to begin genetic dissection of the BNI trait.

Kazakhstan-Siberian Network on Wheat Improvement. Established by CIMMYT in 2000, the Kazakhstan-Siberian Network on Wheat Improvement (KASIB) unites 21 breeding programs of Kazakhstan, Western Siberia, Ural, Altai, and Volga, covering more than 20 million hectares of spring bread wheat. With its "shuttle breeding" programs, KASIB is one of the best examples of effective regional and international cooperation to accelerate breeding. Activities included the sharing and testing of more than 25,000 lines of wheat from Kazakhstan and Russia, significantly enriching the genetic resources of participating countries. More than 70 varieties emerged from KASIB-facilitated shuttle breeding. During 2000-2016, the quality and level of the research has considerably improved, with scores of national specialists being trained at world-class research organizations. Concrete results included the increasing number of varieties submitted to national testing committees and, ultimately, released for farmers' use. Increasing wheat production is critical to ensure participants' food security

and export potential. To meet emerging challenges, KASIB is focusing on drought tolerance, disease resistance and grain quality, addition to yield potential.

E.2 Strategic partnerships

Building one global CGIAR wheat program. The CIMMYT and ICARDA Boards reviewed progress along the 5-year milestone plan and flagged some delays, notably regarding global breeding research coordination and bringing together national representative staff and offices. Both Centers' Program Directors took programmatic and organizational decisions in their August 2016 meeting, such as to distribute joint CIMMYT/ICARDA nurseries by 2019/20, build the Precision Phenotyping Platforms network, and to jointly approach specific bilateral donors.

International Wheat Yield Partnership establishes a research hub at CENEB (Noman E. Borlaug Experimental Station in cd. Obregon).. In 2016, the International Wheat Yield Partnership (IWYP) devised and implemented a science strategy to achieve its core aim of increasing the genetic yield potential of wheat by 50% in 20 years. Through a competitive call for research papers, IWYP awarded the first 8 grants to researchers from 24 institutions in 7 countries and associated with 5 projects aligned with IWYP goals, bringing in new public and private sector partners. A new call for research grants was issued in late 2016 in coordination with USDA's National Institute of Food and Agriculture (NIFA), supporting 7 new projects. The first annual IWYP Project Conference was held in conjunction with CIMMYT Wheat Visitors' Week in Ciudad Obregón, Mexico. An IWYP hub was established at the Norman E. Borlaug Experimental Station (CENEB) near Ciudad Obregón, to evaluate novel germplasm in field trials, including assessing photosynthesis and respiration, stacked yield genes, and newly-identified genes that regulate seed development.

CIMMYT's Wheat Germplasm Bank: A dynamic wheat collection. The Mexico-funded project Seeds of Discovery has genotyped approximately 90,000 CIMMYT and ICARDA wheat germplasm bank accessions—approximately 40% of CIMMYT's collection of 150,000 accessions from more than 100 countries. Data are freely available from CIMMYT databases including GRIN Global (passport), Germinate (molecular), DataVerse (phenotypic evaluation) and at www.wheatpedigree.net. Partners include the Wheat CRP-supported DArT-seq analyses of CIMMYT of maize and wheat germplasm, ICARDA, and SAGARPA, Mexico's agricultural ministry. The Seeds of Discovery initiative and partnerships constitute a parallel and complementary effort to the International Wheat Improvement Network and, in addition to genotypic and phenotypic data, will provide pre-breeding lines containing useful new diversity for traits of interest, such as disease resistance and heat tolerance, and generally broadening the genetic base of improved varieties available to farmers.

E.3 Interactions with other CRPs

Phase III of the Cereal Systems Initiative for South Asia (CSISA) relies on inter-CRP collaboration (see above), as does GENNOVATE (see sections A.4, D.1). Partnerships on crop modelling (FP1) are key to the Global Futures & Strategic Foresight (GFSF) project and the "Flagship 1" component of the CGIAR Research Program on Policies, Institutions, and Markets (PIM).

Measuring and mitigating farming's climate footprint. With CCAFS and partly through CSISA, WHEAT pursues research in South Asia to improve estimates of greenhouse gas emissions and sequestration in smallholder systems, as well as identifying priorities and options for low emissions development and supporting the widespread implementation of low emissions agricultural practices and policies (see section C.1, under FP4, and the report on BNI under E.1 above).

F. Capacity building

MSc and PhD students supervised																		
YEAR	2014		2015			2016			2017			2018			2019			Grand total
GENDER	Male	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	
ALGERIA						1		1	1		1							2
BANGLADESH							2	2										2
CHINA			1	4	5				1		1		1	1	1		1	8
COLOMBIA				1	1													1
ETHIOPIA				2	2				3		3	1		1				6
INDIA			3	2	5	3		3										9
IRAN			6		6	2		2	4		4		1	1				13
KAZAKHSTAN									3	2	5					1	1	6
KENYA						1	1	2								1	1	3
MEXICO	1	1	4	2	6	1	1	2	1		1		1	1				11
NEPAL						1		1										1
PAKISTAN									2		2	1		1		1	1	4
TUNISIA							1	1										1
TURKEY				1	1				2	1	3		1	1		1	1	6
Grand total	**1**	**1**	**14**	**12**	**26**	**9**	**5**	**14**	**17**	**3**	**20**	**3**	**4**	**7**	**1**	**4**	**5**	**73**

More than 18,425 farmers took part in 335 training events in 2016, an 8.4% increase over 2015. These events were organized by projects within the WHEAT portfolio and included field days, workshops and intensive training courses in the areas of sustainable intensification, breeding/seed systems and socioeconomics research. The training events took place in Afghanistan, Bangladesh, Ethiopia, India, Kenya, Mexico, Nepal, Pakistan and Turkey. A clear increase in WHEAT degree students and support for advanced degrees is evident (see table), a trend partly attributable to WHEAT investments in learning and capacity development in developing countries and expected to continue in Phase II.

ICARDA hosted 245 trainees in 2016 who attended regional training courses, 45 (18%) of whom were women. Regional courses involved 33 nationalities and covered scientific management of field experiments, molecular breeding, crop improvement, rust resistant wheat varieties and seed technology, among others topics. In addition to group courses, ICARDA hosted 8 non-degree trainees of whom 2 were women. A total of 13 students were enrolled in 2016 under ICARDA co-supervision: 7 (including 3 women) are Ph.D. students and 6 (including 3 women) are M.Sc. students.

The **Basic Wheat Improvement Course**, a three-month intensive course conducted at CIMMYT's main experiment station near Ciudad Obregón, Mexico, drew 13 participants from Afghanistan, Argentina, Chile, China, Egypt, Mexico, Pakistan, Tunisia and Turkey as well as 8 winners of the Jeannie Borlaug Laube "Women in Triticum (WIT) Early Career Award" from Ethiopia, India, Iran, New Zealand, Pakistan and the USA. CIMMYT's **Advanced Wheat Improvement Course** offered specific sessions on pathology, breeding and biotechnology and in 2016 was attended by 10 participants from 7 countries.

G. Risk management

The WHEAT risk matrix identifies 10 CRP-specific risks under Compliance (obligations to Consortium; partners do not deliver what they agreed to deliver), General Management (reputational), Change Management (high transaction costs intra-CGIAR), Financial (late payout of W1&2, need to pre-finance), and Technology (loss of CRP-specific data). The WHEAT-MC tracks 3 major risks:

- Address delayed transfer of W1&2 funds, which directly affects CRP research and development operations: WHEAT struggled with later-than-usual fund transfers and an ex-post budget cut in December (!);
- In response to non-fulfilled obligations by the partners for commissioned and competitive grants, WHEAT granted several no-cost extensions to ongoing grantees and the WHEAT-MC did not approve new grantees; and
- Owing to the lack of a System-wide Monitoring, Evaluation and Learning (MEL) Framework that can realistically be operationalized, WHEAT and MAIZE continued to support the MEL Community of Practice, the System-level Indicators Taskforce and the System Management Office.

H. Lessons learned (including monitoring CRP progress)

Phase II proposal development came to a close in November. The back and forth on requirements and the online submission tool proved to be costly and demotivating. In the future, the CGIAR System should opt for a tried and tested program development process, such as the one used by BBSRSC.

2016 was a challenging year not only due to the focus on Phase II proposal development but also to CRP restructuring to cope with budget reductions. On the "up" side, this presented an opportunity for gender researchers to contribute shaping Phase II of their CRPs.

H.1 Level of confidence of the response to the key performance indicators

The information reported in Annex 1 is obtained from detailed data found in a variety of sources, including project technical reports and institutional databases. WHEAT is confident about the quality of the indicator information, but will continue to make the collection of quantitative evidence and other types of performance or progress data more systematic across the WHEAT project portfolio, particularly to improve the process and reduce the time required to collect and analyze the information.

WHEAT has contributed to and actively supports inter-CRP efforts to develop a harmonized approach for monitoring development outcomes (IDOs, sub-IDOs). Progress has been slow because of a lack of dedicated resources, the voluntary nature of the activity, the complexity of the task, and competing CRP priorities.

H.2 Unintended results and innovative initiatives

There were no unintended results.

Part II: Financial report

Cumulative financial summary.

Summary Report - by CG Partners	(a) Total POWB budget since inception					(b) Actual cumulative Expenses					(c) Variance / Balance				
	Windows 1 & 2	Window 3	Bilateral Funding	Center funds	Total Funding	Windows 1 & 2	Window 3	Bilateral Funding	Center funds	Total Funding	Windows 1 & 2	Window 3	Bilateral Funding	Center funds	Total Funding
1. AFRICA RICE					-					-	-	-	-	-	-
2. BIOVERSITY					-					-	-	-	-	-	-
3. CIAT					-					-	-	-	-	-	-
4. CIFOR					-					-	-	-	-	-	-
5. CIMMYT	53,312	47,017	76,690		177,018	53,526	33,908	67,140		154,574	(215)	13,109	9,550	-	22,444
6. CIP					-					-	-	-	-	-	-
7. ICARDA	12,820	7,768	22,315		42,903	12,820	7,215	21,699		41,734	-	553	616	-	1,169
8. ICRAF					-					-	-	-	-	-	-
9. ICRISAT					-					-	-	-	-	-	-
10. IFPRI					-					-	-	-	-	-	-
11. IITA					-					-	-	-	-	-	-
12. ILRI					-					-	-	-	-	-	-
13. IRRI					-					-	-	-	-	-	-
14. IWMI					-					-	-	-	-	-	-
15. WORLDFISH					-					-	-	-	-	-	-
Total for CRP	**66,132**	**54,785**	**99,005**	**-**	**219,921**	**66,346**	**41,123**	**88,839**	**-**	**196,308**	**(215)**	**13,662**	**10,166**	**-**	**23,613**
	30%	**25%**	**45%**	**0%**	**100%**	**34%**	**21%**	**45%**	**0%**	**100%**	**-1%**	**58%**	**43%**	**0%**	**100%**

WHEAT funding, 2016.*

	2016 Actual Funding			
	Windows 1&2	Window 3	Bilateral Funding	Total Funding
CIMMYT:				
ACIAR		29	55	84
Arcadia			142	142
Barcel			88	88
BBSRC			592	592
BMGF		1,651	342	1,994
CAAS China		111		111
CGIAR FUND	9,344			9,344
Cornell			3,475	3,475
CSIRO			90	90
FAO			208	208
GI			475	475
GRDC			269	269
ICAR		538		538
IFAD		105		105
INIA		(210)		(210)
KSU			409	409
MAFF			202	202
MOFA		61		61
NRC			79	79
SAGARPA			6,206	6,206
SFSA			595	595
Turkey		148		148
UOT			349	349
USAID		12,353		12,353
USDA			308	308
Others > 50K			263	263

*** W1 donors:** Australia, Bill and Melinda Gates Foundation, Canada, France, India, Japan, Korea, New Zealand, Norway, Sweden, Switzerland, United Kingdom, and World Bank.
The following contribute vital W2 funding: Australia, DFID-UK, USAID, China.

WHEAT funding, 2016 (cont'd).

	2016 Actual Funding			
	Windows 1&2	Window 3	Bilateral Funding	Total Funding
ICARDA				
Bill & Melinda Gates Foundation		214		214
CIMMYT	2,546			2,546
Government of Morocco		22		22
Government of Sudan		538		538
Government of Turkey		166		166
Agricultural Research Center - Egypt			46	46
Arab Fund for Economic and Social Development			363	363
Commonwealth Scientific and Industrial Research Organization			70	70
Cornell University			162	162
Food and Agriculture Organization of the United Nations			86	86
Global Crop Diversity Trust			4	4
Grain Research and Development Corporation			198	198
International Institute of Tropical Agriculture			1,718	1,718
International Maize and Wheat Improvement Center			2	2
Kuwait Fund for Arab Economic Development			327	327
NSW Department of Primary Industries			104	104
OPEC Fund for International Development			3	3
Swedish University of Agricultural Science			26	26
United States Department of Agriculture			101	101
Totals for WHEAT	**11,890**	**15,725**	**17,357**	**44,972**

Financial summary by centers, WHEAT, 2016.

Summary Report - by CG Partners	(a) CRP 2013 POWB approved budget					(b) CRP 2013 Expenditure					(c) Variance this Year				
	Windows 1 & 2	Window 3	Bilateral Funding	Center funds	Total Funding	Windows 1 & 2	Window 3	Bilateral Funding	Center funds	Total Funding	Windows 1 & 2	Window 3	Bilateral Funding	Center funds	Total Funding
1. AFRICA RICE					-					-	-	-	-	-	-
2. BIOVERSITY					-					-	-	-	-	-	-
3. CIAT					-					-	-	-	-	-	-
4. CIFOR					-					-	-	-	-	-	-
5. CIMMYT	9,594	25,143	17,920		52,657	9,344	14,785	14,147		38,276	249	10,358	3,773	-	14,381
6. CIP					-					-	-	-	-	-	-
7. ICARDA	2,546	1,493	3,826		7,865	2,546	940	3,210		6,696	-	553	616	-	1,169
8. ICRAF					-					-	-	-	-	-	-
9. ICRISAT					-					-	-	-	-	-	-
10. IFPRI					-					-	-	-	-	-	-
11. IITA					-					-	-	-	-	-	-
12. ILRI					-					-	-	-	-	-	-
13. IRRI					-					-	-	-	-	-	-
14. IWMI					-					-	-	-	-	-	-
15. WORLDFISH					-					-	-	-	-	-	-
Total for CRP	**12,140**	**26,636**	**21,746**	**-**	**60,522**	**11,890**	**15,725**	**17,357**	**-**	**44,972**	**249**	**10,911**	**4,389**	**-**	**15,550**
	20%	**44%**	**36%**	**0%**	**100%**	**26%**	**35%**	**39%**	**0%**	**100%**	**2%**	**70%**	**28%**	**0%**	**100%**

Financial summary by natural classification, WHEAT, 2016.

	Windows 1 & 2	Window 3	Bilateral Funding	Center Funds	Total Funding	Windows 1 & 2	Window 3	Bilateral Funding	Center Funds	Total Funding	Windows 1 & 2	Window 3	Bilateral Funding	Center Funds	Total Funding
Total CRP No. 3.1 - CRP on Wheat	**POWB Approved Budget**					**Actual**					**Unspent/Variance**				
Personnel	5,519	6,092	7,914	-	19,525	5,519	3,361	5,198	-	14,077	(0)	2,731	2,716	-	5,448
Collaborators Costs - CGIAR Centers	30	3,063	44	-	3,138	30	2,264	28	-	2,322	-	799	16	-	815
Collaborator Costs - Partners	930	7,182	2,839	-	10,951	930	5,257	1,940	-	8,127	-	1,925	899	-	2,824
Supplies and services	2,871	5,744	6,874	-	15,489	2,622	2,907	7,393	-	12,923	249	2,837	(520)	-	2,566
Operational Travel	447	1,097	1,118	-	2,662	447	428	643	-	1,517	0	669	475	-	1,144
Depreciation	929	639	879	-	2,447	929	117	577	-	1,624	(0)	522	301	-	823
Sub-total of Direct Costs	**10,727**	**23,817**	**19,667**	**-**	**54,211**	**10,477**	**14,334**	**15,779**	**-**	**40,591**	**249**	**9,483**	**3,888**	**-**	**13,620**
Indirect Costs	1,413	2,819	2,079	-	6,310	1,413	1,391	1,578	-	4,382	-	1,428	501	-	1,929
Total - All Costs	**12,139**	**26,636**	**21,746**	**-**	**60,521**	**11,890**	**15,725**	**17,357**	**-**	**44,972**	249	10,911	4,389	-	15,549
LESS Coll Costs CGIAR Centers	(30.3)	(3,063)	(44)	-	(3,138)	(30)	(2,264)	(28)	-	(2,322)	-	(799)	(16)	-	(815)
Total Net Costs	**12,109**	**23,573**	**21,701**	**-**	**57,384**	**11,860**	**13,461**	**17,329**	**-**	**42,650**	**249**	**10,112**	**4,372**	**-**	**14,734**

Amounts for each participating center below:

CIMMYT	**POWB Approved Budget**					**Actual**					**Unspent/Variance**				
Personnel	4,369	5,776	7,432		17,577	4,369	3,091	4,754		12,213	(0)	2,685	2,678	-	5,364
Collaborators Costs - CGIAR Centers	30	3,063	44		3,138	30	2,264	28		2,322	-	799	16	-	815
Collaborator Costs - Partners	903	6,771	2,135		9,809	903	5,005	1,346		7,254	-	1,766	789	-	2,555
Supplies and services	2,125	5,360	4,852		12,337	1,876	2,697	5,723		10,297	249	2,663	(872)	-	2,040
Operational Travel	335	1,006	880		2,221	335	368	463		1,165	0	638	417	-	1,055
Depreciation	695	514	716		1,925	695	74	402		1,172	(0)	440	313	-	753
Sub-total of Direct Costs	**8,458**	**22,490**	**16,058**	**-**	**47,006**	**8,208**	**13,499**	**12,716**	**-**	**34,424**	**249**	**8,991**	**3,342**	**-**	**12,582**
Indirect Costs	1,136	2,653	1,862		5,650	1,136	1,286	1,431		3,853	-	1,367	431	-	1,798
Total - All Costs	**9,593**	**25,143**	**17,920**	**-**	**52,656**	**9,344**	**14,785**	**14,147**	**-**	**38,276**	**249**	**10,358**	**3,773**	**-**	**14,380**
LESS Coll Costs CGIAR Centers	(30)	**(3,063)**	**(44)**	**-**	**(3,138)**	**(30)**	**(2,264)**	**(28)**	**-**	**(2,322)**	**-**	**(799)**	**(16)**	**-**	**(815)**
Total Net Costs	**9,563**	**22,080**	**17,875**	**-**	**49,519**	**9,314**	**12,521**	**14,119**	**-**	**35,954**	**249**	**9,559**	**3,756**	**-**	**13,565**

ICARDA	**POWB Approved Budget**					**Actual**					**Unspent/Variance**				
Personnel	1,150	316	482		1,948	1,150	270	444		1,864	-	46	38	-	84
Collaborators Costs - CGIAR Centers					-					-	-	-	-	-	-
Collaborator Costs - Partners	27	411	704		1,142	27	252	594		873	-	159	110	-	269
Supplies and services	746	384	2,022		3,152	746	210	1,670		2,626	-	174	352	-	526
Operational Travel	112	91	238		441	112	60	180		352	-	31	58	-	89
Depreciation	234	125	163		522	234	43	175		452	-	82	(12)	-	70
Sub-total of Direct Costs	**2,269**	**1,327**	**3,609**	**-**	**7,205**	**2,269**	**835**	**3,063**	**-**	**6,167**	**-**	**492**	**546**	**-**	**1,038**
Indirect Costs	277	166	217		660	277	105	147		529	-	61	70	-	131
Total - All Costs	**2,546**	**1,493**	**3,826**	**-**	**7,865**	**2,546**	**940**	**3,210**	**-**	**6,696**	**-**	**553**	**616**	**-**	**1,169**
LESS Coll Costs CGIAR Centers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Net Costs	**2,546**	**1,493**	**3,826**	**-**	**7,865**	**2,546**	**940**	**3,210**	**-**	**6,696**	**-**	**553**	**616**	**-**	**1,169**

Financial summary by Flagship Project, WHEAT, 2016.

	POWB Approved	Current Year Actual Expenditures	Unspent Budget
Summary Report - by Flagship Project			
Flagship 1 - Enhancing WHEAT's R4D strategy for impact	3,402	2,357	1,045
Flagship 2 - Novel diversity and tools for improving genetic gains and breeding efficiency	10,933	7,446	3,487
Flagship 3 - Better varieties reach farmers faster	13,828	11,789	2,039
Flagship 4 - Sustainable intensification of wheat-based farming systems	13,404	11,333	2,071
Flagship 5 - Scaling-up and out	17,543	10,636	6,907
Infrastructure Project	243	243	-
CRP Management/Coordination	1,168	1,168	0
Total - All Costs	**60,522**	**44,972**	**15,550**

CIMMYT			
Flagship 1 - Enhancing WHEAT's R4D strategy for impact	3,148	2,103	1,045
Flagship 2 - Novel diversity and tools for improving genetic gains and breeding efficiency	10,640	7,162	3,478
Flagship 3 - Better varieties reach farmers faster	11,355	9,428	1,927
Flagship 4 - Sustainable intensification of wheat-based farming systems	10,452	9,038	1,414
Flagship 5 - Scaling-up and out	15,893	9,377	6,516
Infrastructure Project	-	-	-
CRP Management/Coordination	1,168	1,168	0
Total - All Costs	52,657	38,276	14,381

ICARDA			
Flagship 1 - Enhancing WHEAT's R4D strategy for impact	254	254	-
Flagship 2 - Novel diversity and tools for improving genetic gains and breeding efficiency	293	284	9
Flagship 3 - Better varieties reach farmers faster	2,473	2,361	112
Flagship 4 - Sustainable intensification of wheat-based farming systems	2,952	2,295	657
Flagship 5 - Scaling-up and out	1,650	1,259	391
Infrastructure Project	243	243	-
CRP Management/Coordination			-
Total - All Costs	7,865	6,696	1,169

Financial summary of gender by Flagship Project, WHEAT, 2016.

	POWB Approved	Current Year Actual Expenditures	Unspent Budget
Summary Gender Report - by Flagship Project			
Flagship Project 1 - Enhancing WHEAT's R4D strategy for impact	1,962	1,221	742
Flagship Project 2 - Novel diversity and tools for improving genetic gains and breeding efficiency	758	446	312
Flagship Project 3 - Better varieties reach farmers faster	1,225	1,022	203
Flagship Project 4 - Sustainable intensification of wheat-based farming systems	2,575	2,250	325
Flagship Project 5 - Scaling-up and out	1,825	1,166	658
CRP Management/Coordination	117	117	0
Total - All Costs	**8,462**	**6,223**	**2,239**

CIMMYT			
Flagship Project 1 - Enhancing WHEAT's R4D strategy for impact	1,774	1,033	742
Flagship Project 2 - Novel diversity and tools for improving genetic gains and breeding efficiency	758	446	312
Flagship Project 3 - Better varieties reach farmers faster	1,215	1,012	203
Flagship Project 4 - Sustainable intensification of wheat-based farming systems	2,253	1,935	318
Flagship Project 5 - Scaling-up and out	1,657	999	657
CRP Management/Coordination	117	117	0
Total - All Costs	7,774	5,543	2,231

ICARDA			
Flagship Project 1 - Enhancing WHEAT's R4D strategy for impact	188	188	-
Flagship Project 2 - Novel diversity and tools for improving genetic gains and breeding efficiency	-	-	-
Flagship Project 3 - Better varieties reach farmers faster	10	10	-
Flagship Project 4 - Sustainable intensification of wheat-based farming systems	322	315	7
Flagship Project 5 - Scaling-up and out	168	167	1
Total - All Costs	688	680	8

Partnership report, WHEAT, 2016.

Institute Acronym	Institute Name	Country	Windows 1 & 2	Window 3	Bilateral	Center Funds	TOTAL
CIMMYT:							
AREU	Afghanistan Research and Evaluation Unit	Afghanistan	-	-	78	-	78
AVRDC	The World Vegetable Center	East Africa	-	920	-	-	920
CSIS	Center for Strategic and International Studies	USA	-	110	-	-	110
CSISA	Cereal Systems Initiative for South Asia	Bangladesh	-	86	-	-	86
Diversityarivys	Diversity Arrays Technology PTY LTD.	Australia	50	-	152	-	202
EIAR	Ethiopian Institute of Agricultural Research	Ethiopia	-	604	-	-	604
GCU	Glasgow Caledonian University	Scotland	192	-	-	-	192
ICAR	Indian Council of Agricultural Research	India	-	238	-	-	238
ICARDA	INTERNATIONAL CENTER FOR AGRICULTURAL RES	Líbano	30	-	-	-	30
IDE	International Development Enterprises	Bangladesh	-	359	-	-	359
IDEI	International Development Enterprises	India	-	84	-	-	84
IFPRI	INTERNATIONAL FOOD POLICY RESEARCH INSTITI	USA	-	127	-	-	127
IIASA	The International Institute for Applied Systems A	Australia	68	-	-	-	68
ILRI	INTERNATIONAL LIVESTOCK RESEARCH INSTITUTI	Kenya	-	1,622	-	-	1,622
INIFAP	Instituto Nacional de Investigaciones Forestales,	México	74	-	105	-	179
IRRI	The International Rice Research Institute	Philippines	-	505	-	-	505
IRTA	Instituto de Investigación y Tecnología Agroalim	Spain	-	-	66	-	66
IWMBD	Instituto of Water Modelling	Bangladesh	-	-	55	-	55
IWWIP	International Winter Wheat Improvement Progr	Turkey	-	86	-	-	86
JIRCAS	Japan International Research Center for Agricult	Japan	160	-	-	-	160
NRSP	National Rural Support	Pakistan	-	56	-	-	56
ORNL	Oak Ridge National Laboratory (ORNL)	USA	68	-	-	-	68
PATCO	Pakistan Agricultural Research Council	Pakistan	-	63	-	-	63
SDC	Society Development Committee	Bangladesh	-	180	-	-	180
TGGmbH	Trait Genetics GmbH	Germany	63	-	-	-	63
UAC	Universidad Austral de Chile	Chile	-	-	55	-	55
UF	University of Florida	USA	-	-	99	-	99
UOFD	University Of California Davis	México	-	1,420	-	-	1,420
WPEP	The Wheat Productivity Enhancement Program	Pakistan	-	-	61	-	61
WRC	Wheat Research Cente	Bangladesh	-	67	-	-	67
WUR	Wageningen University and Research Centre	Amsterdam	63	-	-	-	63
Other > 50K	Other	Other	167	742	702	-	1,611

Partnership report, WHEAT, 2016 (cont'd).

Institute Acronym	Institute Name	Country	Windows 1 & 2	Window 3	Bilateral	Center Funds	TOTAL
ICARDA:							
AARI	Aegean Agricultural Research Institute- Izmir	Turkey	-	10	-	-	10
ARC- Egypt	Agricultural Research Center- Egypt	Egypt	6	8	78	-	92
AREA	Agricultural Research and Extension Authority	Yemen	-	8	36	-	44
ARC- Sudan	Agricultural Research Corporation- Sudan	Sudan	-	129	99	-	228
ARICH	Azerbaijan Research Institute of Crop Husbandry	Azerbaijan	-	-	3	-	3
BDUTAE	Bahri Dağdaş International Agricultural Research	Turkey	19	30	-	-	49
BSARI	Black Sea Agricultural Research Institute	Turkey	-	1	-	-	1
CEMB	Center of Excellence in Molecular Biology- Punja	Pakistan	-	-	3	-	3
CCRIM	Central Cotton Research Institute Multan	Pakistan	-	-	2	-	2
CCRIS	Central Cotton Research Institute Sakrand	Pakistan	-	-	13	-	13
CNRADA	Centre National de Recherche Agronomique et c	Muritania	-	-	8	-	8
EMTZARS	East Mediterranean Transitional Zone Agricultur	Turkey	-	3	-	-	3
EIAR	Ethiopian Institute of Agricultural Research	Ethiopia	-	-	31	-	31
CRIFC	Field Crops Central Research Institute	Turkey	-	-	3	-	3
GAP	GAP Soil and Water Resources and Agricultural R	Turkey	-	2	-	-	2
GCSAR	General Commission for Scientific Agricultural R	Syria	-	-	38	-	38
INRA	Institut National de la Recherche Agronomique	Morocco	-	24	46	-	70
INGC	Institut National des Grandes Cultures	Tunisia	-	8	56	-	64
ISRA	Institut Senegalais De Recherches Agricoles	Senegal	-	-	8	-	8
IAR- Zaria	Institute for Agricultural Research- Zaria	Nigeria	-	-	27	-	27
IPM	Integrated Pest Management	Pakistan	-	-	2	-	2
LRRI	Land Resources Research Institute	Pakistan	-	-	2	-	2
NARC	National Agricultural Research Center	Palestine	-	7	62	-	69
NCARE	National Center for Agricultural Research and Ex	Jordan	-	7	28	-	35
NIBGE	National Institute of Biotechnology & Genetic Er	Pakistan	-	-	24	-	24
Nat-IPM	National IPM Programme	Pakistan	-	-	6	-	6
NUST	National University of Sciences & Tenchnology	Pakistan	-	-	5	-	5
OAR	Office of Agricultural Research	Iraq	-	-	3	-	3
UOW	RABAT - UNIVERSITY OF WOLLONGONG (UOW)	USA	-	-	6	-	6
IAGS	The Institute of Agricultural Sciences -Punjab Un	Pakistan	-	-	2	-	2
TARI	Trakya Agricultural Research Institute	Turkey	-	15	-	-	15
UZRIPI	Uzbek Research Institute of Plant Industry	Uzbekistan	-	-	3	-	3
All Other Partners	All Other Partners		2	-	-	-	2
Total for CRP			960	7,521	1,968	-	10,449

Annex 1. Indicators of output-level progress in 2016.

The Traffic Light Indication sums up the progress achieved of projects under WHEAT, per Flagship Project in 2016, regardless of their funding (Windows 1/2/3 or bilaterally funded). It monitors the progress per Cluster of Activity, per Flagship Project, and for the CRP as a whole. (Please note per-CoA completion is not specifically referenced here, due to structural shifts in 2015 and 2016.)

Flagship Projects (as of 2016)	FP Performance (aggregation of progress towards all CoAs/FPs - weighted average)
FP1 Maximizing value for money, social inclusivity	84.6%
FP2 Novel diversity and tools	92.8%
FP3 Global partnership to accelerate genetic gain	87.9%
FP4 Sustainable intensification	89.9%
FP5 Human and institutional capacities	88.0%
Total weighted average - CRP performance	87.3%

CRP indicators of progress, with glossary and targets.

#	CRPs concerned by this indicator	Indicators	Glossary & Comments	Deviation narrative (if actual is more than 10% away from target)	2012		2013		2014		2015		2016			
					Target (if availabl	Actual	Target	Actual	Target	TOTAL	Target	Actual	Target	CIMMYT Actual	ICARDA Actual	Total
KNOWLEDGE, TOOLS, DATA																
1	All	1. Number of flagship "products" produced by CRP	Glossary: These are frameworks and concepts .. they should be likely to change the way stakeholders along the impact pathway allocate resources and/or implement activities .. change the way these stakeholders think and act. For the CRP WHEAT, each Flagship Project is a flagship "product.	Following a standardization of CRP structures, the WHEAT strategy was reorganized around five Flagship Projects (FPs) in 2014, encompassing the nine Strategic Initiatives of		10	10	10	5	5	5	5	5	5		5
2	All	2. % of flagship products produced that have explicit target of women farmers/NRM managers	Included in FPs: FP1 - Maximizing value for money, social inclusivity through prioritizing WHEAT R4D FP3 - Partnership to accelerate genetic gain in farmers field FP4 - Sustainable intensification FP5 - Human and institutional capacities, scaling out and up	Following a standardization of CRP structures, the WHEAT strategy was reorganized around five Flagship Projects (FPs) in 2014, encompassing the nine		3	3	4	4	4	4	4	4	4		4
3	All	3. % of flagship products produced that have been assessed for likely gender-disaggregated impact	Included in FPs: FP1 - Maximizing value for money, social inclusivity through prioritizing WHEAT R4D FP3 - Partnership to accelerate genetic gain in farmers field FP4 - Sustainable intensification FP5 - Human and institutional capacities, scaling out and up	Following a standardization of CRP structures, the WHEAT strategy was reorganized around five Flagship Projects (FPs) in 2014, encompassing the nine			10	10 of which 2 more in-depth	4	4	4	4	4	4		4
4	All	4. Number of "tools" produced by CRP	Glossary: These are significant decision-support tools, guidelines, training manuals, software, and/or videos; significant in that they should be likely to change the way stakeholders along the impact pathway allocate resources and/or			327 (16 co-developed with other	522 changed to 25	23 (17 co-developed with other	26	39	25	162	25	230.95	23	254
5	All	5. % of tools with explicit target of women farmers														0
6	All	6. % of tools assessed for likely gender-disaggregated														0
7	All	7. Number of open access databases maintained by CRP	Institutional Multimedia Publications Repository, Institutional Research Data and Software Repository, Germinate Wheat, GRIS (wheatpedigree.net), IWYP.org, rusttracker.org, Wheat Atlas, Wheat Doctor			5	5	6	To be reviewed	11	5	10	5	8	11	19
8	All	8. Total number of users of these open access databases	Unique visitors					124,450	54,767	119,832	125,000	112,393	100,000	141,205	500	141,705
9	All	9. Number of publications in ISI journals produced by CRP				121 (18 with other CRPs)	121	121 (23 jointly with other CRPs)		107	120	167	120	175	29	204
10	1,2,3, 4, 6	10. Number of strategic value chains analyzed by CRP	India wheat value chain mapping (Mittal); Global impact study (Lantican); adoption/impact study Iran (Fisher); seed value chains Ethiopia, Uzbekistan, Morocco & synthesis variety release analysis 3 countries (ICARDA); CPGs on poverty/wheat consumption, ASARECA scoping study, wheat nutrition & health			5	5	4	2	10	5	10	8	6	0	6
11	1,5,6,7	11. Number of targeted agro-ecosystems analysed/characterised by CRP														
12	1,5,6,7	12. Estimated population of above-mentioned agro-ecosystems														

CRP indicators of progress, with glossary and targets (cont'd).

#	CRPs concerned by this indicator	Indicators	Glossary & Comments	Deviation narrative (if actual is more than 10% away from target)	2012		2013		2014		2015		2016			
					Target (if availabl	Actual	Target	Actual	Target	TOTAL	Target	Actual	Target	CIMMYT Actual	ICARDA Actual	Total
CAPACITY ENHANCEMENT AND INNOVATION PLATFORMS																
13	All	13. Number of trainees in short-term programs facilitated by CRP (male)	From CIMMYT Training database, plus Competitive Partner Grants and ICARDA Short-term = < 90 days			18,220 (14,144 shared with ther CRPs)	16,415	14,232 (171 with other CRPs)	17,000	15,990	3000	16,516	10,000	17192	319	17511
14	All	14. Number of trainees in short-term programs facilitated by CRP (female)	From CIMMYT Training database, plus Competitive Partner Grants and ICARDA Short-term = < 90 days			4,886	5,226	3,068 (73 with other CRPs)	To be reviewed	3,705	1000	4291	1000	2979	289	3268
15	All	15. Number of trainees in long-term programs facilitated by CRP (male)	From CIMMYT Training database, plus Competitive Partner Grants and ICARDA Long-term = > 90 days			30	40	121 (7 with other CRPs)	To be reviewed	44	24	86	30	464	28	492
16	All	16.Number of trainees in long-term programs facilitated by CRP (female)	From CIMMYT Training database, plus Competitive Partner Grants and ICARDA Long-term = >90 days			19	23	65 (4 with other CRPs)	To be reviewed	36	24	57	30	34	35	69
17	1,5,6,7	17. Number of multi-stakeholder R4D innovation platforms established for the targeted agro-ecosystems by the CRPs	Latin America- 9, Asia- 46, Africa- 8			38	43	45	50	50	45	101	50	63		63

CRP indicators of progress, with glossary and targets (cont'd).

#	CRPs concerned by this indicator	Indicators	Glossary & Comments	Deviation narrative (if actual is more than 10% away from target)	2012		2013		2014		2015		2016			
					Target (if availabl	Actual	Target	Actual	Target	TOTAL	Target	Actual	Target	CIMMYT Actual	ICARDA Actual	Total
18	All	18. Number of technologies/NRM practices under research in the CRP (Phase I)	Germplasm: 184,633 Agronomy: 372 From KPI database			265,730	260,000	124,517		200,005	120,000	322,569	200,000	5713.22	21400	27,113
19	All	19. % of technologies under research that have an explicit target of women farmers														
20	All	20. % of technologies under research that have been assessed for likely gender-disaggregated impact														
21	1,5,6,7	21 Number of agro-ecosystems for which CRP has identified feasible approaches for improving ecosystem services and for establishing positive incentives for farmers to improve ecosystem functions as per CRP's recommends														
22	1,5,6,7	22. Number of people who will potentially benefit from plans, once finalised, for the scaling up of strategies														
23	All, except 2	23. Number of technologies /NRM practices field tested (phase II)				34,850	2,600	2600		2151	1,000	3,599	2000	850	960	1,810
24	1,5,6,7	24. Number of agro-ecosystems for which innovations (technologies, policies, practices, integrative approaches) and options for improvement at system level have been developed and are being field tested (Phase II)														
25	1,5,6,7	25. % of above innovations/approaches/ options targeted at decreasing inequality between men and women														
26	1,5,6,7	26. Number of published research outputs from CRP utilised in targeted agro-ecosystems														
27	All, except 2	27.Number of technologies/NRM practices released by public and private sector partners globally (phase III)				50	50	46	50	24	50	73	50	48	25	73

CRP indicators of progress, with glossary and targets (cont'd).

#	CRPs concerned by this indicator	Indicators	Glossary & Comments	Deviation narrative (if actual is more than 10% away from target)	2012		2013		2014		2015		2016			
					Target (if availabl	Actual	Target	Actual	Target	TOTAL	Target	Actual	Target	CIMMYT Actual	ICARDA Actual	Total
POLICIES IN VARIOUS STAGES OF DEVELOPMENT																
28	All	28. Numbers of Policies/ Regulations/ Administrative Procedures Analyzed (Stage 1)				3	2	6	2	8	2	9	2	3	0	3
29	All	29. Number of policies / regulations / administrative procedures drafted and presented for public/stakeholder consultation (Stage 2)				3	1			3	1	6	1	1	1	2
30	All	30. Number of policies / regulations / administrative procedures presented for legislation (Stage 3)				0	0	1	1	1	1	3	1	1	1	2
31	All	31. Number of policies / regulations / administrative procedures prepared passed/approved (Stage 4)								1	1	3	1	0	0	0
32	All	32. Number of policies / regulations / administrative procedures passed for which implementation has begun (Stage 5)								0	1	4	1	0	0	0
OUTCOMES ON THE																
33	All	33. Number of hectares under improved technologies or management practices as a result of CRP research	No data available for 2016			1,500,000	1,650,000	1,650,000		4,845,000	1,815,000	7,000,000	2,000,000	No data available for 2016		
34	All	34. Number of farmers and others who have applied new technologies or management practices as a result of CRP research	No data available for 2016			1,650,000	2,802,000	2,802,000		10,310,000	3,082,200	7,000,000	1,000,000	No data available for 2016		

Annex 2: Performance measurement framework, WHEAT, 2015-16.

Outcomes		Indicators	Baseline			Data	
			2012	2013	2014	2015	2016
Flagship Project 1: Sustainable intensification and income opportunities for the poor							
2015 2016	Number of publications in ISI journals produced by CRP; supported where, possible with relevant indicators (citations, downloads)	Number of publications in ISI journals produced by CRP	121	121	107	167	191
		Citation rates, including self-citations (TBD) and 3-year citation windows (TBD)		8	41	58	2.9*
2015 2016	Number of women participants in capacity-building events	Number of women trainees in short term programs facilitated by CRP	4886	3068	1069	4291	2979
		Number of women trainees in long term programs facilitated by CRP	19	65	36	57	34
2015 2016	% of women participants in CRP-funded Wheat improvement courses	Total number of participants in CRP short term program facilitated by CRP	23108	17300	5157	20807	20171
		% of women participants in CRP short term program facilitiated by CRP	21%	18%	21%	21%	19%
		Total number of participants in CRP long term program facilitated by CRP	49	186	80	143	498
		% of women participants in CRP long term program facilitated by CRP	39%	35%	45%	40%	7%
Outcomes	Establish baseline with WEAI in a particular geography (TBD)	WEAI index	No data available at present				
2016	Generate new knowledge of socioeconomic dynamics and drivers of change in wheat systems and apply such new knowledge, tools, and methods to better prioritize WHEAT research and better target interventions in wheat-based farming systems	# of knowledge, tools and methods of socioeonomic dynamics and drivers of change in wheat systems					30
		# of opportunities that knowledge, tools and methods of socioeonomic dynamics was used to prioritize wheat research and to target interventions in wheat-based farming systems					3

Performance measurement framework, WHEAT, 2015-16 (cont'd).

Outcomes		Indicators	Baseline			Data	
			2012	2013	2014	2015	2016
	All FP2 outputs are used by other FPs to develop their outputs and achieve outcomes						
Flagship Project 3: Global partnership to accelerate genetic gain in farmers' field							
2015 2016	New, more productive wheat lines, able to maintain productivity in S Asia and other heat-stressed regions (with a temperature increase of 1C), with diverse and durable resistance to all three major rusts (Asia, Africa and Latin America), with resistance to diseases and pests of regional importance other than rust, with acceptable grain quality for local food industries, tested and relased by NARS (600+ individual co-operators worldwide)	Number of germplasm provided to NARS (Data used for 2014/2015: germplasm developed)	50 (AR 18)	46 (AR 18)	63	64	59
2015 2016	New, more productive wheat lines based on CGIAR lines adopted by farmers (for specific geographies)	Number of hectares under improved technologies or management practies as a results of CRP research (Based on known seed production of WHEAT improved germplasm to extrapolate hectares, assuming average farm size 1 hectare; under review, working on harmonizing different project reporting formats to make them comparable and extract data applicable for relevant time period (e.g. during 2013))	1,500,000	1,650,000	4,845,000	7,000,000	8,400,000
2016	p.a. increase of 0.9% of genetic yield potential gains maintained in new wheat cultivars and elite lines for Asia, Africa and Latin America	% increase in yield potential gains maintained in new wheat cultivars and elite lines for Asia, Africa and Latin America					Period 2007 - 2014 irrigated 1.63%/yr rainfed 2.6%/yr heat 0.3%/year across all 1.67 Source: Crespo et al., 2016, CS, 56:1-13

Performance measurement framework, WHEAT, 2015-16 (cont'd).

Outcomes		Indicators	Baseline			Data	
			2012	2013	2014	2015	2016
Flagship Project 4: Sustainable intensification of wheat-based cropping systems							
2016	at least 10,000 wheat producers in China, India, Pakistan increase their nitrogen use efficiency (NUE) by 50% (produce up to 50% more grain per kilo of N & P fertilizer applied) by end 2015	Number of producerrs in China, India and Pakistan that increased their nitrogen use efficiency by 50% by the end of 2015					no data available at present
2015 2016	Through 'downstream' projects under FP4 (CSISA, MasAgro-Take it to the Farmer, others), several hundred thousands of small producers have access to particular set/range of technologies and practices	Number of small producers that have access to particular set/range of technologies and practices (Data used: # of technologies/NRM practices released by public and private sector partners globaly (Phase III))	50	46	24	73	waiting for input from ICARDA
Flagship Project 5: Human and institutional capacities for seed systems and scaling-out							
2015 2016	Through 'downstream' projects under FP4 (CSISA, MasAgro-Take it to the Farmer, others), several hundred thousands of small producers are linked with input, output and financial markets to enable adoption of improved wheat technologies through locally adapted strategies	Number of small producers linked with input, output and financial markets to enable adoption of improved wheat technologies				no data available at present	no data available at present.
2015 2016	Increased number of farmers accessing improved seed in Ethiopia, Pakistan and other geographies (TBD)	Number of farmers that have access to improved seed in Ethiopia, Pakistan and other geographies (TBD)				324,075	540,000 (Ethiopia, Pakistan- USAID, Afghnaistan-ACIAR; Africa SARD-SC;
2015 2016	Increased number of open access databases users compared to previous year(s)	Number of users that have access to open access databases		124,450	119,832	112,393	133,464

CGIAR

RESEARCH PROGRAM ON
Wheat