The document structure follows the Consortium Outline Full Proposal template for Phase II.
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Section 3: Annexes

3.1 Participating Partners Budgets
As per Consortium guidance, see separate template in online submission tool.

3.2 Partnership strategy
WHEAT’s global partners’ network is essential for addressing cross-border challenges, co-developing and disseminating International Public Goods and thus maintain the WHEAT comparative advantages. The WHEAT Partnership Strategy is based upon these assumptions:

1. WHEAT can achieve outcomes and impact only through partnerships outside and within the CGIAR, of which the going onto 50 years International Wheat Improvement Network (http://wheatatlas.org/nurseries/references) is the prime example.

2. Different partnerships and partners are needed in the different phases along the non-linear continuum from discovery of new knowledge to achievement of systemic change (e.g. discovery to scaling out). Table 32-1 visualizes this by way of examples.

3. The further WHEAT moves along this continuum, the less it can/should lead and influence (Circle of Influence principle).

4. As products, solutions and approaches developed under WHEAT move towards scaling-out/-up, partners-of-partners (e.g. boundary partners) become the key drivers of change.

Table 32-1. Different types of partnerships along the continuum from discovery of new knowledge to achievement of systemic change.

<table>
<thead>
<tr>
<th>Strategy**</th>
<th>Discovery</th>
<th>Validation</th>
<th>Scaling-out</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>CIMMYT-ICAR: Research coordination &amp; collaboration (5-yr plans)</td>
<td></td>
<td>NGO collaboration on mechanization business development (e.g. CSISA-MI: iDE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MasAgro Take It To The Farmer: Innovation Systems Approach</td>
</tr>
<tr>
<td>Program/Project-based</td>
<td>Genomic Selection: The next frontier for rapid gains GENNOVATE (11-CRPs, 80 case studies)</td>
<td>Cereal Systems Initiative in South Asia (CSISA): Complex agri impact challenges*</td>
<td></td>
</tr>
<tr>
<td>Regional / Global</td>
<td>Durable Rust Resistance in germplasm improvement program</td>
<td>Wheat Initiative: Global program</td>
<td></td>
</tr>
<tr>
<td>National</td>
<td></td>
<td>MasAgro: Complex agri impact challenges*</td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>S. Korea, Japan, BMZ-CIM: post-doc expert secondment</td>
<td>Pakistan Agricultural Innovation Program: Discrete agri impact challenges*</td>
<td></td>
</tr>
</tbody>
</table>
This strategy aims to

1. Make clear to our existing and future partners how we want to go about partnership and why it is so important to WHEAT, based on their feedback;

2. Support program and project leads, as well as WHEAT-MC, to better plan ahead, set up, manage and close well-functioning partnerships at the strategic and operational level; be they lead, co-lead or participating partner (ILRI Partnership Strategy refers to contractor, equal partner and service provider categories);

3. Develop new kinds of partnerships, for specific purposes and in specific contexts: Work with new kinds of partners (e.g. ORNL, USA), participate in new types of partnership (e.g. International Wheat Yield Consortium, aligned with WHEAT; GIZ scaling out multi-CRP p’ship), including improved alignment of independent research efforts (for definition and categorization of different actions and instruments, see http://www.faccejpi.com/Document-library/Strategic-Research-Agenda# and http://www.faccejpi.com/).

The strategy will build on learning from the ILAC-led ‘Analysis of the portfolio of activities and networks of WHEAT’ study (draft report, March 2015). This network analysis has been done for all other CRPs, providing opportunities for inter-CRP learning. How will this strategy be implemented? By

1. Giving partnership as such more attention:
   a. Integrating methods and tools along the partnership life cycle into the WHEAT project management cycle;

2. Improving upon screening partners:
   a. In many cases, WHEAT cannot choose its partners (e.g. there is only one; donors stipulate partners). Therefore, a better SWOT analysis at the outset is needed, as well as explicit mutual expectations management (e.g. agree on ‘how to partner’)

3. Staying close to partners and fostering partnership management practices (sustaining, partnering capacity) in three critical areas:
   a. Approaches, methods and tools, such as stakeholder and network analysis, mutual self-assessments and targeted capacity development activities
   b. Relationship management: Roles and Competencies
   c. Building and maintaining Partnership Knowledge Base

4. Exchange of experiences and know-how with other CRPs in the context of country coordination.

**Table 32-2. Strategic partnerships: Illustrative examples (ongoing, into Phase II).**

<table>
<thead>
<tr>
<th>MSP: Complex agri impact challenges: Cereal Systems in South Asia (CSISA) WHEAT FP4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Convener of the Partnership and their role</td>
<td>CIMMYT leads CSISA’s work in India and Nepal, is a partner in CSISA Bangladesh and leads CSISA’s wheat breeding objectives. IRRI leads CSISA’ work in</td>
</tr>
</tbody>
</table>
Bangladesh. Est. 2009, as a follow-up to the Rice Wheat Consortium, now in Phase III.

| Specific focus and objective | • promote durable change at scale in South Asia’s cereal-based cropping systems with 8M farmers by 2020, by:
• Promoting widespread adoption of resource-conserving practices, technologies and services that increase yields with lower water, labor and input costs.
• Supporting mainstreaming innovations in national-, state- and district-level government programs to improve long-term impacts achieved through investments in the agricultural sector.
• Generating and disseminating new knowledge on cropping system management practices that can withstand the impacts of climate change in South Asia.
• Improving the policy environment to facilitate the adoption of sustainable intensification technologies.
• Building strategic partnerships that can sustain and enhance the scale of benefits accrued through improving cereal system productivity.

| Science Agenda | Scaling-out: Catalyzing widespread dissemination of production and post-harvest technologies to increase cereal productivity, resource use efficiency and income. CSISA supports women farmers by improving their access and exposure to modern and improved technological innovations, knowledge and entrepreneurial skills; Process-based research on crop and resource management practices for future cereal-based systems; High-yielding, heat- and water-stress-tolerant rice, wheat varieties for current and future cereal and mixed crop-livestock systems; Improved policies and institutions for inclusive agricultural growth |

| Geographical focus / location | Operate in 12 rural ‘innovation hubs’ in Bangladesh, India and Nepal, CSISA works to increase the adoption of various resource-conserving and climate-resilient technologies, and improve farmers’ access to market information and enterprise development; see also [http://csisa.org/csisa-locations/](http://csisa.org/csisa-locations/) |

| Role of the CRP/FP in the partnership | Bilaterally funded multi-stakeholder partnership contributing to WHEAT FP4.1 and 4.3 (as well as to MAIZE, other CRPs). W1&2-funded competitive grants under FP4.1 have collaborated with CSISA researchers. Same for W1&2-funded strategic gender research and FP3.1 germplasm improvement (not in Phase III). |

| Key CGIAR partner(s) and their (its) role(s) | CIMMYT
IFPRI is a partner in CSISA Bangladesh, India and Nepal, and leads CSISA’s policy objective.
ILRI is a partner in CSISA Bangladesh, India and Nepal, and leads CSISA’s livestock activities.
IRRI leads CSISA’s work in Bangladesh, is a partner in CSISA India and leads CSISA’s rice breeding objective.
WorldFish is a partner in CSISA Bangladesh and leads CSISA’s aquaculture activities.
iDE: Co-implements CSISA-Mechanization and Irrigation (CSISA-MI). IDE is an international NGO that creates income and livelihood opportunities for poor rural households. |

<p>| Key ‘external’ partner(s) and their (its) role(s) | CSISA’s key national collaborators: Bangladesh Agricultural Research Institute, Indian Council of Agricultural Research, Nepal Agricultural Research Council. For more information about partners, see: Page 60, <a href="http://csisa.org/wp-content/uploads/sites/2/2014/06/CSISA-BD-Annual-Report-2014.pdf">http://csisa.org/wp-content/uploads/sites/2/2014/06/CSISA-BD-Annual-Report-2014.pdf</a>; 1,472 partners in India, of which 1,372 private sector SMEs, see p.73, |</p>
<table>
<thead>
<tr>
<th>Contribution to ToC and impact pathways</th>
<th>From validation, with feedback to discovery research outside CSISA, to dissemination and outcome generation; project researchers collaborate with technology delivery and adoption stakeholders</th>
</tr>
</thead>
</table>
## Multi NARS partnership: Global Precision Phenotyping Platforms Network WHEAT FP3

| **Convenor of the Partnership and their role** | Lead Center CIMMYT for WHEAT; project initiator based on December 2012 CRP partners conference |
| **Specific focus and objective** | - set up a 2nd generation global network that maximizes genetic gain per year in farm fields, focusing on developing countries with substantial numbers of smallholder farms;  
- expand precision and prediction value of phenotyping data for new germplasm that annually emerge from the WHEAT and partner breeding pipelines;  
- To ultimately maximize genetic gain per year by getting more, and more diverse improved varieties, faster onto farmers’ fields, by fostering germplasm exchange and line testing for specific traits directly among NARS partners.  
- Foster international germplasm exchange (physical and data).  
- Where appropriate, develop multi-crop platforms via inter-AFS-CRP collaboration |
| **Science Agenda** | Precision phenotyping methods development and dissemination in up to 15 platform locations, focusing on different traits. Higher quality phenotyping data (yield, abiotic and biotic stresses) are paramount to fully utilize the potential of new molecular selection technologies. |
| **Geographical focus / location** | Started 2015: Uruguay (multi-disease), Sudan (heat), Tunisia (septoria) |
| **Role of the CRP/FP in the partnership** | Co-fund establishment of platform, capacity development, knowledge exchange across platforms, together with each NARS partner (co-funding in-kind and/or financial). Funds project management and coordination under FP3.2. W1&2-funded only. |
| **Key CGIAR partner(s) and their role(s)** | CIMMYT, ICARDA |
| **Key ‘external’ partner(s) and their role(s)** | INIA Uruguay  
IRESA Tunisia  
ARC Sudan |
| **Contribution to ToC and impact pathways** | Support discovery research under FP2 (e.g. on heat and drought, yield), integral part of validation research under FP3, leading to elite line development and global dissemination to over 600 IWIN collaborators. |

Just as important is committing resources to developing and maintaining partnerships:
Table 32-3. WHEAT uses a mix of (co)-funding approaches and modalities to accommodate different partnership purposes and partner co-funding ability.

<table>
<thead>
<tr>
<th>Type of p'ship / example</th>
<th>Decision-maker</th>
<th>Funding timeframe</th>
<th>Partner co-funding</th>
<th>Funding source</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEAT competitive grants</td>
<td>Research; WHEAT = contractor (to non-CGIAR R&amp;D partner sub-grantees)</td>
<td>WHEAT-MC</td>
<td>1-3 yrs; 1 yr contracts</td>
<td>Sometimes; in-kind (salaries, infrastructure use)</td>
</tr>
<tr>
<td>WHEAT commissioned grants</td>
<td>See above</td>
<td>WHEAT-MC; FP Leads</td>
<td>1-3 yrs; 1-yr contracts</td>
<td>Sometimes; in-kind</td>
</tr>
<tr>
<td>Global or regional consortium</td>
<td>Equal partners CRP NARS, other / Precision Phenotyping Platform Network</td>
<td>Consortium mgmt. body, Sci advisory body guides</td>
<td>Multi-year</td>
<td>Yes, in-kind &amp; financial</td>
</tr>
<tr>
<td>National, regional or global coordination of R4D</td>
<td>Membership (Wheat Initiative), ad hoc, permanent forum, committee (country coordination; African SROs, e.g. ASARECA)</td>
<td>Members, by consensus</td>
<td>Varies, for coord. only</td>
<td>NA</td>
</tr>
<tr>
<td>Bilateral program or project</td>
<td>Research, development; national implementation partner sub-grantees / CSISA Also: CIMMYT, ICARDA sub-grantees</td>
<td>Program or Project Mgr, steering committee, donor Non-CRP Project Mgr</td>
<td>1-3 yrs depends on bilateral contract</td>
<td>Sometimes</td>
</tr>
<tr>
<td>NEW: Joint CRP project</td>
<td>CRPs = equal partners</td>
<td>CRP-MCs</td>
<td>1-3 yrs</td>
<td>NA</td>
</tr>
<tr>
<td>Non-CGIAR aligned program or project</td>
<td>CIMMYT, ICARDA under WHEAT = contractee / IWYP</td>
<td>Non-CRP program mgr &amp; steering committee</td>
<td>depends</td>
<td>Y</td>
</tr>
<tr>
<td>NEW: WHEAT &amp; non-CGIAR aligned program: Joint project</td>
<td>WHEAT = equal partner / FACCE-JPI</td>
<td>WHEAT-MC / non-CRP-MC</td>
<td>depends</td>
<td>Could be</td>
</tr>
</tbody>
</table>
What **kind of partners** does WHEAT work with? Overall, WHEAT combines more than 250 partners that together have a tremendous track record. Instead of providing a generic categorization of partners, we provide some examples of collaboration:

1. WHEAT’s International Wheat Improvement Network is the most important source of new genetic variation for wheat yield increases, adaptation to climate change, resistance to pests and diseases and the basis for the rapid response to Ug99 rust races.

2. WHEAT accesses, develops and transfers scientific innovations to NARS partners as an IPG, through germplasm and data exchange, joint research and capacity development. It uses its convening power to involve ARIs and the private sector in research within pre-competitive domains, e.g. for hybrid research, genomic selection, Big Data, mechanization, and nutrition research.

3. WHEAT is co-leading an 11-CRP research study on gender norms and women and men's decision-making within households related to farm planning and management. The study develops synergies between the scarce gender research capacities in ARIs and NARS to empirically analyze gender roles and social norms in wheat growing environments. It also examines the way these factors affect production and productivity of wheat. The study will develop strategies to address gender-based constraints in wheat farm systems and the wider environment.

4. WHEAT partners are an important source for the capacity building of students, scientists, technicians and professionals from NARS with 5 to 10 students finishing their degree training every year. In 2014, over 500 applied training courses and field days reached out to 20,000 farmers and research and development collaborators.

5. The deployment of CGIAR wheat staff in regional offices allows close collaboration, understanding of farmer needs, opportunities for engaging local partners in collaborative research and scaling-out, which has led to the successful development of sustainable intensification approaches in Asia, Africa and Latin America, as well as south-south collaboration on mechanization.

6. WHEAT shapes the international R&D agenda to address cross-border challenges and foster collaboration among NARS based on delivery of IPG. It engages with sub-regional and regional agricultural research organizations (e.g. ASARECA, APAARI, CACAARI, PROCISUR), launches with partners new international consortia (e.g. International Wheat Yield Partnership, Durable Rust Resistant Wheat) and participates in the G20 endorsed Wheat Initiative.

**Engagement with the private sector**

Wheat-related research remains overwhelmingly in the public sector, though in recent years private sector engagement has increased in developed countries. WHEAT engages with this sector by:

1. Performing joint and commissioned research, such as on wheat hybrids, marker development, conservation agriculture and fertilizer regimes (e.g. Syngenta, Limagrain, Bayer Crop Science).

2. Co-developing solutions along the value chain, such as business models for appropriate-scale mechanization solutions (in Bangladesh, Mexico, Ethiopia).

3. Working with seed companies to disseminate improved varieties for adoption by farmers.
4. Through further capacity development and knowledge-sharing capacity (e.g. Borlaug Foundation for Training, with private sector contributions; sponsorship of conferences and awards, such as the Jeanie Borlaug Laube Women in Triticum (WIT) Early Career Award, HeDWIC/Bayer Crop Science).

5. With all wheat agri-food system actors, through hubs (e.g. CSISA, AIP/Pakistan, MasAgro)

What are WHEAT partners looking for? Surveys underline key elements of Centers’ and their R&D partners’ comparative advantage

1. In the first CGIAR Stakeholder Perceptions Survey, research partners rated WHEAT highest among all CRPs on global expertise, high-caliber staff, high-quality research innovation, relevance of research and facilitating access to research, helping others to innovate and develop sector specific knowledge.

2. The Partner Priorities Survey emphasized that the close proximity and in-depth understanding of CGIAR researchers is a strong comparative advantage. WHEAT staff are based in Afghanistan, Bangladesh, China, Egypt, Ethiopia, India, Iran, Kazakhstan, Kenya, Lebanon, Mexico, Morocco, Nepal, Pakistan, Rwanda, Syria, Tunisia, Turkey and Uzbekistan.

3. A major donor-funded CIMMYT Breeding Program Review noted the success of the CGIAR’s International Wheat Improvement Network and considered capacity development another key strength: “CIMMYT has excellent relationships with the international research community as well as the national research partners. Training is a key element of these relationships and CIMMYT has a very good track record ... CIMMYT plays a critical role in supporting NARs through sharing best practices, training, providing technology services, and collaborating on projects.”

Strategic Partnership Activities: Major WHEAT partner consultation events between 2012 and 2016


- Since 2012-13, G-20 Wheat Initiative: Thirteen CIMMYT scientists are members of nine Expert Working Groups, contributing to improved global coordination of national wheat research: http://www.wheatinitiative.org/activities/expert-working-groups.

- 2013, ICAR (India): 5-year planning meeting and participation at annual ICAR-DRWB meetings. The Director of ICAR-DRWB (Karnal) is a member of the WHEAT-Management Committee.

- 2013-14: WHEAT Partner Priorities Survey, with 92 responses from 34 countries regarding priorities for IAR4D versus national research; http://wheat.org/partnerships/wheat-partner-priority-survey/.

- 2014, PROCISUR/IICA (Latin America Southern Cone): Identification of R&D priorities from member countries’ perspective at Borlaug 100 Summit. http://wheat.org/dr-victor-m-villalobos/. WHEAT participated in the CGIAR-IICA consultation on Sustainable Agriculture Intensification in LAC.


- Yearly, Central Asia: CACAARI annual review and planning meetings (managed by the CGIAR Coordination Unit, Tashkent): http://www.cacaari.org/en.php.


2015 (Nov): International Wheat Innovation Workshop, with the major European wheat research programs: [https://colloque.inra.fr/iwiw](https://colloque.inra.fr/iwiw).

2015 (Dec): MAIZE, WHEAT Sustainable Intensification write-shop with CRPs HT, DS.

**2016 Partner Feedback on WHEAT Full Proposal via online consultation**

In February 2016, WHEAT surveyed all 50+ non-CGIAR partner participants of the *Global Partners Meeting on Phase II* (December 2014) and opened up the online consultation via its webpage and a press release. WHEAT received a total of 25 responses from a wide range of countries (India, South Africa, Ethiopia, Tunisia, Australia, Kazakhstan, Europe, Japan, etc.) and type of partner institution (NARS, ARIs, universities, etc.).

Overall, the Full Proposal found wide acceptance, and a number of helpful suggestions were received:

- Partners found the document relevant and applicable;
- Those who had already participated in pre-proposal development stated that their concerns and comments had been addressed;
- Overall, satisfaction with the Full Proposal was high (68% very, 32% satisfied);
- 100% of partners endorsed the Full Proposal.

2016 Selected R&D partners participate in Full Proposal development.


(Apr): Participation GCARD3 Conference, Johannesburg, South Africa.

(July-Sept): Workshops with YPARD, IDS on youth strategy, based on a framing paper.
3.1 Capacity development strategy

Introduction

CIMMYT and ICARDA have a long history of capacity development (CD) activities; to strengthen their collaborating institutions in less developed countries. During the 1960s and 1970s, such activities focused on building a basic cadre of agricultural researchers in most developing countries through support of degree studies and long-term on-the-job training courses. During the 1980s and 1990s, the scope of capacity development activities diversified both in terms of disciplines and training modalities. Many developing countries established degree study programs at their own universities. From the early 2000s onwards, almost all capacity development efforts of both centers were concentrated within research projects. Though project-based funding assured the relevance of training interventions for specific research projects, it prevented a more strategic approach. The downside was a fragmentation of efforts and short-term duration of interventions without monitoring and follow-up. Projects generally end before their outputs reach ultimate beneficiaries and do not include evaluation of training impact, which is usually largest after the project completion. In WHEAT Phase-I, several approaches were taken to strengthen the capacities of intermediary and ultimate beneficiaries, including: a) international/regional/national training courses on areas identified by the stakeholders; b) farmer field days and demonstrations of improved technologies; c) technical training, and training of trainers; d) advanced degree training (via co-supervision of postgraduate students); and e) ad-hoc, on-the-job training of visiting scientists. A 2014 study on the impact of training in China is illustrative of the kind of impacts that long-term capacity development activities in partnership with a NARS can deliver (provide hyperlink).

These and other lessons learned from approaches employed during the first phase of WHEAT are reflected in the comprehensive capacity development strategy for WHEAT Phase II, which aims to engage at the three levels: Individual (competence development; maintain highly recognized international training courses), organizational development and via inter-CRP collaboration and at the societal level (see Table 33-2).

Performance gaps and underlying problems of National Agricultural Research and Extension Systems (NARES) are different in every country and region. There is no “silver bullet” solution applicable across the countries and regions. While it is not in the scope for WHEAT (on its own) to address the full range of the capacity development needs of the collaborating NARS, this CRP aims to adopt a comprehensive perspective, in supporting enhanced capacities of relevant NARS actors in particular regions to establish capacity development strategies, WHEAT support will focus on methods and tools to develop a CD strategy, bring relevant actors to the table, capacity/needs assessment and other methods.

The new cross-cutting CoA led by a BMZ-co-funded position will serve as a platform for inter-Flagship Project coordination and focusing of training/capacity building of R&D partners in SSA, Asia and LA, with the aim to significantly enhance the local capacities. Note that research on capacity development, with a focus on innovation systems, will be led by FP4.4.

Long-term objectives

1. Build a new generation of wheat scientists among our NARS partners and within CIMMYT and ICARDA, together with a committed group of national public and private partners. Gender-sensitive approaches throughout capacity development cycles are a critical component.
a. Links to subIDO *Enhanced individual capacity in partner research organizations through training and exchange*. WHEAT considers CGIAR Centers to be in scope. Aiming for *Enhanced institutional capacity* at IDO-level (e.g. multi-country, several NARS partners per country) is only realistic, if CRPs collaborate in a particular country (e.g. Country Coordination).

2. Integrate capacity development strategy and activities into improved scaling out approaches and partnerships for greater impact, fully complementary to the FP4.4 objective of enabling improved farmer decision-making and farm management through tailored capacity development at community and landscape levels, which can be scaled out by development partners.

a. Links to subIDO: Increased capacity for innovation in partner development organizations and in poor and vulnerable communities. Such a development outcome is realistic for a few of WHEAT intervention areas. Inter-CRP collaboration on systems research on innovation pathways and adoption dynamics should reinforce this.

**Strategic actions and progress indicators** (see table 33-2 below for more detail)

Strategic interventions led or coordinated by FP4.4 include:

1. Identifying and employing the best capacity building approaches to enhance the knowledge/skills of partners engaged in various CoAs;

2. Systematically assessing the capacity building needs of key partners, and designing appropriate intervention strategies;

3. Designing innovative capacity building content development and knowledge-sharing mechanisms following best practices in learning and instructional design theories;

4. Developing a process of fellowships and mentorships for future research leaders through better linkages between CG centers, ARIs and advanced NARIs;

5. Developing and adopting gender-sensitive approaches in capacity building to enhance the achievement of gender-related goals and overall outcomes;

6. Effectively transferring knowledge on validated new tools/technologies, including molecular markers/genomics-based breeding, remote sensing for crop management, managing large datasets, quality control in seed production, seed and farm business management skills, sustainable intensification of wheat-based systems, processing and value-addition; g) strengthening institutions to influence policy design and reform, through facilitation of and engagement in multi-stakeholder dialogues, thereby enhancing the capacity of decision makers to use research outputs; and

7. Formalizing M&E of capacity development to solicit feedback, quantify the effectiveness of training, and effectively capture the lessons learned. are shown in the table below (see per FP sections for a description of the role of capacity development in each FP’s impact pathway and theory of change).
### Budget and resource allocation:

Table 33-1. Budget components relate to strategy implementation and do not include per FP budgets (from whatever source of funding) for cap dev activities.

<table>
<thead>
<tr>
<th>Strategic, bottom-up activity</th>
<th>Required budget p.a. $US000’s</th>
<th>Funding source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop Capacity Development strategy, guide and mainstream implementation</td>
<td>1 FTE (250k)</td>
<td>BMZ-CIM (bilateral), W1&amp;2 – CoA budget</td>
</tr>
<tr>
<td>A NARS comprehensive Capacity Development Needs Assessments (1-3 p.a.)</td>
<td>200k</td>
<td>W1&amp;2 matched to NARS funding</td>
</tr>
<tr>
<td>B Maintain and expand international training programs</td>
<td>150-250k</td>
<td>W1&amp;2 for coordinator; participants via project and other funding</td>
</tr>
<tr>
<td>C Design and implement a WHEAT Learning Platform: Focus on demand-driven knowledge-sharing and learning activities with the NARS partners of the Precision Phenotyping Platforms Network.</td>
<td>250k, increasing to 750k</td>
<td>W1&amp;2 matched by NARS funding (in-kind, financial)</td>
</tr>
<tr>
<td>D Develop approaches to simultaneously increase the ‘capacity to innovate’ in all components of an innovation system</td>
<td>Tbd</td>
<td>FP4.4 budget</td>
</tr>
<tr>
<td>E Build, maintain and share an overview of Capacity Development activities in all projects</td>
<td>20% of 1 FTE (50k)</td>
<td>W1&amp;2</td>
</tr>
<tr>
<td>F Assist R4D implementation partners (non-CGIAR, CGIAR), with methods and tools</td>
<td>Tbd based on a multi-year action plan; best estimate 300k</td>
<td>Initially W1&amp;2</td>
</tr>
<tr>
<td>G Integrate Cap Dev progress indicators into the WHEAT M&amp;E&amp; L Framework</td>
<td>Completed by end 2017; follow-up cost for routine implementation tbd</td>
<td>Part of Lead and Participating Center MEL unit budget</td>
</tr>
<tr>
<td><strong>2018</strong> (not feasible with 2017 W1&amp;2 budget)</td>
<td><strong>US$ 1M</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Table 33-2. WHEAT CD strategic and bottom-up actions.

<table>
<thead>
<tr>
<th>Key activities / Progress indicator</th>
<th>Levels of engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td><strong>Strategic actions</strong></td>
<td></td>
</tr>
<tr>
<td>(A) Support (a) NARS partner(s) in a particular country in realizing a comprehensive capacity development assessment, which may point to the need for change at the institutional level. Participatory assessments, including action plans and Open issues list, documented and communicated (e.g. piloted with IRESA-Tunisia, see draft report here hyperlink TNA Tunisia 10-04), see also <a href="https://library.cgiar.org/bitstream/handle/10947/4080/CapDevIndicators_18%20Nov2015.pdf?sequence=1">https://library.cgiar.org/bitstream/handle/10947/4080/CapDevIndicators_18%20Nov2015.pdf?sequence=1</a> outputs 1 and 2, p.5 NARES partners repeatedly plan for Capacity Development in their annual budgets (this would be a novelty in most public sector NARS; not proposed as indicator by Cap Dev CoP)</td>
<td>Y</td>
</tr>
<tr>
<td>(B) Maintain and expand international training programs that cut across all FP’s scientific domains and foster a network of alumni, who promote international agricultural research for development (IAR4D). Post-training and 1-year later self-assessments of learning goals achievement and benefits derived from applying learning on the job completed by participants. See Cap Dev Indicators Nov 2015 paper (link above): Number, quality and targeting of short-term training Registered alumni and alumni use of web-based services dedicated to them.</td>
<td>Y</td>
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</table>
| (C) Building on B, with a select group of partners, design and implement a WHEAT Learning Platform, as a model for effective and sustainable information management (e.g. Wheat Atlas), knowledge sharing and learning tools, make use of new learning formats and channels and provides a major inroads for inter-CRP collaboration. Depending on potential users’, funders and partners input, may evolve into several related platforms, e.g. (national; between relevant actors of a national agricultural sector; regional: between actors of different national agricultural sectors and at global wheat research community level).
As a first lower-cost step, focus on demand-driven knowledge-sharing and learning activities with the NARS partners of the Precision Phenotyping Platforms Network. Also, establish repeatable approach to sharing training and learning materials currently used by different WHEAT partners (possibly in collaboration with the G-20 Wheat Initiative).
*Project milestone achievement, target audience participation rates and self-assessments.*
*Learning Platform: Access, usage, use intensity and user satisfaction indicators.* | Y | Y |   |   |
A joint undertaking with FP4.4, develop approaches to simultaneously increase the ‘capacity to innovate’ in all components of an innovation system, at the individual, organization and enabling environment levels, so that local stakeholders’ capacity to negotiate their agricultural futures is improved.

**Approach to monitor progress towards outcomes to be developed together with other CRPs, making use of suggested indicators Cap Dev Indicators Nov 2015 paper (link above), p.14**

| Build One Global CGIAR Wheat Program by 2018 |
| ICARDA & CIMMYT joint CD planning, coordination and implementation for own staff and activities aimed at R&D partners and end users is a routine activity. |

**Bottom-up activities and progress indicators:** Their focus is to build the competence of CGIAR and non-CGIAR project leaders and scientist-‘trainers’ planning and practicing capacity development.

| (E) Build, maintain and share an overview of Capacity Development activities in all projects |
| WHEAT budget assigned, part of a job description, database accessible and used. |

| (F) Assist R4D implementation partners (non-CGIAR, CGIAR), with methods and tools to identify performance gaps, learning needs, provide options for how to train/learning formats, collective and self-assessments of learning impact, as well as planning for capacity development in departmental and project budgets. |
| Individual and collective self-assessment, participant surveys of learning goals achievement and benefits derived from applying learning on the job; participant feedback of performance of project leaders and scientists engaged in training different target groups and change over time. |

| (G) For both strategic and bottom-up: Integrate Cap Dev progress indicators into the WHEAT M&E& L Framework. See Cap Dev Indicators Nov 2015 paper (link above), p.11. |
| The aforementioned study of the impact of CIMMYT training on Chinese scientists relied on five major indicators of research capacity (e.g. ability to obtain the research funding, five dimensions of academic performance). The results show that the CIMMYT training programs have improved the trainee’s ability to obtain research funding and their academic performance. (hyperlink). |

| ARI partners: INRA-France, Agriculture Canada, Uni. Cordoba-Spain, CSIRO-Australia, USDA-USA |
| Non-profit partners: CGIAR-ICARDA; IITA; Borlaug Training Foundation; Crop Life International; FAO |
| Private sector partners: SOSEM-Tunisia, INGC-Tunisia, BASF-Germany, Syngenta |
3.4 Gender strategy

Knowledge on gender in wheat based agri-food systems gained in Phase I and informing Phase II

Until 2011, the integration of gender and social equity in CRP WHEAT’S socio-economic research was not an institutional priority. It was based on individual interpretations and interests and tended to be donor-driven. Since then structured, strategic work to create an effective learning research institution able to support, assimilate and mainstream researcher-driven learning on gender in wheat and maize systems has been an important focus. Work to date includes Gender Audits in WHEAT and MAIZE (2013), a Gender Capacity and Awareness Building Program to strengthen scientist research skills in gender (Wong et al. 2015); Research Management Framework; developing gender in IDO and Flagship Projects (2014-2015); developing gender-responsive Key Performance Indicators; Gender budget tracking (DAC); and a Gender Policy (draft 2015). This work has contributed towards a dramatic upsurge in bilateral partnerships and funding, from 4 projects in 2012 to 20 in 2014 and 18 in 2015. CRP WHEAT leadership demonstrates strong support through ensuring gender is addressed in meetings, TOC workshops, reviews etc.

Challenges to integration between Flagships remain. It can be difficult for upstream scientists to understand how their work on germplasm suited to large environments can address what appear to be trait preferences by small niche groups, including women or particular indigenous communities. Taking gender to the types of scale WHEAT operates on is a further challenge. The increasingly high profile of gender in WHEAT’s work can create expectations among scientists and partners for support in gender research and analysis that cannot currently be met within existing staff capacity. A community of practice is under development and it is expected this will help expand analytic skills and knowledge.

The revised Gender Strategy for WHEAT (approved 2014) guides gender research planning and implementation. Given the paucity of gender data in wheat-based systems in particular (Jafry, 2013), WHEAT is prioritizing building a strong evidence base on gender relations in these systems. The aim is to contribute towards equality of opportunity and outcomes from wheat R4D between resource-poor women and men farmers. The research strategy for gender in WHEAT is broadly:

- To initiate research in a geographical area with a scoping study to document the current state of knowledge and experiences to date, including both research and development related to wheat, as well as overall policy frameworks and the organizational landscape.
- Subsequently, to complement this with cases studies on gender norms and agency in wheat producing areas.

During Phase I, WHEAT undertook a scoping study to assess the status of integration of gender and social equity in wheat R4D in South Asia, a priority region for the CRP (Jafry, 2013). The scoping study confirmed the paucity of evidence regarding gender and social inclusion in wheat-based livelihoods. Initial capacity strengthening for sex-disaggregation in data collection was initiated in Phase I and will be consolidated in Phase II.

WHEAT Phase II research priorities (see section 1.4) are further informed by WHEAT research on gender and rural livelihood diversification (Rahut et al. 2014); women’s participation in farming activities in Pakistan (Ali et al. 2014, 2015); the need to address gender trade-offs of new agricultural technologies (Beuchelt & Badstue 2013); and the potential of gender-responsive service provision and information diffusion in South Asia (Mittal & Mehar, 2014). The literature review covering WHEAT research and similar research suggests that wheat growing areas are facing significant climate-change related stress, and other forms of stress. However, sharply unequal gender relations render women particularly vulnerable with weaker coping strategies, particularly when men out-migrate. At the same time, the
rehearsal of socially acceptable gendered behaviors in public forums may belie considerably more complex intra-household decision-making processes. Women are actually far more involved in almost all tasks in many (though not all) wheat-based farming systems than social norms suggest; intersectionalities with caste and age make the picture more complex still. There is limited evidence, requiring further study, that when wheat lines express strongly marketable traits such as rust-resistance these may be grown entirely for sale as seed by men (Nelson, 2013). Women may not be able to access women-preferred traits if they are also offered in these lines unless downstream work on intra-household decision-making is conducted (etc.). Gender-responsive and gender-transformative research is needed to understand and negotiate carefully between public accepted social norms and more complex realities. Examples of WHEAT research in Phase I are described below. Phase II will begin analyses of data as well as conduct further research.

**GENNOVATE:** CRP WHEAT is a leading actor in GENNOVTE (https://gender.cgiar.org/collaborative-research/gennovate/), a cross-CRP comparative research initiative examining how gender norms and agency influence the ability of men, women and youth to learn about, try out, adopt and adapt new agricultural technologies. In WHEAT 48 case studies were developed in 8 countries. Initial findings are taking shape: In Uzbekistan male outmigration contributes to increased involvement of women in value addition and farm management. This is beginning to influence changes in gender norms related to ‘what a woman can do’. In Morocco, mechanization of agricultural activities in wheat production is ranked amongst the top innovations for women reducing female drudgery in weeding, sieving, winnowing and cleaning seeds. However, despite increasing female involvement in both Morocco and Uzbekistan in farm management women prefer to consider these roles as temporary. This may be a strategy for managing 'dissonance' between societal norms and what is actually happening.

**Promoting ICT-based delivery of climate-smart agricultural practices to women and men in Bihar and Haryana, India:** Research on the mobile phone delivery of information on weather, modern seed varieties, and climate-smart agricultural practices to 900 men and women farmers indicated reduced information asymmetry among farmers in general, and between women and men farmers specifically. The listening rate (i.e. the proportion of the full duration of the message listened to) of women farmers was equivalent to that of men farmers. Women farmers reported agro-advisory messaging has improved their knowledge about climate-smart technologies as well as their participation in intra-household decision-making because they are now better informed and recognized as such by male partners.

**Gender Dimensions of the Ability to Adopt Climate-Smart Agricultural Practices in Bihar and Haryana, India:** Comparative research on differences between men and women farmers in climate-smart villages, regarding their ability to select and adopt climate-smart agricultural practices (CSAPs) showed social institutions, including gender, caste and tribal status, as well as the economic position of the household are significant factors determining the ability of households to adopt CSAPs. Although adoption of CSAPs in Bihar is low due to poverty and small landholdings, female-headed households are more likely to adopt CSAPs than male-headed households.

**Wheat Trait preferences:** Only a limited number of studies consider gender differences in wheat trait preferences. For example, an Ethiopian study (Nelson, 2013) shows that both women and men value high-yield attributes, tillering and also baking quality, grain marketability, and plant dry matter for animal fodder, fuel, and roofing. Women prefer 'tried and tested' older varieties for preparing traditional dishes, home-made fermented beverages, and as straw for roofing material. Men are primarily concerned with marketability and high yield. New, widely grown rust-resistant varieties have, in the study area, never been cooked or used for other purposes. They are grown only for seed due to high market demand (Nelson, 2013, see also Ortiz-Ferrara et al. 2000). This has strong implications for
work to develop integrative traits: marketability in male-dominated markets may prevent women from accessing and benefiting from secondary traits they favor. Downstream work may need to focus on securing equity in benefit flows, securing women a niche in markets, etc.

**Persisting unequal gender roles and relations in many core wheat regions**

Many WHEAT core target regions, particularly rural areas, from North Africa, across the Middle East and into South and East Asia, frequently exhibit rigid cultural and social norms (Abdelali-Martini 2011; Jafry 2013; Offenhauer 2005). Despite planned and unplanned change in all these regions, including civil rights and women’s movements, tenacious and unequal gender roles and relations, and consequently differential abilities to benefit from technologies often persist (Kabeer et al. 2011; Echavez, 2012; Behera et al., 2015). Research on laser land levelling (LLL) in Haryana, India, show that female headed households (FHH) have almost no access to information, and women farmers depend on male relatives or children to approach a male LLL owner or service provider to draw up a contract (Aryal et al. 2015).

Studies elsewhere report that men more likely to prepare land and plant, whilst harvesting and transport/ head-loading is shared between men and women. Weeding and post-harvest processing is either shared or mainly done by women (Ashrafi 2009; Klawitter et al. 2009; Munoz et al. 2013; Tavva et al. 2013).

Interpretative caution is important: Women and men frequently deliberately model gender roles in public spaces in accordance with local societal norms. However, actual roles and responsibilities, and intra-household decision-making processes, can be considerably more complex. Projects developed on the basis of ‘public displays’ run the risk of obscuring actual behaviors and processes and can further marginalize women by excluding consideration of their needs and priorities. Gender-blind projects may result in further supporting the capabilities of men thereby deepening inequalities (Galiè, 2014). Indeed, ‘conceptual lock in’ persists in many research and extension systems whereby men are considered farmers and women helpers (Ashrafi 2009; Aryal et al. 2014; Farnworth & Colverson, 2015), despite strong participation by women in reality (Nelson, 2013; Galiè et al. 2013, 2014).

In Pakistan households with active female participation were able to grow high value crops, required less hired labor and had a higher income compared to households with no women’s participation (Ali et al. 2014, 2015). Findings from Afghanistan indicate that women’s involvement in wheat production depends on factors including economic standing, marital status, labor resources, land ownership, the degree of stigma related to men’s and women’s involvement in certain activities, and how strongly individuals and households adhere to these (Ashrafi 2009; Munoz et al. 2013).

Studies in the IGP on gendered vulnerabilities to climate changes suggest that inequalities in existing social structures shape gendered patterns of vulnerability (Sugden et al. 2014). Women typically have weaker social support networks, weaker access to assets including land and credit with which to potentially bridge a difficult season, less access to advice on adaptation and mitigation technologies, and lower participation in intra-household decision-making around which coping, adaptation and mitigation strategies to adopt (Sugden et al. 2014; Sheremenko & Magnum, 2015; Mehar et al. 2016). Male outmigration is a primary response to livelihood stress; this can magnify the vulnerabilities of women left behind (Sugden et al. 2014, see also Rahut et al. 2014).

**Two-pronged approach to implement the WHEAT Gender Strategy**

As described in section 1.4, the Gender Strategy is implemented through

- Strategic gender research
- Mainstreaming gender research into ongoing and future programs and projects, whilst incorporating gender research into institutional frameworks. How is this achieved?
Incorporating the gender research dimension in institutional frameworks

Under the WHEAT Research Management Framework (RMF) funded projects prepare a detailed work plan. Activities planned are assigned to the person responsible in the Research Management System (RMS). This person must provide progress updates at the task and summary task levels. Reports are then aggregated up to the project level and up to the Cluster of Activity, Flagship Project, and CRP levels. Physical progress reported to the RMS is integrated to financial management. This allows financial and physical issues in implemented to be notified and projects to be recalibrated as necessary. Key Performance Indicators (KPIs) are registered at the RMS level. Gender is mainstreamed into all relevant CRP WHEAT research development, implementation and evaluation processes:

- Gender-responsive R4D project design; Gender budget tracking (DAC).
- Gender Competency Framework: to strengthen scientist research skills in gender.
- Gender-responsive and sex-disaggregated research implementation in targeting, data collection and analysis, participatory technology testing / evaluation, demonstrations and training.
- Monitoring and evaluation through tracking gender-responsive Key Performance Indicators.
- Accountability for gender-responsive outcomes.

Strong attention will be paid to managing iterative research processes. As results and lessons learnt with respect to gender are generated they will be fed back into FP and CRP learning processes, thus contributing to further development, and calibration of, the programmatic and institutional frameworks. In turn this will inform the next generation of research projects and FP implementation.

Tracking and evaluating progress

Under the WHEAT Research Management Framework (RMF) funded projects prepare a detailed work plan. Activities planned are assigned to a specific individual in the Research Management System (RMS). This person provides progress updates at task and summary task levels. Reports are then aggregated up to project level and thence to Cluster of Activity, Flagship Project, and CRP levels. Physical progress reported to the RMS is integrated with financial management reporting. This allows financial and physical issues arising during implementation to be assessed with projects recalibrated as necessary. Key Performance Indicators (KPIs) are registered at RMS level.

Sex-disaggregated KPIs include the number of (i) Wheat lines with characteristics valued by women farmers, (ii) Technologies evaluated with explicit relevance for women farmers, (iii) Trials conducted with women farmers, (iv) Demonstrations conducted with women farmers, (v) Technologies demonstrated with explicit relevance for women farmers, (vi) Surveys with sex-disaggregated data.

Adoption studies and impact assessments (especially under CoA 1.2) investigate uptake of CRP WHEAT technologies.

When funding has been secured for projects sex-disaggregated data on beneficiaries to be reached can be provided.
3.5 Youth strategy

Introduction

90% of the world’s young people live in Africa, Asia and Latin America and the Caribbean. Up to 70% of youth in SSA and South Asia live in rural areas (Bennell 2010), and 47% of rural youth in Africa work in agriculture (Kokanova 2013).

The combined challenges of continued population growth, declining agricultural productivity growth and environmental depletion put pressure on agricultural research and development to work on all fronts to further enhance agricultural productivity and food security. Youth, or young women and men, represent a tremendous human resource and development potential, but have often been neglected in agricultural research and development. In recognition of the need to leverage the potential of youth for agricultural development and food security, CRP WHEAT phase II will include special attention on exploring avenues for harnessing the capacities, opportunities and empowerment of young women and men as agents of change in wheat agri-food systems. In the course of phase II, WHEAT will increasingly combine bottom-up and top-down approaches. Part of the strategy is also to determine the comparative advantage of WHEAT in doing youth-related research linked to agricultural systems research.

The rationale for a focus on youth in WHEAT

The agricultural sector’s declining ability to attract youth causes concern in the face of continued population growth, rising food demands and natural resources challenges (Sumberg et al. 2012). According to Kokanova (2013), youth working in agriculture represent the poorest group of working rural youth compared to rural youth engaged in other sectors, often earning significantly less than the common poverty threshold of $1.25 per day. Across the globe, more and more young people do not see the farming sector as offering attractive livelihood options (Leavy and Hossain 2014). Increasingly, traditional small-scale farming, which in many parts continues to involve high levels of drudgery and hardship, is no longer enough to make ends meet and raise a family.

Young people today are generally better educated than their parents. However, with higher levels of education typically come greater expectations – both of young people themselves but also parents’ expectations for their children. But many rural contexts do not offer options that match youth aspirations (Leavy and Hossain 2014; Chinsinga and Chasukwa 2012).

Farming is a viable choice only for those who can access (enough) land and inputs. However, land fragmentation linked to rising populations as well as gerontocratic and very often patriarchal social systems is a key constraint to the development of small-scale agriculture (White 2012; for Ethiopia, see also Bezu and Holden 2014). Still, as Leavy and Hossain (2014) note, agriculture, and related fields, could acquire status among young people to the extent that it was modern and cash-based rather than subsistence oriented.

In 2013, global youth unemployment reached 12.6%, with young people almost three times more likely than adults to be unemployed (Drylands Systems Youth Strategy, table 1) and the situation is particularly critical in developing regions where 90% of the global youth population lives. Moreover, high levels of unemployment and disillusion can lead to social and political instability with the ‘Arab spring’ in 2010-11 as a recent example, as also noted by ILO in its Policy Brief on investments in rural youth (ILO 2012). The world needs farmers, as well as professionals and entrepreneurs engaged in dynamic, inclusive agri-food systems, to ensure the food and nutrition security of future generations. However, while hopes for developing the agricultural sector are often pinned to the alleged energy and innovativeness of youth and their willingness to take risks (e.g. IFAD 2013; Adedugbe 2013), interventions focusing on youth should appeal and make sense to young women and men from their own perspectives (White 2012).
Defining youth as a social category

The concept of ‘youth’ as a distinguishable demographic group is socially defined and varies across different contexts\(^1\). ‘Youth’ is often viewed as a stage in life of transition from childhood to adulthood, associated with physiological and psychological changes and increasing social and economic autonomy (World Bank 2006; Bennell 2007; White 2012). In many contexts the concept of ‘youth’ does not exist as such or is delimited by entirely different parameters for entry into adulthood, e.g. age-sets, initiation or rites of passage, the onset of menstruation or childbearing, marriage, death of a parent, working for pay (Keesing 1981, Potash 1981 in Quisumbing et al. 2014). However, defining ‘youth’ as being in transition to adulthood, conceals the fact that they are living in the here and now with their own needs, rights and interests (White 2012; Sumberg in CGIAR Consortium Off 2015).

Formal, legal definitions of youth typically apply age-based criteria linked to rights or special protective measures and policies, e.g., the right to vote or the uptake of hazardous work, and in many countries the age of 18 marks the boundary to adulthood in the legal sense. The UN system usually defines youth as persons between the ages of 15 to 24, and children as persons up to the age of 14 years.\(^2\)

Though in principle the term ‘youth’ covers both genders, in practice it often refers primarily to young males, thus rendering invisible the gender-based constraints and opportunities young rural women face (Farnworth and Sillah 2013; Levine et al. 2008; Bertini 2011). Overall, the social heterogeneity of youth and their embeddedness in different social relations and institutions needs to be understood and taken into account in research and development interventions. In WHEAT research on youth will be guided by relevant social definitions of this demographic group, taking into account their heterogeneity.

WHEAT youth strategy

By including youth-related and –focused research, we address IDO B.1: Equity and inclusion achieved. Informed by the commitment to promote equality of opportunity and outcomes, the objectives as well as the expected impact and outcomes of the CRP WHEAT youth strategy are listed in the table below:

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Impact</th>
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<tbody>
<tr>
<td>• To increase inclusion of youth in multi-stakeholder research partnerships.</td>
<td>• Improved livelihoods due to improved opportunities for young women and men to engage in wheat-based agri-food systems.</td>
</tr>
<tr>
<td>• To harness the opportunities and innovation capacities of resource-poor young women and men in wheat-based agri-food systems.</td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Outcomes</td>
</tr>
<tr>
<td>• WHEAT scientists and research teams increase research focus on youth’s local opportunity structures and their linkages to sustainable agri-food system development.</td>
<td>• Increased livelihood opportunities for young women and men, directly or indirectly linked to wheat based agri-food systems.</td>
</tr>
</tbody>
</table>

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\(^1\) This is reflected in national policies; for example, Ethiopia’s national youth policy (2004) defines youth as those aged between 15-29, while the National Youth Policy of Nepal (2010) defines youth as “women, men and third gender” persons aged 16-40 years old (http://www.youthpolicy.org/).

\(^2\) However, even within the UN system diverging age brackets exist, e.g. the Youth Fund of UN Habitat includes in the youth category people with in the age of 15-32 years, the Convention on Rights of the Child applies to persons up to the age of 18 years,
Overall approach to youth in CRP WHEAT

WHEAT’s overall approach to youth focuses on understanding and harnessing rural opportunity structures. Limited research has been conducted specifically on the roles of young women and men in agriculture (Farnworth and Sillah 2013; Proctor and Lucchesi 2012; Paroda et al. 2014) and related value chains, and statistics are rarely disaggregated by age (FAO 2014, p. xvii). Integrating a perspective on youth in the WHEAT phase-II agenda therefore has to begin with strengthening the evidence base and the establishment of a research agenda. Borrowing from Sumberg et al. (2012), key research questions include:

- How are opportunities for engagement with wheat farming and wheat agri-food system development more broadly structured for young women and men in different places?
- What are the implications of this structuring for consequent patterns of young women and men’s engagement with wheat farming and wheat agri-food systems, as well as for livelihood, poverty, social justice and sustainability outcomes?
- How might particular policy options affect or modify these outcomes?
- What are the politics around these policy options and associated processes?

Emerging findings from GENNOVATE

Current examples under CRP WHEAT of research with specific attention to the perspectives of rural youth include the cross-CRP comparative research initiative, GENNOVATE, informed by an agency – opportunity structure conceptual framework, and in which WHEAT plays a lead role (http://gender.cgiar.org/wp-content/uploads/2015/12/GENNOVATE-Flyer_WEB.pdf). As part of this initiative WHEAT is capturing the views of young women and men regarding social norms and practices in relation to their aspirations, livelihoods, capacities for innovation, physical mobility, access to economic opportunities and family formation.

Initial findings from 18 communities in Ethiopia, Bangladesh, India and Nepal indicate that the aspirations of young men and women are mostly found outside agriculture or NRM activities (see Fig.3.5-1 below). For many of these young respondents owning a business, holding a degree, or migrating is fundamental for moving out of poverty. As many relate farming activities with economic stagnation and backwardness, they hope for other opportunities.

Still, at the same time, both young women and men express interest in agriculture-related business activities, figure 3.5-2. Yet, limited access to knowledge and resources are common constraints for youth respondents across these countries. Young people speak critically about their local opportunity structures and wish for more inclusion and openness. As a young Nepalese man points out: “To be a working man I must transform traditional farming system to advance system. I must bring a total transformation in agriculture. But when I passed JTA course in 2068 B.S. (2011 AD) and came back home, I couldn’t do anything because I don’t get favorable environment. Our elders will not listen to us [and] we do not have irrigation. No irrigation, then nothing can be done in agriculture.”
Figure 3.5-1. Aspirations of rural youth (frequency), 2015 data from 36 FGs (18 men, 18 women) in 18 communities in Ethiopia, Bangladesh, India and Nepal.

Figure 3.5-2. Entrepreneurship by gender (frequency), agri and non-agri, 2015 data from 36 FGs (18 men, 18 women) in 18 communities in Ethiopia, Bangladesh, India and Nepal.
**Integrating youth in WHEAT phase-II R4D agenda**

In phase II, WHEAT will take a two-pronged approach: i) develop and implement a strategic framework for the systematic integration of youth-related issues in wheat agri-food systems research; ii) develop and apply key principles and practices for inclusion of youth-related concerns in research.

**i) Strategic framework**

In order to take stock, and achieve a rigorous input to the process of strengthening the systematic integration of youth into the WHEAT research agenda, in 2016 WHEAT is partnering with IDS to develop a strategic framework for its engagement with young people and youth-related issues. The framework will include a detailed exploration of the distinction between, on the one hand, structural issues and interventions (i.e. that affect or have the potential to affect multiple social groups), and on the other hand, what might be considered “youth-specific” issues and interventions. Structural issues within the agricultural sector include those affecting productivity, and access to land, credit, technology and markets. A working hypothesis is that much current policy and development programming that purports to address the youth and agriculture problem is “youth-specific” and therefore fails to address – or even acknowledge – the core structural issues. The development of the strategic framework will draw on findings from GENNOVATE, and on relevant research literatures, including: literature on the structural transformation of agriculture in the developing world; literature on youth transition, youth employment and young people’s imagined futures; and literature on the “new entrant problem” in developed country agriculture and the use of social protection programs to facilitate the inter-generational transfer of key assets like land. The strategic framework will guide the subsequent steps to integrate youth-related issues in the WHEAT research agenda.

**ii) Integrating a youth-lens in WHEAT research practice and procedures**

Where relevant, youth will be targeted purposefully in WHEAT research projects and increased emphasis put on gathering feedback on the research process from young men and women. In addition to sex-disaggregation, people level data collection and analysis will also be disaggregated systematically by age and other relevant socio-economic variables. Where possible and relevant, mixed methods will be applied, combining qualitative and quantitative data collection and analysis and engaging youth as research partners. To take into account the social heterogeneity of youth, representation of diverse groups will be ensured to the extent possible.

For projects with a youth focus or component, this dimension will be incorporated in the monitoring and evaluation frameworks. Similarly, adoption studies and impact assessments as well as foresight and targeting and value chain analyses will seek to incorporate consideration of youth issues.

As integration of youth in WHEAT research practice and procedures progresses, it is expected that increased awareness and capacity will lead to an increase of research projects paying special attention to youth. In a first stage of phase II, WHEAT will pursue a bottom-up approach: i.e., identify opportunities for youth-centered research that can be included into ongoing projects. Later on in phase II, WHEAT will increasingly apply top-down approaches, designing new projects from the beginning with youth components or planning youth-focused projects.
WHEAT will focus its youth informed and -focused research on the FP1, FP3 and FP4. Potential researchable issues include:

<table>
<thead>
<tr>
<th>FP</th>
<th>Possible research questions</th>
</tr>
</thead>
</table>
| 1  | • What are the structural opportunities and constraints for young men and women to engage in wheat agri-food systems?  
• What are the implications of this structuring for consequent patterns of young men and women’s engagement with wheat agri-food systems and how might particular institutional arrangements, policy options, programs, technological support or capacity building and training affect or modify these outcomes?  
• Are young men and women’s voices being heard and what are the best ways to enhance their contribution in policy dialogues? |
| 3  | • How can youth’s priorities be addressed in product development strategies?  
• How can youth be included as co-designers of agricultural innovations? |
| 4  | • What types of institutional arrangements and business models can enhance the ability of youth to access and benefit from more efficient and labor saving technologies?  
• How inclusive are service providers (public, private, NGOs) with consideration to youth in particular? How can their inclusiveness be enhanced? |
3.6 Results based management
Describe the strategy for monitoring, evaluation, learning (including feedback loops), and impact assessment; table of IDO indicators to be used, and explanation how they are going to be collected. Explain how results-based management is incorporated into CRP management structures. Max 6 pages text.

Final 2nd Call Full Proposal Guidance: CRPs “are expected to propose a RBM framework which is described as a management strategy focusing on performance and achievement of outputs, outcomes and impact. This framework should describe how CGIAR’s approach to RBM is conceptualized and will be operationalized for the CRPs to demonstrate commitment to accountability and adaptive management”. In a footnote, it is expected that guidance on operationalization of the RBM framework by the CRPs and Platforms will be developed by MEL CoP and made available through the online tool.

"I should have made nothing if I had not made mistakes." (Winston Churchill)

Results-Based Management System

Purpose
For Phase II, WHEAT will be implementing a results-based management (RBM) framework. This framework will act as a strategic management system that integrates strategy, results, people, resources, processes and measurements. It will also consist of a set of tools for strategic planning, monitoring and evaluating performance, reporting, improvement and learning. RBM will support greater accountability, transparency, informed decision making, learning from experience and better management of opportunities and risks.

This framework will be implemented based on a set of globally recognized RBM principles (see section 1.3).

Steps in Managing for Results
Given that RBM is a management strategy, the framework will be part of the overall ongoing CRP cycle of planning, budget allocation, risk management, and performance reporting and evaluation, including value for money.

Key steps that will be used throughout this cycle include: defining and revising based on lessons the impact pathways at CRP level and theories of change at the Flagship level; budget allocation based on performance; planning for monitoring and evaluation; establishing responsibilities and accountabilities; monitoring and analyzing performance and risks information; using performance and risks information; and reporting performance results.

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5 Ibid.
Implementation within CRP

CRP Impact Pathway and Flagship Theories of Change

The CRP impact pathway and Flagship Programs’ theories of change as presented in the proposal above were developed during workshops with Flagship teams. A participatory approach was used to capture all views, experiences and known evidence into these theories of change. They serve as the CRP’s hypotheses of the way by which change is expected to occur from output to outcome and impact. They are meant to be dynamic document and adapted as evidence is further collected. Assumptions explaining the causality underlying the relationships between the outcomes and impacts were also identified. Key assumptions will be tested to validate the theories of change. Furthermore, critical risks were included and will be monitored to support effective management of the CRP.

In terms of high-level outcomes, the CRP will be contributing to the following CGIAR Strategy and Results Framework elements:

Interoperable Tools to Support RBM Implementation

The CRP’s RBM framework will be supported by a user-friendly Information Communication Technology (ICT) online platform that will cover the whole program and project management cycles, including pre- and planning, monitoring, reporting, adaptive management (i.e., support decision making and program/project improvements) and learning as part of the operationalization of the CRP’s MELIA plan.
Given that projects will align to Flagship Projects’ theories of change (ToCs), the platform will be structured on the basis of these ToCs. The CRP will ensure that the platform will comply with CGIAR policies (e.g., Open Access and Data Management Policy); is interoperable with other systems, including those of the other lead center; and can produce reports necessary for the CRP. To the extent possible, interoperability with other CRPs’ systems will also be sought to support reporting at the portfolio level.

To ensure effective implementation of this ICT online platform, capacity building at various levels will be needed.

3.6.1 Monitoring, Evaluation, Learning and Impact Assessment (MELIA)

Figure 36-1. WHEAT MEL Framework along research-to-development continuum and Circle of Influence. (courtesy of CCAFS, T. Schuetz et al.)

Purpose

In order to effectively implement the RBM framework, strengthening monitoring, evaluation, learning and impact assessment (MELIA) will be necessary at both project and program levels. A robust and strategic plan is proposed and will support CRP cycle of planning, budget allocation and reporting steps. Operationalization of the plan will take place following submission of the proposal under the guidance of the CGIAR MEL Communication of Practice (CoP). To the extent possible, the MEL CoP will strive to establish minimal standardization and consistency across the CRPs to contribute to coherent reporting at the portfolio level.

In addition to the above RBM principles, the MELIA strategy will focus on adding value and creating opportunities for adaptive management and learning. The CRP will use a modular approach for the
implementation of the strategy, which will include a suite of tools, guidelines and best practices. Furthermore, plans will be put in place to systematically review the strategy and make necessary adjustments, where required, to better assist staff and management in delivering and improving the performance of the CRP. It is expected that the strategy and its modules will improve over time as more information is gathered and experience is gained in implementing such a framework.

**MELIA Strategy Modules**

**Monitoring**

A monitoring plan consisting of a continuous process of collection and analysis of data is proposed on: the performance of the CRP at the output, outcome and impact levels; the key assumptions of the theories of change; and the critical risks.

The definition of indicators to assess these above elements will be conducted by using a two-pronged approach. First, the CRP will seek indicators already in existence that are credible, well-recognized, accessible, and being monitored by other better positioned organizations (e.g., FAO, WB) and/or in national statistics. Second, in cases where there are no suitable indicators, the CRP will develop new indicators with a cost-effective monitoring system in close collaboration with the Flagship teams. Furthermore, the CRP will support and seek to use, where possible, standardized indicators established by the MEL CoP and other communities of practice.

A set of proposed indicators for intermediate development outcomes to which the CRP will be contributing is proposed in the table 5 (section 2.2). These proposed indicators and others at lower levels will be developed and confirmed during the operational phase of the RBM framework after proposal submission.

In addition to the targets identified for SLOs, the CRP will identify targets to indicators, to the extent possible and where appropriate, drawing from existing baselines, studies, and thematic and regional context expertise. The methodology used to identify the targets and to measure progress, as well as key assumptions, will be detailed to ensure transparency.

To complete the monitoring plan, data collection sources and methodologies, responsibilities and timelines will be identified for each of the indicators. A variety of methodologies are expected to be used dependent on the indicators, including document reviews, surveys, case studies, meta-analyses, meta-syntheses, impact assessments, adoption studies and contribution analysis.

**Evaluation**

Under the CGIAR Policy for Independent External Evaluation, several types of evaluations have been identified to support the system, including IEA commissioned External Evaluation, CRP-Commissioned External Evaluations (CCEEs), and Impact Assessments.

The IEA conducts a cycle of **Independent External Evaluations** of CRPs to provide accountability, support to decision making, and lessons for improving quality and effectiveness of research programs. It is expected that IEA will use CRP monitoring and evaluation information as its primary source of evidence, including CCEEs, impact assessments, and annual monitoring reports.
The CRP will operationalize a rolling evaluation plan to build credible evaluative evidence to support decision-making and lessons for improved and more cost-effective programming. This rolling plan will include CCEEs, impact assessments and other studies identified by CRP management.

The **CCEEs** will most likely be at the Flagship level but could also include other programming elements to evaluation. The conduct of these CCEEs will be spread over the cycle to minimize the burden on management and researchers. The CCEEs will cover at least half of the budgeted activities of a Flagship in a cycle in line with the CGIAR Independent Evaluation Arrangement’s Guidance for CRP-Commissioned External Evaluations (January 2015). A maximum budget of $300,000 per year will be identified in the CRP budget for the conduct of these CCEEs. Joint CCEEs will be sought to leverage the resources of multiple CRPs and to assess performance within a geographic focus (likely in line with the site integration plans) or thematic area (e.g., seed systems, nutrition, and gender). They will be conducted in line with the CGIAR Evaluation Standards.

These CCEEs will consist of a systematic and objective assessment of the program based on evaluation criteria related to relevance, efficiency, quality of science, effectiveness, impact and sustainability. They are considered the building blocks to the external evaluations conducted by the IEA.

The CRP proposed rolling plan for CCEEs is attached to this section. The CRP management will annually review this plan to ensure it meets its needs for accountability and learning purposes. Planned impact assessments can be found in the FP1 section of the proposal.

**Impact Assessment**

Globally, impacts are defined as the positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended. Within the CGIAR, impacts are described as the consequences of the CRPs on the state of selected development variables concerning the SLOs, which are themselves related to Sustainable Development Goals. There is increasing recognition that interventions that contribute to complex, indirect causal chains, with multiple partnerships, and with data limitations require a broad range of methods to evaluate effectively, especially at the impact level.

Therefore, the CRP will adopt a mixed methods approach to evaluate its performance, including ex-ante and ex-post impact assessments. Specific needs of the CPR for the conduct of impact assessments will be identified as part of the monitoring plan as well as by the programming needs for prioritization of research and improved performance.

Impact assessments aim to understand impact (attributable change) and how that impact has been brought about. In order to do so in a way that yields unambiguous results, it is helpful to analyze interventions with a theory-based evaluation (TBE) methodology (Ton, 2012). The basis of this approach is the use of theories of change and the determination of critical nodes where the development process may need to be validated. These critical nodes are the focal points of impact assessment. Depending on the nature of the critical node, (i) whether it is a state or a process, (ii) whether data related to the critical node can be gathered easily or not, and (iii) whether the data is quantitative or qualitative, will determine the type of method that can be employed for the impact assessment, hence the mixed methods. The rigorous application of impact logic for conducting meaningful ex-ante impact assessment allows for determining the key issues that need to be monitored in order to do ex-post impact assessment.
assessment. For each step in the intervention logic framework there are a number of questions that need to be answered:

- What are the key assumptions and do they need to be tested?
- What outside factors that are not under control of the programme play a key role? How do they form a counterfactual to the intervention logic?
- To what extent are idiosyncratic circumstances at play? Is there scope for generalisations?

**Reporting**

The annual reporting process will be the key method for the CRP to describe its progress and results achieved as established in the Flagship theories of change. Reporting of results will be conducted at the output and outcomes levels, and when possible, at the impact level. A review of data collected on indicators, assumptions and risks will serve as guides for reporting on results. As part of this process, the CRP will also document any lessons and changes to the implementation of the program, including to the theories of change and monitoring plan.

**Learning**

In line with the RBM principles, the CRP will be operationalizing a variety of measures to support learning from the information collected from monitoring and evaluation. The CRP will integrate these measures as part of its planning and reporting cycle with clear roles and responsibilities. The measures include:

- Annually reviewing and revising the ToCs based on evidence collected, and to the extent possible, conducting contribution analysis to reflect and strengthen the CRP performance story;
- Annually conducting reflection sessions on performance and risk information collected;
- Adjusting and prioritizing the implementation of the Program in line with the evidence collected;
- Implementing and adjusting mitigation measures to manage risks;
- Documenting lessons learned and best practices (e.g., meta-synthesis of lessons from evaluations);
- Conducting evaluation workshops to reflect on and adjust to the evaluation findings and lessons;
- Knowledge management and information sharing; and
- Following up on learning decisions, including actions plans in response to evaluation recommendations.

**3.6.2 Budget Allocation to MELIA**

Resources required to implement a robust and credible MELIA strategy have been included accordingly in the CRP's budget.

For the MEL elements of the strategy, a budget of 2% of CRP budget should be allocated. This allocation would cover:
WHEAT CRP: Annexes

- development and implementation of a stronger monitoring and reporting interoperable platform
- management of data collection measures in various geographies to implement the monitoring plan effectively
- annual conduct of a CCEE, which is estimated at USD 300,000 of consulting fees per evaluation
- MEL specialists to provide MEL expertise to CRP and project leads, build capacity across the lead centers and partners, and coordinate the implementation of the MEL modules

As for impact assessments, detailed information of the budget and coverage can be found under the FP1 section of the proposal.
## Proposed Rolling Evaluation Plan for CCEEs

### CRP PHASE II - Rolling Evaluation Plan

<table>
<thead>
<tr>
<th>CRP</th>
<th>Review / Evaluation/</th>
<th>Dates</th>
<th>Evaluation Focus</th>
<th>Main Evaluation Topic/Issue</th>
<th>Geographic Focus</th>
<th>Description</th>
<th>Budget</th>
<th>Participating Centers</th>
<th>Evaluation Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEAT CCEE</td>
<td>Review / Evaluation/</td>
<td>2017</td>
<td>FP2 - Novel tools and diversity</td>
<td>relevance, efficiency, quality of science, effectiveness, impact and sustainability</td>
<td>TBD</td>
<td>TBD</td>
<td>Max - 300K</td>
<td>CIMMYT, ICARDA, IITA</td>
<td>M. Guertin</td>
</tr>
<tr>
<td>WHEAT CCEE</td>
<td>Review / Evaluation/</td>
<td>2018</td>
<td>FP1 - Inclusive and profitable wheat opportunities</td>
<td>Joint evaluation with MAIZE</td>
<td>TBD</td>
<td>TBD</td>
<td>Max - 300K</td>
<td>CIMMYT, ICARDA, IITA</td>
<td>M. Guertin</td>
</tr>
<tr>
<td>WHEAT CCEE</td>
<td>Review / Evaluation/</td>
<td>2019</td>
<td>FP4 - Sustainable Intensification</td>
<td>Joint evaluation with MAIZE</td>
<td>TBD</td>
<td>TBD</td>
<td>Max - 300K</td>
<td>CIMMYT, ICARDA, IITA</td>
<td>M. Guertin</td>
</tr>
<tr>
<td>WHEAT CCEE</td>
<td>Review / Evaluation/</td>
<td>2020</td>
<td>FP3 - Better varieties reach farmers faster</td>
<td>Based on Management Committee needs</td>
<td>TBD</td>
<td>TBD</td>
<td>Max - 300K</td>
<td>CIMMYT, ICARDA</td>
<td>M. Guertin</td>
</tr>
<tr>
<td>WHEAT Thematic CCEE</td>
<td>Review / Evaluation/</td>
<td>TBD</td>
<td>Thematic - TBD</td>
<td>TBD</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Note:** Planned impact assessments can be found in the FP1 section of the CRP.

**Note:** Joint CCEEs will be sought to leverage the resources of multiple CRPs and to assess performance within a geographic focus (likely in line with the site integration plans) or thematic area (e.g., seed systems, nutrition, and gender). They will be conducted in line with the CGIAR Evaluation Standards.
### 3.7 Linkages with other CRPs and Country Coordination

The tables below provide more detailed information about inter-CRP collaboration, including on Country Coordination (e.g. site coordination), provided in section 1.7 and Tables 7 and 8a. WHEAT distinguishes between CRP-with-CRP and multi-CRP collaborations. Table 37-3 describes which Country Coordination countries are “priority” for WHEAT, intended scope of engagement and opportunities for inter-CRP collaboration. WHEAT also proposes additional countries for ‘bottom-up’ Country Coordination with interested CRPs. Table 37-4 provides more detail on researchable issues and inter-CRP collaboration opportunities, whilst Table 37-5 lists WHEAT planned contributions to ongoing national consultation processes.

#### Table 37-1a. Inter-CRP collaboration CRP-with-CRP.

<table>
<thead>
<tr>
<th>WHEAT Collaborates with (CRP)</th>
<th>Ongoing (from Phase I) or New</th>
<th>Our CRP provides (mention relevant FP of your own CRP)</th>
<th>Our CRP receives (mention relevant FP of your own CRP)</th>
<th>Added value</th>
<th>Geo focus or scope</th>
<th>Collaboration Mode (our CRP is ...)</th>
<th>Budgeted in core and/or uplift? &amp; estimated USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>State CRP(s) you are collaborating with</td>
<td>State Ongoing</td>
<td>Use one line per major ‘provides’</td>
<td>Use one line per major ‘receives’</td>
<td>State: Global OR Regional (e.g. which region) OR one, a few country/ies)</td>
<td>State: Joint (e.g. 50/50) OR Junior OR Lead partner identify funding source(s): W1&amp;2, W3/Bil Optional: Classify as Light, Medium, OR Heavy</td>
<td>State whether you budgeted in Core and or Uplift budget; Show estimated budget p.a. / how many years e.g. max 6 yrs 2017-22</td>
<td></td>
</tr>
</tbody>
</table>

- **CCAFS**
  - **See also Table 37-2**
  - **Ongoing**
    - N modeling & measurement
    - Use one line per major ‘provides’
    - Use one line per major ‘receives’
    - State: Global OR Regional (e.g. which region) OR one, a few country/ies)
    - State: Joint (e.g. 50/50) OR Junior OR Lead partner identify funding source(s): W1&2, W3/Bil Optional: Classify as Light, Medium, OR Heavy
    - State whether you budgeted in Core and or Uplift budget; Show estimated budget p.a. / how many years e.g. max 6 yrs 2017-22

- **Ongoing**
  - Climate smart varieties and practices
  - Innovation / adoption hubs
  - Climate-Smart Villages S. Asia: Scaling out CSA
  - CCAF S priority regions
  - Joint partners: Combine CCAF S FP3 & WHEAT Bilateral
  - Yes, in both CRPs core

- **New**
  - HeDWIC: Analog site definition, data collection, germplasm improvement
  - Climate modeling
  - Climate-proof wheat in 25 years from now:
  - Global
  - Joint partners, jointly fundraise
  - Yes, in both CRPs uplift

- **New**
  - Analog site definition, data analysis
  - Climate modeling
  - Identify climate vulnerable ecologies based on long-term IWIN data
  - Global
  - Joint partners, W1&2
  - Yes, in both CRPs uplift

- **PIM**
  - Ongoing, expanded
  - Global databases, models, tools, CoP (FP1 Foresight)
  - Define needs, co-invest in modeling, provide data
  - Better, more useful foresight also at portfolio level
  - Global
  - Joint partners, together with other CRPs, W1&2
  - Yes, both CRPs in core; expanded in uplift
<table>
<thead>
<tr>
<th>CRP: Annexes</th>
<th>Activity</th>
<th>Description</th>
<th>Ongoing, expanded</th>
<th>Impact assessment case studies</th>
<th>Ex ante, ex post IA approaches, tools</th>
<th>Improved IA methodologies, methods; inter-CRP aggregation</th>
<th>Global</th>
<th>Joint partners, inter-CRP dimension</th>
<th>Yes, WHEAT uplift W1&amp;2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing, expanded</td>
<td>Impact assessment case studies</td>
<td>Improved IA methodologies, methods; inter-CRP aggregation</td>
<td>Global</td>
<td>Joint partners, inter-CRP dimension</td>
<td>Yes, WHEAT uplift W1&amp;2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>Value chain analysis, improvement cases FP3.7, FP4.3, 4.4</td>
<td>Improved value chain research, inter-CRP collaboration on value chain analysis &amp; change</td>
<td>Priority PIM, WHEAT target regions S. Asia, SSA, C Asia?, N Africa?</td>
<td>Joint partners, inter-CRP dimension</td>
<td>Yes, WHEAT uplift W1&amp;2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New (changed)</td>
<td>Collaborative Platform for Gender Research (PIM FP6)</td>
<td>Improved value chain research, inter-CRP collaboration on value chain analysis &amp; change</td>
<td>Priority PIM, WHEAT target regions S. Asia, SSA, C Asia?, N Africa?</td>
<td>Joint partners, inter-CRP dimension</td>
<td>Yes, WHEAT uplift W1&amp;2</td>
<td></td>
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<tr>
<td>New</td>
<td>Measuring and reducing post-harvest losses</td>
<td>Tbd whether value add; currently planned to be incorporated into value chain analysis</td>
<td></td>
<td></td>
<td>No</td>
<td></td>
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</tr>
<tr>
<td>A4NH</td>
<td>Ongoing</td>
<td>Improved nutrition in H+ target regions based on appropriate mix of biofortified crops including wheat</td>
<td>S Asia</td>
<td>Junior partner, funded by A4NH bilateral</td>
<td>Yes, A4NH bilateral core</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>wheat quality R&amp;D for nutrition and health (fiber, starch)</td>
<td>Improved nutrition and health in A4NH target regions with high per capita wheat consumption</td>
<td>Global; suitable target countries</td>
<td>Tbd</td>
<td>Yes, WHEAT W1&amp;2 uplift</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WLE</td>
<td>New</td>
<td>Improved ex ante targeting and prioritizing, inter-CRP collaboration in specific geographies at landscape level</td>
<td>S Asia, C Asia, SSA</td>
<td>Joint partners, W1&amp;2, link to bilateral projects under both CRPs</td>
<td>Yes, WHEAT W1&amp;2 uplift</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Ex-DS</td>
<td>New</td>
<td>Expand systems research under FP4, integrate into existing intervention areas</td>
<td>C Asia, Morocco, Ethiopia</td>
<td>NA</td>
<td>Yes, WHEAT core and uplift W1&amp;2, bilateral</td>
<td></td>
<td></td>
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<tr>
<td>scale-out: 3 action sites (FP4)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>
Table 37-1b. Multi-CRP collaboration.

<table>
<thead>
<tr>
<th>Collaborate with (CRPs)</th>
<th>Ongoing (from Phase I) or New</th>
<th>Our CRP provides/gives (mention relevant FP of your own CRP)</th>
<th>Our CRP receives (mention relevant FP of your own CRP)</th>
<th>Added value</th>
<th>Geo focus or scope</th>
<th>Collaboration Mode (light, medium, heavy)</th>
<th>Budgeted (core or uplift) and estimated USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>All CRPs</td>
<td>new</td>
<td>Country coordination plans &amp; implementation See Tables 37-3 and 37-4 below</td>
<td>See Tables 37-3 and 37-4 below</td>
<td>See 37-3, 37-4</td>
<td>Tbd</td>
<td>Yes, WHEAT uplift</td>
<td></td>
</tr>
<tr>
<td>JIRCAS and 3 other CRPs (Livestock, CCAFS, DCL)</td>
<td>Ongoing (expanded) BNI Consortium</td>
<td>Member, joint R&amp;D with JIRCAS, cross-crop/systems learning with other CRP projects (FP2)</td>
<td>Learn from other crop/BNI projects, fundamental research</td>
<td>New source of nitrogen use efficiency, reduce N2O in many farming systems, across crops/rotations</td>
<td>Global</td>
<td>Joint partners: CRPs W1&amp;2 &amp; Bilateral plus JIRCAS bilateral</td>
<td>Yes, WHEAT uplift</td>
</tr>
<tr>
<td>Ongoing w/ JIRCAS: Germplasm, introgressions (FP2)</td>
<td>w/JIRCAS: wheat trait discovery R&amp;D (FP2)</td>
<td>Find BNI wheat varieties that can go on farmers fields</td>
<td>Global</td>
<td>Joint partners, WHEAT W1&amp;2, JIRCAS bilateral</td>
<td>Yes, WHEAT core</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All AFS-CRPs</td>
<td>Ongoing, expanded</td>
<td>Capacity for inter-CRP collaboration, WHEAT MEL approaches, methods</td>
<td>Grow WHEAT M&amp;E capacity, expertise</td>
<td>Inter-CRP M&amp;E Framework, Platform; Metrics for faster, more precise, genetic gain, more structured pipelines</td>
<td>Global</td>
<td>Joint partners in CoP</td>
<td>Yes, WHEAT core and uplift</td>
</tr>
<tr>
<td>New</td>
<td>See Genetic Gains Platform</td>
<td>high-throughput data standards, processing &amp; open access (GOBII - BMGF/CGIAR)</td>
<td>Global</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>New</td>
<td>See Genetic Gains Platform</td>
<td>Unlock and make accessible genetic diversity of CGIAR crops in genebank collections</td>
<td>Global</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>Breeding, agronomy, farm mgmt, mechanization solutions developed under WHEAT, FP3-4</td>
<td>Other CRPs solutions for other crops and farming systems</td>
<td>Combine, adapt breeding, agronomy, farm mgmt, mechanization for multi-crop farming systems</td>
<td>tbd</td>
<td>tbd</td>
<td>Yes, WHEAT uplift W1&amp;2</td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>Innovation framework and adoption dynamics;</td>
<td>Innovation framework and adoption dynamics</td>
<td>Share, build knowledge across</td>
<td>Tbd</td>
<td>Tbd</td>
<td>Yes, WHEAT uplift</td>
<td></td>
</tr>
<tr>
<td>CRP</td>
<td>Description</td>
<td>Analysis &amp; R&amp;D Targeting</td>
<td>Systems R&amp;D Targeting</td>
<td>CRPs for Specific Intervention Areas</td>
<td>Intervention Areas</td>
<td>Partnerships</td>
<td>Uplifts</td>
</tr>
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</tr>
<tr>
<td>New See also Country Coord.</td>
<td>Partner on dual-purpose crops R4D (targeting, breeding &amp; farm mgmt, value chains) Partner with resources on dual-purpose crops R4D (targeting, breeding &amp; farm mgmt, value chains)</td>
<td>Joint R4D on dual purpose crops for value addition and improved livelihoods</td>
<td>2-3 agroeco zones tbd</td>
<td>Joint partners, CRPs W1&amp;2 and co-fundraise for bilateral</td>
<td>Yes, WHEAT uplift W1&amp;2 and bilateral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New See also Country Coord.</td>
<td>Partner with other CRPs their NARS partners, to identify and develop companion crops, livestock, agroforestry: Insert into ongoing, new systems projects</td>
<td>Insert companion crops into another AFS-CRPs scope, activities in specific geographies</td>
<td>S. Asia, Mexico, SSA, N. Africa?</td>
<td>Joint partners, CRPs large bilateral projects / funding</td>
<td>Yes, WHEAT uplift bilateral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>Share, co-develop precision phenotyping methods, tools development, up to 15 sites focusing on different traits, data collection &amp; processing</td>
<td>Share knowledge, use platforms/sites (e.g. Sudan for sorghum/heat)</td>
<td>Share WHEAT, other CRPs’ precision phenotyping platforms, sites with other AFS-CRPs, crops; reinforce international germplasm exchange</td>
<td>Global</td>
<td>Tbd</td>
<td>Yes, WHEAT uplift W1&amp;2</td>
<td></td>
</tr>
</tbody>
</table>

PIM, AFS-CRPs

See Table 37-1a above

PIM, A4NH

See Table 37-1a above
WHEAT-CCAFS collaboration

WHEAT with CCAFS collaboration will take place around research activities relating to (i) climate sensitive breeding strategies and (ii) participatory evaluation of technologies and practices developed under FP4 in Climate Smart Villages. Collaboration between the two CRPs will address the following key questions:

1. How can genotypic responses to climate be better understood through use of current and future crop and climate databases and modeling tools? (led by CIMMYT)

2. What are the predictable aspects of climate that need to be taken into account when breeding for future climates? (Led by CCAFS)

3. How can previous research and breeding efforts accelerate rapid adaptation of cropping systems in climate vulnerable hotspots (led by CIMMYT)

4. What WHEAT FP4 practices and technologies work where, for whom and to what extent?

Promising climate-resilient material, including those identified during CCAFS Phase I from analysis of historical IWIN data, will be evaluated more intensely in climate vulnerable sites in Asia and Africa. Wherever appropriate, this research will take place in CCAFS climate smart villages where outputs together with other FP4-driven management practices will be evaluated under a climate lens. In addition to FP4 targets, the climate lens will make use of WHEAT and CCAFS data and tools (e.g. climate projections, farm typologies and farming system models) to support the evaluation of technologies in terms of enhanced resilience to climate variability and extremes (particularly drought and high temperature), mitigation of GHG emissions and associated costs. Through CCAFS Climate Smart Villages, WHEAT will also gain access to important climate-related actors in both the public and private sectors for scaling up and out.

In the climate change debates, fertilisers have come under much criticism given their role in GHG emissions, to the point where some civil society stakeholders at UNFCCC events will question whether fertilisers are necessary in Africa. That said, it is hard to envisage how future productivity and food security goals can be achieved in Africa without greater use of synthetic fertiliser. Working with all the relevant AFS-CRPs, CCAFS will examine the role of fertilisers, particularly nitrogen, in achieving the CSA targets (food security, adaptation and mitigation). This will include meta-analysis of the scientific literature and drawing on field and farmer experiments globally. One of the aims will be to define the appropriate targets, indicators and MRV system that will be needed to drive optimal nitrogen use. Nutrient retention, nutrient leakage, nutrient output and nutrient efficiency targets will be considered globally and for particular contexts. Key partners will be WHEAT among other AFS-CRPs, as well as Wageningen and YARA.
Table 37-2. Continued and new CCAFS-WHEAT collaborations are shown in the table below. Some budget figures remain to be determined.

<table>
<thead>
<tr>
<th>Degree of collaboration (envisaged)</th>
<th>Medium (share, analyze data, sites.)</th>
<th>Heavy (jointly plan, fund, implement projects)</th>
<th>Topic CRP-FP level (researchable issue)</th>
<th>Budget</th>
<th>Target geographie s</th>
<th>What each CRP brings to table</th>
<th>Cross-cutting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light (info exchange, joint publications)</td>
<td>Medium (share, analyze data, sites.)</td>
<td>Heavy (jointly plan, fund, implement projects)</td>
<td>Topic CRP-FP level (researchable issue)</td>
<td>Budget</td>
<td>Target geographie s</td>
<td>What each CRP brings to table</td>
<td>Cross-cutting</td>
</tr>
<tr>
<td><strong>Climate-smart breeding strategies</strong></td>
<td></td>
<td></td>
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<tr>
<td>Medium: FP1.4</td>
<td>Medium:</td>
<td>Heavy:</td>
<td>Topic: Improving nitrous oxide estimates globally with major focus on strategies to optimize nitrogen use in wheat (and maize).</td>
<td>Budget: W1&amp;2 $300k + Bilateral 90k (based on Phase I CCAFS budget)</td>
<td>Target: Global application but field work in Mexico and India</td>
<td>What: WHEAT: crop trials on nitrogen use efficiency. CCAFS: Improved crop models to estimate N2O from fertilizer use in wheat; trade-off analysis to identify priority mitigation actions.</td>
<td>Cross-cutting: CCAFS: Modeling methodology, analysis.</td>
</tr>
</tbody>
</table>
### Participatory evaluation of community supported agriculture practices and portfolios in Climate Smart Villages

| W: FP 4.3  | C: FP1.2 | Continue with Phase I collaboration Develop, adapt, and target portfolios of CSA practices for sustainable intensification of smallholder, vulnerable farming systems. Practices being evaluated include: Improved nutrient and water management (laser land-leveler, nutrient expert, green seeker, micro-irrigation), climate-resilient germplasm, expert validation and scaling-up/out. | W: Bilateral project funding (e.g. CSISA; ACIAR) and W1 and 2 ca. 1M p.a. CCAFS: W1 and 2 (F1) as in Phase I | S. Asia | CCAFS: CSV innovation platforms W: Validated LLL technology, Nutrient Expert farmer decision-making support |

### Upstream R&D on N-cycle and climate change

| W: FP2.3 | Biological nitrification inhibition in major CGIAR crops to reduce N2O emissions and to improve NUE in agricultural systems. | Collaborati on between 4 CRPs and JIRCAS W: 0.5M p.a. |  | CCAFS: measurements and modeling GHG emissions. |
**WHEAT Perspectives and Progress on Country Coordination**

Table 37-3. Overview of WHEAT participation in Country Coordination and further countries proposed by WHEAT.

<table>
<thead>
<tr>
<th>Region</th>
<th>Countries</th>
<th>WHEAT scope of engagement</th>
<th>inter-CRP</th>
<th>Coordination mechanism (proposed)</th>
<th>Initial joint activities (ideas)</th>
<th>Co-Invest (estimated amount, type)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>WHEAT priority</td>
<td>focal point</td>
<td>germplasm improvem.</td>
<td>seed systems</td>
<td>sustainable intensification</td>
</tr>
<tr>
<td></td>
<td>Bangladesh</td>
<td>Y</td>
<td>T.P. Tiwari, T. Krupnik</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>S Asia</td>
<td>India</td>
<td>Y</td>
<td>E. Duveiller</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Nepal</td>
<td>Y</td>
<td>Arun Joshi</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td></td>
<td>Pakistan</td>
<td>Y</td>
<td>M. Imtiaz</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Region</td>
<td>Country</td>
<td>Y</td>
<td>Added by</td>
<td>Y</td>
<td>Y</td>
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</tr>
<tr>
<td>Central Asia</td>
<td>Iran</td>
<td>Y</td>
<td>added by WHEAT / J Kamali</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Uzbekistan</td>
<td>Y</td>
<td>Ram Sharma</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>SE Asia</td>
<td>Kazakhstan</td>
<td>Y</td>
<td>M. Karabayev</td>
<td>Y</td>
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<tr>
<td>N Africa</td>
<td>Vietnam</td>
<td>N</td>
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<td></td>
<td>Morocco</td>
<td>Y</td>
<td>M. Baum</td>
<td>Y</td>
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<tr>
<td>Region</td>
<td>Country</td>
<td>Lead</td>
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<tr>
<td>Horn of Africa</td>
<td>Ethiopia</td>
<td>B. Abeyo</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
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<tr>
<td>East Africa</td>
<td>Kenya</td>
<td>S. Bhavani</td>
<td>Y</td>
<td>Y</td>
<td>tbd</td>
<td>tbd</td>
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<td></td>
<td>Malawi</td>
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<td></td>
<td>Rwanda</td>
<td>F. Baudron</td>
<td>Y</td>
<td>Y</td>
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<td>Tanzania</td>
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<td>Y</td>
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<td>Y - tbd</td>
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<tr>
<td>S Africa</td>
<td>Mozambique</td>
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<td></td>
<td>Zambia</td>
<td>S. Mugo</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Central &amp; Latin America</td>
<td>Nicaragua</td>
<td>N</td>
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<td></td>
<td>Mexico</td>
<td>B. Govaerts</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
Table 37-4. Key opportunities per country from a WHEAT perspective.

<table>
<thead>
<tr>
<th>Region</th>
<th>Country priority (bold)</th>
<th>Tier I or II (+ or ++) &amp; focal point</th>
<th>WHEAT scope of engagement</th>
<th>inter-CRP</th>
<th>Coord. mechanism</th>
<th>Joint activities</th>
<th>Invest (amount, type) needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>S Asia</td>
<td>Bangladesh (+) T.P. Tiwari</td>
<td>Y - yield, salinity, disease resistance, CC-traits, Phenotyping for leaf blight, wheat blast, dual purpose crops</td>
<td>Y - faster access; replacement rates; strategize biofortified varieties (Zn, Fe)</td>
<td>Y - CA-based crop management; water and nutrient efficiency, yield potential, dual purpose crops</td>
<td>N</td>
<td>Y - inputs, mechanization, farmer decision support, biofortified crops</td>
<td>Greater resilience to CC; stable income thru diversification, risk management, biotic (e.g. blast, BpLB) and abiotic (e.g. saline, heat, drought) tolerant</td>
</tr>
<tr>
<td>India</td>
<td>E. Duveiller</td>
<td>Y - shorter duration, heat-tolerant, WUE (Indo Gangetic Plains, Bihar, Madyar Pradesh, Haryana); dual purpose varieties adapted to early sowing (fodder + grain), Zn/Fe grain content</td>
<td>Y - faster access; replacement rates; strategize biofortified varieties (Zn, Fe);</td>
<td>Y - CA-based crop management; water &amp; land use efficiency, irrigation systems rotation, dual purpose crops</td>
<td>Y - water, land management landscape scale; post-harvest?</td>
<td>Y - inputs, seeds, mechanization, farmer decision support</td>
<td>Socioeconomi c; Joint R4D; Adapt R4D results; Share sites, support services</td>
</tr>
<tr>
<td>Country</td>
<td>Added by</td>
<td>Y - crop rotation innovation, short duration wheat, WUE, NUE, raised beds, CA in irrigated, rainfed environments (cold!, warm, temperate); raised bed; suppl. Irrigation; diversification in rainfed areas</td>
<td>Y - seed systems innovation; multi-crop sowing machines</td>
<td>Y - durum value chain</td>
<td>Sustainable scaling-out of improved practices, seed</td>
<td>AIP-Pak, USAID project mechanism</td>
<td>International Partners in Agriculture Inn. Prog. CIMMYT, IRRI, ILRI, IFPRI, ICARDA, AVRDC, Uni Davis- Cal.</td>
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<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Nepal</td>
<td>Arun Joshi</td>
<td>Y - faster access; replacement rates; strategize biofortified varieties (Zn, Fe), Y - CA-based crop management: Laser Land Levelling &amp; Nutrient Expert</td>
<td>tbd</td>
<td>Y- biofortified crops, improved nutrition</td>
<td>Stabilize yields under CC; higher income thru diversification, risk mgmt; Improved nutrition</td>
<td>use CSISA mechanisms?</td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td><strong>added by WHEAT / M. Imtiaz</strong></td>
<td>Y - yield, rust resistance, Zn/Fe grain content, feed quality Y - faster access; replacement rates; strategize biofortified varieties (Zn, Fe), Y - zero till rice, wheat, companion crops rotation, laser leveling, CA in irrigated, rainfed environments (cold!, warm, temperate); raised bed; suppl. Irrigation; diversification in rainfed areas</td>
<td>Y - seed systems innovation; multi-crop sowing machines</td>
<td>Y - durum value chain</td>
<td>Sustainable scaling-out of improved practices, seed</td>
<td>AIP-Pak, USAID project mechanism</td>
<td>International Partners in Agriculture Inn. Prog. CIMMYT, IRRI, ILRI, IFPRI, ICARDA, AVRDC, Uni Davis- Cal.</td>
</tr>
<tr>
<td>Central Asia</td>
<td><strong>added by WHEAT / J Kamali</strong></td>
<td>Y - yield, early maturity (heat and drought escape), reverse yield decline (by 30% over recent yrs; irrigation, rainfed); rust resistance, quality faster access through pre-release multiplication</td>
<td>Impact of changing climate, water crisis on wheat, maize prod.</td>
<td>tbd</td>
<td>Intensify wheat based production systems to reduce wheat imports</td>
<td>use DCL/ ICARDA action sites for rainfed areas</td>
<td>Adapt R4D results; Share sites, support services</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td><strong>added by WHEAT / Ram Sharma</strong></td>
<td>Y - yield, cold tolerance, yellow rust, heat tolerance, salinity short duration faster access through pre-release multiplication</td>
<td>Y - Accelerate adoption of varieties thru crop rotation with maximum profitability, seed systems, innovation platform, CA</td>
<td>tbd</td>
<td>Reduce rural poverty</td>
<td>Winter wheat breeding closely linked with Turkey/CIMMYT/ICARDA program in Turkey</td>
<td></td>
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<tr>
<td>Kazakhstan</td>
<td><strong>added by CIMMYT / M. Karabayev</strong></td>
<td>Y - see Systems Y - expand CA, crop diversification</td>
<td>Y - Accelerate adoption of varieties thru crop rotation with maximum profitability, seed systems,</td>
<td></td>
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<tr>
<td>SE Asia N Africa</td>
<td>Morocco</td>
<td>added by WHEAT / M. Baum</td>
<td>Y - heat tolerance, pests/diseases</td>
<td>Y - see Systems</td>
<td>Y - WUE, crop rotation for diversification, soil health,</td>
<td>Y - seed systems innovation</td>
<td>tbd</td>
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<tr>
<td>Horn of Africa</td>
<td>Ethiopia</td>
<td>(+++) B. Abeyo</td>
<td>Y - rusts, heat, WUE, regional germplasm exchange; Phenotyping Platform for stem rust (DW) and septoria (BW).</td>
<td>Y - improved farmer access, maintain, improve replacement rates</td>
<td>Y - mechanization</td>
<td>Y - seed systems innovation</td>
<td>Y - durum value chain; Ethiopia historically DW producer but currently major importer.</td>
</tr>
<tr>
<td>East Africa</td>
<td>Kenya</td>
<td>S. Bhavani</td>
<td>Y - rusts, heat, WUE, regional germplasm exchange; global PP for stem rust (Bread wheat)</td>
<td>seed out scaling with Kenya Seed Co.</td>
<td>tbd</td>
<td>tbd</td>
<td>tbd</td>
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<tr>
<td>Malawi</td>
<td></td>
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<tr>
<td>Rwanda</td>
<td>F. Baudron</td>
<td>Y - Identify varieties that meets quality characteristic demanded by I formal market)</td>
<td>Y - improved farmer access</td>
<td>Y - mechanization, crop rotation for diversification, soil health (erosion)</td>
<td>N</td>
<td>Y - Analyze wheat value chain and decide on feasibility to develop viable wheat industry (farm to fork).</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>(+++)</td>
<td>scale out improved seed access (SARD-SC/wheat)</td>
<td>scale out improved seed access (SARD-SC/wheat)</td>
<td>tbd</td>
<td>Y- on the ground scoping study to investigate potential</td>
<td>Reduce import bill, higher farmer incomes</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Scale Out Improved Seed Access (SARD-SC/wheat)</td>
<td>Scale out Improved Practices (SARD-SC/wheat)</td>
<td>Y</td>
<td>tbd</td>
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<tr>
<td>Uganda</td>
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<tr>
<td>Burkina Faso</td>
<td>scale out improved seed access (SARD-SC/wheat)</td>
<td>tbd</td>
<td>tbd</td>
<td>tbd</td>
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<tr>
<td>Cameroon</td>
<td>Y - tbd</td>
<td>scale out improved practices (SARD-SC/wheat)</td>
<td>Y - tbd</td>
<td>Reduce import bill, foster value chains</td>
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<td>DRC</td>
<td>Y - tbd</td>
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<td>Ghana</td>
<td>Y - tbd</td>
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<tr>
<td>Mali</td>
<td>Y - high potential increased production, productivity</td>
<td>Y - high potential increased production, productivity</td>
<td>Y - tbd</td>
<td>Reduce import bill, foster value chains</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Nigeria</td>
<td>Y - tbd</td>
<td>scale out improved practices (SARD-SC/wheat)</td>
<td>Y - tbd</td>
<td>Reduce import bill, foster value chains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td>Y - high potential increased production, productivity</td>
<td>Y - high potential increased production, productivity</td>
<td>Y - tbd</td>
<td>Reduce import bill, foster value chains</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Zambia</td>
<td>Y - fast track seed multiplication established;</td>
<td>scale out technologies / N-use efficiency (green seeker); long term trials wheat maize legume rotation; fodder during winter for cattle</td>
<td>Analyze wheat value chain / evaluate feasibility to increase wheat production to reduce import</td>
<td>bilateral (MASAGRO)</td>
<td></td>
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</tbody>
</table>
Table 37-5. WHEAT planned contributions to national Country Coordination processes.

<table>
<thead>
<tr>
<th>Target country (++, + countries relevant to WHEAT)</th>
<th>Define steps taken so far (March 2016) to establish national level engagement with other CRPs towards site integration</th>
<th>Define plan and schedule through which WHEAT will provide relevant elements for development of CGIAR site integration in this country</th>
</tr>
</thead>
</table>
| Bangladesh                                       | Seven CGIAR centers representing over 7 CRPs have established a CGIAR Advisory Committee several years ago. This committee will serve as a platform for site integration efforts in Bangladesh, to both better integrate with NARES and also to build in new strategic objectives for the next phase of the CRPs, including renewed focus on food and nutrition security, gender and youth. Through this venue all CGIAR centers plus AVRDC and IFDC meet with our NARS and Ministry officials twice a year. All details for this integration as well as 4 CAC minutes are posted on the web, which provides further details of the CAC and avenues for site integration efforts: [http://gcard3.cgiar.org/national-consultations/bangladesh/](http://gcard3.cgiar.org/national-consultations/bangladesh/)| • Leverage existing bi-annual coordination mechanism  
• Determine how to fund greater capacity for WHEAT participation  
• Focus on shared socio-economic approaches (e.g. HH surveys), water and nutrient use efficiency, yield gap studies, farming systems analysis in wheat based systems, business models for mechanisation, other services  
• Focus on better agronomy, biotic (e.g. wheat blast), and abiotic (e.g. terminal heat, saline, drought) stress tolerant and fast track seed multiplication.  
• Joint fundraising for joint new projects (CRPs, national partners) to fill gaps in current portfolio |
| Ethiopia                                         | Coordination committee representing 11 CGIAR Centers based in Ethiopia, plus 3 others (Africa Rice, IITA and IRRI), 10 CRP focal points meets quarterly, coincides with existing Heads of Institutes meetings. Smaller group of six (3 Centers and 3 CRPs) to manage country coordination process, with support from ILRI Communications and Knowledge Management team. Key activities to date:  
• Creating a database of our major partners/collaborators  
• Mapping CGIAR Center and CRP work in Ethiopia (November 2015). Continuing to refine.  
• Engaging in partners’ (ATA, RED&FS) national consultations on alignment to GTP II (November 2015 – January 2016).  
• Creating a wiki for the coordinating committee | • Use existing coordination mechanisms  
• Determine how to fund greater capacity for WHEAT participation  
• Contribute to sharing information about research projects, to avoid double work. Many donors and implementing agencies that do not coordinate.  
• Push for joint actions with regard to socioeconomic approaches, seed system innovation across crops, sharing of research sites |
CRPs and Centers should continue to align with Government’s Growth and Transformation Plan II (GTP II, late 2015), Sustainable Land Management (SLM), other large, ongoing programs. Improve alignment via a new joint CGIAR-national agriculture research system collaboration and communication mechanism, with a permanent secretariat for joint planning, sharing of findings, and monitoring and evaluation. Problem areas: Shared understanding of what site integration means, adequate funding for participating in coordination.

<table>
<thead>
<tr>
<th>Country</th>
<th>Meeting Details</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>1st meeting CGIAR-NARS 23rd March</td>
<td>See Tables 37-3, 37-4</td>
</tr>
<tr>
<td>Kenya</td>
<td>1st meeting CGIAR-NARS 10-11th March 2016</td>
<td>See Tables 37-3, 37-4</td>
</tr>
<tr>
<td>Mali</td>
<td>Ad hoc committee with 7 Centers, 1st consultation meeting with NARS came up with a draft framework of the site integration: Includes CGIAR Mali current status, principles, gaps and opportunities for site integration, resourcing, communication within and outside the CG, mechanisms to monitor progress and assess activities and impact. Working groups on five main issues of site integration; Full report on the national consultation by March 25th, 2016. The Site Integration plan will be submitted on or before April 29th, 2016</td>
<td>• The key connector/contributor under WHEAT is SARD-SC/Wheat project, in which Mali participates (ICARDA-led) – successor project under TAAT? • Make sure SARD-SC/WHEAT has capacity to engage in country coordination processes</td>
</tr>
<tr>
<td>Nepal</td>
<td>Site integration steering committee formed, includes Centers, CCAFS. Stakeholder consultation meeting on 11 January 2016, next one January 2017. Areas for collaboration identified: How to better align CG work with national policy issues, demand for continued capacity building of local agricultural scientists, the development of stronger national databases, promoting local genetic resources and the need for research on both climatic and non-climatic stress on agriculture. Ideas for new research avenues were also raised. For more info, see <a href="https://library.cgiar.org/handle/10947/4148">https://library.cgiar.org/handle/10947/4148</a> Key reference point: Agriculture Development Strategy (ADS 2015-2035) approved by Government of Nepal on 14th August, 2015.</td>
<td>• Continue to co-lead process with existing coordination mechanism • Push for joint activities to stabilize yields under climate change; higher income thru diversification, risk mgmt; improved nutrition for the poorest</td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td>• The key connector/contributor under WHEAT is SARD-SC/Wheat project, in which Mali participates (ICARDA-led) – successor project under TAAT?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure SARD-SC/WHEAT has capacity to engage in country coordination processes</td>
</tr>
<tr>
<td>Country</td>
<td>Description</td>
<td>Actions</td>
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</table>
| Rwanda    | Coordinating committee of six people representing 4 centres, 4 site integration meetings, one with three main donors (USAID, EU, and DFID); working on mapping all on-going Centers'/CRPs projects. Builds on existing R4D Forum by CRP-Humid Tropics. CGIAR site integration workshop in Kigali on 29th March, 2016, to bring together an estimated 75 representative of donors, government agencies, other development organizations, civil societies, and financial institutions. Aim to finalize site integration plan by end of April, 2016. | • Verify, provide focal point for WHEAT  
• Determine how to fund for greater capacity for WHEAT participation |
| Tanzania  | Coordination Committee comprises: Ministry of Agriculture, Livestock and Fisheries, Private Sector (1), 7 CGIAR Centres based in Tanzania plus 4 others (Africa Rice, ICRISAT, CIMMYT, Bioversity International ) + 9 CRP focal points. National stakeholders’ consultation workshop held in December 2015: Principles of success and major opportunities for integration between and amongst CG centers, CRPs and national partners identified. Ensure CGIAR alignment with the national agricultural priorities (Tanzanian Agricultural Sector Development Program (ASDP) Phase II. For changes, new programs used AFRICA RISING (USAID) as model; good example of collaboration and integration, common set of research sites and staff from various centres are participating in the implementation the project. CGIAR-FARA-African Development Bank’s Africa-wide initiative on FEEDING AFRICA: Tanzania, is one of the focus countries for TAAT. Plans for organizing a CG- NARS national awareness workshop to popularize to the new government, our best-bet technologies for scaling-up and out using the internally-sourced resources | • Contribute to AFRICA RISING-type multi-crop program development  
• Focus on establishing critical mass regarding wheat R4D and capacity on both sides to collaborate: Demand six times greater than supply (production), low yields, very little interaction with NARS |
| **Zambia** | Steering committee (CIMMYT, ILRI, WorldFish, HarvestPlus, CIAT, IITA, Bioversity, ICRAF, ICRISAT and CIP). Site integration consultation workshop 9-10 February Participants identified key activities that would be required to bring about site integration and which areas they would like to proceed in partnership with the CGIAR and CRPs. The Zambian National Agriculture Investment Plan (NAIP) provided basis for discussion. Key issues to tackle for site integration:  
  a) Resource mobilization to drive the site integration process  
  b) Development of coordination structures to provide strategic direction for site integration  
  c) Capacity development of national partners and research infrastructure  
  d) Collaboration mechanisms  
  e) Alignment of CGIAR research activities to national priorities  
  f) Identification of research priorities, effective delivery and scaling-out  
  g) Impactful development initiatives to ensure improved production, food and nutrition security for smallholder farmers in Zambia. |
| --- | --- |
|  | • Continue to co-lead  
• Determine how to fund greater capacity for WHEAT participation  
• Push for joint activities in water use management (irrigation), soil management, rotation |
3.8 Staffing of management team and flagship projects

Name: Hans-Joachim BRAUN

Role in WHEAT: Director CRP WHEAT, FP3 co-leader

Expertise

- Leads and manages 40 internationally recruited scientists
- Board member, Wheat Initiative and board member, International Wheat Yield Partnership
- Main author or co-author on more than 120 scientific articles, including more than 50 peer-reviewed articles and book chapters
- Contributed to the development and release of 44 winter wheat varieties grown on nearly 1.5 million hectares in Central and West Asia
- Recipient of Friendship Award of China for contribution to disease resistance wheat lines in Gansu province

Employment including current position

- 2015—to date: Director, CRP WHEAT, CIMMYT
- 2004—to date: Director, Global Wheat Program, CIMMYT
- 1983: Post Doc, CIMMYT

Education

- 1983, Ph.D., University of Hohenheim, Germany
- 1980, M.S., University of Stuttgart-Hohenheim, Germany

Selected Recent Peer-reviewed publications

Please see http://wheat.org/download/wheat-publications/ (comprehensive publications list for all WHEAT Flagship and Cluster of Activities leads)
FP1 Inclusive and profitable wheat opportunities

Name: Olaf ERENSTEIN

Role in WHEAT: WHEAT MC-member, FP1 leader (time commitment 50%)

Expertise

- Program director of a team of 30+ internationally recruited scientists located in sub-Saharan Africa, Latin America and Asia. The team’s research-for-development (R4D) aims to help prioritize, target, understand and enhance wheat and maize interventions for greatest impact and social inclusiveness.
- Since 2013 involved in the CRP’s Management Committee.
- Research has focused on R&D implications based on agricultural system and innovation analysis in developing countries, particularly in cereal based systems (wheat, maize, rice).

Employment including current position

- 2013 – to date: Director Socio-economics Program, CIMMYT, Mexico (initially Ethiopia)
- 2009-2012: Senior Ag-economist, CIMMYT, Ethiopia
- 2004-2009: Agro-economist, CIMMYT, India
- 2000-2004: Production economist, Africa Rice Centre (WARDA/ADRAO), Côte d’Ivoire/Mali

Education

- 1999, Ph.D. Agricultural Economics, Wageningen University, the Netherlands
- 1990, M.Sc. Agricultural Economics & M.Sc. Tropical Crop Science, Wageningen Ag. University, the Netherlands
Name: Yigezu YIGEZU

Role in WHEAT: FP1 co-leader and CoA 1.2 co-leader

Expertise

- Agricultural economics with focus on international development and policy analysis.
- Production economics, bio-economic modeling of production systems, natural resource and environmental economics, policy analysis, and technology adoption, out-scaling and impact assessment.
- Econometrics, mathematical programming, stochastic dynamic programming, computable general equilibrium (CGE) and input-output (IO) modeling.

Employment including current position

- 2012— to date: Senior Scientist; Social, Economic and Policy Research Program, ICARDA, Amman Jordan
- 2010-2011: Postdoctoral scientist, Social, Economic and Policy Research Program, ICARDA, Aleppo, Syria
- 1999-2001: Senior research assistant, Livestock policy analysis program, ILRI, Addis Ababa, Ethiopia

Education

- 2009, Ph.D., Department of Agricultural Economics, Purdue University, USA
- 2005, M.Sc., Department of Agricultural Economics, Purdue University, USA
CoA 1.1

Name: Gideon KRUSEMAN

Role in WHEAT: CoA 1.1 leader (time commitment 50%)

Expertise

- As ex-ante and foresight specialist, leading this research with a multi-disciplinary team of scientists located in sub-Saharan Africa, Latin America and Asia, since August 2015.
- Expert in quantitative economic and bio-economic modeling of complex systems at farm household, community, value chain, national and global levels, using econometric, simulation and mathematical programming techniques.
- Expert in quantitative and qualitative ex-ante policy analysis.
- Expert in ex-post impact assessment, monitoring and evaluation.
- Published numerous research papers on a wide variety of topics in international journals of repute, besides (co)authoring several books/edited volumes/technical manuals and book chapters.
- As a Faculty Member at Wageningen University and senior researcher fellow at LEI, guided several Ph.D. and M.Sc. students, and served as external panel member on PhD committee.

Employment including current position

- 2016-to date: Focal point Big Data at CIMMYT
- 2015-to date: Ex-ante and foresight specialist at CIMMYT
- 2015-2016: Consultant Big Data
- 2006-2015: Lead on environmental economic modelling, at LEI Wageningen, ex-ante and ex-post impact evaluation of programs, projects and policies in Netherlands, EU, Tunisia, Egypt and Bangladesh
- 2004-2006: Senior Research fellow at the Institute of Environmental studies in Amsterdam involved in environmental modelling, research on the poverty environment nexus, environmental policy
- 2003-2004: Consultant for IFPRI for East African highlands project; consultant for ICCO concerning monitoring and evaluation
- 1992-2003: Worked in different capacities in Wageningen University and DLO research institutes on research related to food security and sustainable land use and research on climate change
- 1989-1992: Associate expert for the Andean outreach project of CIAT’s bean program covering Peru, Ecuador and Bolivia.

Education

- 2000, Ph.D. in Development economics, Wageningen University, Netherlands
Role in WHEAT: CoA 1.1 leader at ICARDA

Expertise

- Fellow of the Global Futures project (of PIM) at ICARDA between 2014-2016 (mainly conducting wheat foresight for MENA region).
- Economic modelling, analysis of farm efficiency and productivity, Natural resources management (governance and new institutional economics), conservation agriculture economics.
- Currently involved in the preparation of FPs 1 and 5 of PIM II, FP1 of wheat CRP II, FP5 of livestock CRP II, and FP1 of DCL CRP II.

Employment including current position

- 2014-to date: Scientist, Agricultural Economist at ICARDA
- 2011-2013: Assistant Professor of Agricultural Economics, at Carthage University, Tunisia
- 2009-2011: Postdoctoral researcher at Ghent University, Belgium,
- 2004-2005: Research Assistant, INRAT, Tunisia

Education

- 2009, Ph.D., Agricultural Sciences, Ghent University, Belgium
- 2006, Master Degree in agricultural economics, SupAgro, Montpellier, France
- 2004, Master Degree in agricultural economics and development INAT, Tunisia
- 2001, Engineer Degree in agricultural economics, ESAM, Tunisia
CoA 1.2

Name: Aziz KARIMOV

Role in WHEAT: CoA 1.2 co-leader; CoA 1.4 co-leader (time commitment 50%)

Expertise

- Market/Value chain economics
- Adoption-impact assessment
- Productivity and efficiency analysis

Employment including current position

- 2015-to date: Agricultural Economist, CIMMYT -Turkey
- 2011-2013: Research Fellow, UNU-World Institute for Development Economics Research (UNU-WIDER), Finland
- 2007-2011: Junior Researcher, Center for Development Research (ZEF), Germany

Education

- 2012, Ph.D., Agricultural Economics, University of Bonn, Germany
- 2004, MA, Economics, Northeastern University, Boston, USA

YIGEZU: CoA 1.2 co-leader, see FP1
CoA 1.3

Name: Dina NAJJAR

Role in WHEAT: CoA 1.3 co-leader

Expertise:

- Principal investigator for activities related to examining the interplay between gender norms and wheat innovations (hardware and software) in Morocco and Uzbekistan, gender wage gap and working conditions in wheat-based systems of Morocco and Egypt, women’s economic empowerment in wheat based systems of Nigeria, Sudan and Ethiopia.
- Interdisciplinary training in anthropology, natural resources management and agriculture; with a concentration on relations between gender norms and wheat-related agricultural innovations.

Employment including current position

- 2014-to date: Associate Social and Gender Research Scientist, International Center for Agricultural Research in the Dry Areas (ICARDA), Jordan
- 2014-to date: Special Graduate Faculty, The School of Environmental Design and Rural Development, University of Guelph, Canada

Education

- 2013, Ph.D. in Anthropology, University of Western Ontario, Canada
- 2008, Masters in Natural Resource Management, University of Manitoba, Canada
- 2004, Ecosystem Restoration Post-graduate Certificate, Niagara College, Canada
- 2003, Bachelor of Science in Agriculture and a Diploma of Ingenieur Agricole, American University of, Beirut, Lebanon
Name: Lone Bech BADSTUE

Role in WHEAT: CoA 3.1. co-leader

Expertise

- Rural Development Sociologist with special focus on gender and social heterogeneity, crop genetic resources improvement and seed systems, knowledge processes, local livelihoods and farmer decision making processes.
- Badstue has over 15 years of experience working with international development issues. She has broad experience working with different types of social actors and multi-disciplinary teams on issues related to rural development processes, including social relations and gender, seed systems and crop genetic resources, technology diffusion, natural resource management and collective action, as well as mainstreaming of gender in institutional procedures and project portfolios. She has long-term experience in several countries of Latin America and in Tunisia and Kenya, and short-term assignments in a number of countries in Sub-Saharan Africa and Asia.
- Badstue is currently Strategic Leader for Gender research at CIMMYT, and chairs the Executive Committee of GENNOVATE, a collaborative research initiative on Gender Norms, Agency and Innovation in Agriculture and Natural Resource Management involving 11 CRPs.

Employment including current position

- 2011—to date: Strategic Leader for Gender Research, CIMMYT, Mexico
- 2010 –2011: Gender and Advocacy Specialist, Helen Keller International (HKI), Kenya
- 2000–2006: Associate Scientist, CIMMYT, Mexico

Education

- 2006, Ph.D. Rural Development Sociology, Wageningen University, The Netherlands
- 2000, MA Social Anthropology, University of Copenhagen, Denmark
CoA 1.4

Name: Girma Tesfahun KASSIE

Role in WHEAT: CoA 1.4 leader

Expertise

- Girma Tesfahun Kassie is an agricultural economist (PhD) working for the international center for agricultural research in the dry areas (ICARDA) as a senior scientist based in Addis Ababa, Ethiopia.
- Girma has close to 20 years of research and teaching experience in many fields of applied economics particularly in the fields of agricultural production economics, agricultural marketing and value chain analysis, discrete choice analysis, agricultural risk analysis, and monitoring, evaluation and impact assessment of agricultural programs and technologies.
- He has 23 peer reviewed journal publications.

Employment including current position

- 2014—to date: Senior Scientist, agricultural marketing, ICARDA
- 2009—2013: Associate Scientist, socioeconomics, CIMMYT, Zimbabwe
- 2004—2008: Research Fellow, biosciences, ILRI
- 1995—2004: Program Leader, socioeconomic research, Amhara Regional Agricultural Research Institute

Education

- 2008, Ph.D., World Food Economics, University of Kiel, Germany
- 2002, M.Sc. Agricultural Economics, Alemaya University of Agriculture

Karimov: CoA 1.4 co-leader, see CoA 1.2
FP2 Novel diversity and tools for improving genetic gains and breeding efficiency

Name: Kevin PIXLEY

Role in WHEAT: FP 2 co-leader; Director, Genetic Resources Program, CIMMYT

Expertise

- As Director of Genetic Resources Program of CIMMYT, provides strategic and administrative leadership to conserve and apply a wide range of genetic and bioinformatics tools.

- As Associate Professor of Agronomy at the University of Wisconsin, leads the oat breeding program with emphasis on cultivar development while developing opportunities for graduate student research projects.

- As Associate Director & Maize Breeder, Maize Program, CIMMYT, develops the research agenda and strategies for CIMMYT Global Maize Program’s Projects, provide research and administrative leadership for approximately 10 internationally recruited scientists.

- Maize Crop Leader, HarvestPlus Challenge Program, (June 2003-2012), coordinate and lead efforts of a global network of scientists seeking to enhance nutritional value of maize, lead a maize breeding program to develop maize with enhanced nutritional value for provitamin A and zinc.

- Developed and provided grey leaf spot (GLS), streak virus (MSV) and turcicum resistant inbred lines currently used by private and public sector programs in Africa, investigated use of marker-assisted selection for MSV resistance breeding, initiated quality protein maize (QPM) breeding.

Employment including current position

- 2011-to date: Director, Genetic Resources Program, CIMMYT. Co-leader of CRP WHEAT FP2. Project Leader of MasAgro Biodiversidad.

- 2009-2001: Associate Professor of Agronomy, University of Wisconsin, Madison, WI, USA.

- 1990-2009: Maize Breeder, CIMMYT. Held various positions including Program Director of the Tropical Ecosystems Program, Associate Director of the Maize Program, Team Leader and Regional Representative for CIMMYT in Zimbabwe/Southern Africa, Maize Coordinator for Harvest Plus, and others.

Education

- 1990, Ph.D. in Plant Breeding, Iowa State University

- 1985, M.Sc. in Crop Physiology, University of Florida

- 1982, B.Sc. in Agronomy, Purdue University

Name: Ahmed AMRI
Role in **WHEAT**: FP2 co-leader, CoA 2.2 co-leader

**Expertise**

- Cereal breeding and wheat pre-breeding (30 years)
- Conservation of genetic resources (15 years)
- Curating wheat genetic resources
- In situ conservation of dryland agrobiodiversity (20 years)

**Employment including current position**

- 2008-to date: Head of Genetic Resources Unit at ICARDA
- 2001-2009: Regional Coordinator West Asia and Iran office, ICARDA
- 1999-2006: Agrobiodiversity project regional coordinator, GEF
- 1980-1999: Cereal breeder, INRA-Morocco

**Education**

- 1989, Ph.D. Genetic and breeding, Kansas State University, USA
- 1980, M.Sc. Plant Breeding, IAV Hassan II in Morocco (coursework at University of Minnesota)
CoA 2.1

Name: Kate DREHER

Role in WHEAT: CoA 2.1 leader

Expertise

- As a Germplasm Data Coordinator at CIMMYT since 2013, helps to coordinate efforts to implement institutional databases and tools for storing and utilizing maize and wheat phenotypic, genotypic, and genealogical data.

- Serves as a CIMMYT representative to the CGIAR Data Management Task Force and the Wheat Information System Expert Working Group, leads the CGIAR Dataverse Community of Practice.


Employment including current position

- 2013-to date: Germplasm Data Coordinator, CIMMYT, México
- 2007-2013: Biocurator, Carnegie Institution for Science, USA
- 2007-2007: Molecular Biology Consultant, CIMMYT, México

Education

- 2007, Ph.D. in Plant Biology, University of California, Davis, USA
- 1999, B.A. in Biology and Economics, Williams College, USA
CoA 2.2

**Name:** Kanwarpal DHUGGA

**Role in WHEAT:** CoA 2.2 co-leader

**Expertise**

- Biotechnology Opportunities in Agriculture. Wheat transformation and regeneration.
- Agronomy, biochemistry, chemistry, genetics, molecular biology, and statistics.
- Building and leading international teams of scientists from diverse disciplines focused on crop improvement using an integrated approach

**Employment including current position**

- 2015 – to date: Lead, Biotechnology Opportunities in Agriculture, CIMMYT, Mexico
- 1996-2014: Research Scientist, Sr. Research Scientist, Research Fellow, DuPont Pioneer, Johnston, USA
- 1991-1995: Basic Life Sciences Research Associated, Dept. Biological Sciences, Stanford University, USA

**Education**

- 1987, Ph.D. Genetics, the University of California, Riverside, CA, USA
- 1980, M.Sc. Plant Breeding, Punjab Agricultural University, Ludhiana, India

Amri: CoA 2.2 co-leader, see FP2
CoA 2.3

**Name:** Michel GHANEM

**Role in WHEAT:** CoA 2.2 co-leader

**Expertise**

- A crop physiologist and agronomist working at ICARDA as crop physiologist where he leads the Crop Physiology Laboratory. His research focuses on deciphering plant traits that contribute to drought and heat adaptation.

**Employment including current position**

- Head, Crop Physiology Laboratory, ICARDA
- 2010—2012, Research Associate, Spanish National Research Council, Department of Plant Nutrition (CEBAS), Alfocea Lab, Spain
- 2009—2012, Chargé de recherches, Fonds de la Recherche Scientifique (FNRS), Belgium
- Researcher, Catholic University of Louvain, Belgium

**Education**

- Ph.D., Plant biology, University of Louvain
- Agronomy Engineering
Name: Matthew REYNOLDS

Role in WHEAT: CoA 2.3 co-leader

Expertise

- Germplasm development and improvement of breeding methodology
- Understanding genetic and physiological bases of crop adaptation
- Strategy development, external fundraising and project management
- Initiated Wheat Yield Consortium in 2009 which became International Wheat Yield Partnership (IWYP) in 2014- to raise genetic yield potential of wheat to its biological limit
- Lead CIMMYT Wheat Physiology Laboratory and IWYP Research Hub
- Establishing the Heat and Drought Wheat Improvement Consortium (HeDWIC), an international partnership involving hundreds of plant abiotic stress experts; target budget of $50m+, endorsed by the Wheat Initiative as a research priority for the wheat community.
- Wrote strategic initiatives on yield potential & abiotic stress for earlier phase of CRP WHEAT

Employment including current position

- 1996-to date: Distinguished Scientist (since 2014); Principal Scientist (since 2004), Head of Wheat Physiology, 1996-present, International Maize and Wheat Improvement Center (CIMMYT), Mexico.
- 2014: Expert Consultant, Bayer
- 2005: Associate Expert, Australian Centre for Plant Functional Genomics (ACPFG)
- 1989-95: Scientist & post-doctoral fellow, Wheat Program, CIMMYT, Mexico
- 1984-1989: Research Assistant, Department of Horticulture, Cornell University

Education

- 1989, Ph.D. Horticulture science, Cornell University
- 1984, M.Sc. Crop physiology, Reading University
- 1983, B.A. Botany, Oxford University
CoA 2.4

Name: Jessica RUTKOSKI

Role in WHEAT: CoA 2.4 leader

Expertise

- Expert in gain from selection theory and implementation of genomic selection in applied breeding programs

Employment including current position

- 2014-to date: Assistant Professor, International Programs, College of Agriculture and Life Sciences, Cornell University
- 2014-to date: Adjunct Assistant Professor, Plant Breeding and Genetics Section of the School of Integrative Plant Sciences
- 2014-to date: Adjunct Associate Scientist, CIMMYT

Education

- 2014, Ph.D, Plant Breeding and Genetics, Cornell University
- 2009, BS, Genetics, University of Wisconsin Madison
FP3 Better varieties reach farmers faster

**Name:** Hans-Joachim BRAUN

**Role in WHEAT:** Director CRP WHEAT, FP3 co-leader

**Expertise**
- Leads and manages 40 internationally recruited scientists
- Board member, Wheat Initiative and board member, International Wheat Yield Partnership
- Main author or co-author on more than 120 scientific articles, including more than 50 peer-reviewed articles and book chapters
- Contributed to the development and release of 44 winter wheat varieties grown on nearly 1.5 million hectares in Central and West Asia
- Recipient of Friendship Award of China for contribution to disease resistance wheat lines in Gansu province

**Employment including current position**
- 2015—to date: Director, CRP WHEAT, CIMMYT
- 2004—to date: Director, Global Wheat Program, CIMMYT
- 1983: Post Doc, CIMMYT

**Education**
- 1983, Ph.D., University of Hohenheim, Germany
- 1980, M.S., University of Stuttgart-Hohenheim, Germany
Name: Michael BAUM

Role in WHEAT: FP 3 co-leader

Expertise

- Plant breeding and cytogenetics; molecular marker application in plant breeding; doubled haploid breeding in wheat and barley; genetic transformation in cereals and legumes.
- Coordinate the work of up to 40 international scientists (barley, durum and bread wheat, chickpea, lentil, faba bean breeding, cereal and legume pathology, virology, biotechnology, international nurseries, seed health, cereal and legume quality), and more than 50 technical staff in the West Asia and North Africa region with major hubs in Rabat, Morocco, Terbol, Lebanon, Izmir, Turkey, Cairo, Egypt.

Employment including current position

- 2010-to date: Director, Biodiversity and Integrated Gene Management Program (BIGM), International Center for Agricultural Research in the Dry Areas (ICARDA), Amman- Rabat, Morocco
- 1992-2010: Biotechnologist, BIGM, ICARDA, Aleppo, Syria
- 1989-1991: Post-doctoral Fellow, CSIRO, Canberra, Australia
- 1985-1988: Ph.D. student, Göttingen, University, Germany,

Education

- 1988, Ph.D. in plant breeding and cytogenetics, University of Göttingen, Germany
- 1985, Diploma in Agriculture, University of Göttingen, Germany
CoA 3.1

Braun: CoA 3.1 co-leader, see FP3

Baum: CoA 3.1 co-leader, see FP3
CoA 3.2

Name: Carolina SAINT PIERRE

Role in WHEAT: CoA 3.2 co-leader

Expertise

- Project Coordination. CRP-WHEAT Coordinator for the Global Network of Precision field-based Wheat Phenotyping Platforms, promoting partnership, communication and data sharing, training activities, and the use of good phenotyping practices for innovative and interdisciplinary research in wheat phenotyping.
- Project Coordination. Wheat Phenotyping Coordinator for Seeds of Discovery, providing overall management of phenotyping activities for the characterization of ~70,000 gene bank wheat accessions under field and glasshouse conditions with partners including scientists from ICARDA, CIMMYT, INIFAP, universities and national institutes.
- Wheat Phenotyping. Lead greenhouse and field experiments to evaluate genetically modified wheats in Mexico, being also responsible for official documentations and interactions with Mexican authorities and auditors.
- Wheat Physiology. Lead studies to understand gene action of canopy temperature in wheat. Conducted researches on wheat stem solidness and its relationship to water-soluble carbohydrates, and experiments on the influence of moisture stress and soil N on protein content, protein quality, and end-use functionality of different wheat varieties.
- Wheat Breeding. Participation in Wheat Breeding Programs at CIMMYT and Oregon State University, contributing in pre-breeding activities and in the development of cultivars with durable resistance to biotic and abiotic stresses, enhanced grain yields, and superior end-use properties.

Employment including current position

- 2011-to date: Scientist, Wheat Phenotyping Coordinator, Global Wheat Program, CIMMYT-México
- 2008-2011: Associate Scientist, Wheat Physiology, Global Wheat Program, CIMMYT-México
- 2002-2006: Graduate Research Assistantship, Oregon State University, OR, USA
- 1998-2002: Graduate Research Assistantship, Universidad Nacional del Sur, CIC, and CONICET, Argentina

Education

- 2006, Ph.D., Crop and Soil Science Department, Oregon State University, OR, USA
- 2002, M.Sc., Agrarian Sciences, Universidad Nacional del Sur, Bahía Blanca, Argentina

Baum: CoA 3.2 co-leader, see FP3
CoA 3.3

Name: Sridhar BHAVANI

Role in WHEAT: CoA 3.3 co-leader

Expertise

- Wheat rust genetics, pathology and breeding: Sridhar Bhavani is CIMMYT wheat scientist working on wheat rust genetics, pathology and breeding based in Kenya and is the international coordinator for stem rust screening activities in East Africa under the DRRW (Durable Rust Resistance in Wheat) project. Sridhar facilitates pre-breeding and breeding components for several global partners with an objective to develop durable stem rust resistant varieties and the result of such massive screening efforts has resulted in the release of more than 80 varieties globally that are resistant to Ug99 globally. Sridhar is also keen in understanding the race-non specificity of stem rust resistance genes that confer durability and so far 13 new loci with adult plant resistance to stem rust Ug99 have been identified for which fine mapping is underway to develop reliable markers that can be used in breeding. He has collaborative projects with Montana State University (BREAD), Cornell University (DRRW), USDA, AAFC, CSIRO, GRDC, BBSRC, ICAR, PBI, Sydney and National Research Institutes. As a part of capacity building Sridhar also organizes an annual training course at KARI, Njoro focusing on standardization and evaluation of germplasm against stem rust U99.

Employment including current position

- 2011-to date: Scientist, CIMMYT
- 2010-2011: Associate Scientist, CIMMYT
- 2008-2010: Post-Doc, CIMMYT

Education

- Ph.D. Molecular genetics and Breeding, University of Sydney
- M.Sc. Molecular Biotechnology, University of Sydney
Name: Kumarse NAZARI

Role in WHEAT: CoA 3.3 co-leader

Expertise

- Leading cereal rust activities at RCRRC and coordinating ICARDA’s rust research activities in CWANA
- Regional coordinator of BGRI rust surveillance in CWANA
- Coordinator of International Wheat Rust Trap Nurseries

Employment including current position

- Senior cereal rust pathologist, Regional Cereal Rust Research Center (RCRRC), ICARDA, Turkey

Education

- Ph.D., University of Sydney
CoA 3.4

Name: Pawan SINGH

Role in WHEAT: CoA 3.4 co-leader

Expertise

- Lead SI5 in the CRP WHEAT Phase I
- Scientific oversight to four CRP competitive partnership projects and Precision Phenotyping Platforms in Tunisia (Septoria tritici blotch), Uruguay (Multiple Diseases) and Bolivia (Blast) in CRP WHEAT Phase I
- Development and implementation of high throughput disease screening protocols including phenotypic, molecular and biochemical analysis for wheat disease
- Host-pathogen interactions for fungal head and leaf blight diseases of wheat
- Disease assessment and identification of the causal pathogen, understanding the population biology of the pathogen using pathogenicity, virulence and molecular analysis
- Scientific oversight to four CRP competitive partnership projects and Precision Phenotyping Platforms in Tunisia (Septoria tritici blotch), Uruguay (Multiple Diseases) and Bolivia (Blast) in CRP WHEAT phase I
- Scientific Advisory Board member for the project “Novel Strategies for Managing Blast Diseases of Rice and Wheat” USDA NIFA/AFRI Competitive Grant 2013-68004-20378

Employment including current position

- 2015-to date: Senior Scientist, Head Wheat Pathology, International Maize and Wheat Improvement Center (CIMMYT), Mexico
- 2009-2014: Scientist, Head Wheat Pathology, CIMMYT, Mexico
- 2004-2008: Post-Doctoral Fellow, North Dakota State University, Fargo, USA
- 2001-2004: Professional Research Associate, University of Saskatchewan, Saskatoon, Canada

Education

- 2001: Doctorate of Philosophy, Plant Sciences, Department of Plant Sciences, University of Saskatchewan, Saskatoon, Canada
- 1995: Master of Science, Plant Breeding, Department of Genetics and Plant Breeding, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, India
Name: Mustapha EL BOUHSSINI

Role in WHEAT: CoA 3.4 co-leader

Expertise

- Host plant resistance to insect pests (screening of germplasm, mechanisms of resistance and biotypes characterization)
- Biological control (parasitoids and entomopathogenic fungi)

Employment including current position

- 2014—to date: Principal entomologist (Integrated pest management of cereal and legume pests), ICARDA, Rabat, Morocco
- 2005—to date: Adjunct Professor, Entomology Department, Kansas State University, Manhattan, KS, USA
- 1997-2014: Senior Entomologist (IPM of cereal and legume insect pests), ICARDA, Aleppo, Syria

Education

- 1992, Ph.D., Entomology, Kansas State University, Manhattan, USA
- 1986, M.S., Entomology, Kansas State University, Manhattan, USA
CoA 3.5

Name: Carlos GUZMAN

Role in WHEAT: CoA 3.5 leader

Expertise

- Wheat breeding
- Molecular markers
- Genetic resources
- One of the leaders of the Expert Working Group on Improving Wheat Quality for Processing and Health

Employment including current position

- 2014-to date: Scientist, Head of Wheat Chemistry and Quality Laboratory at CIMMYT, Mexico
- 2012-2013: Post-doctoral Fellow at CIMMYT, Mexico
- 2006-2011: PhD student at University of Cordoba, Spain

Education

- 2007, Ph.D. in Plant Breeding “Polymorphism of waxy proteins and puroindolines in Spanish hulled wheats”. ETSIAM, Genetics Department, University of Córdoba, Spain
- 2011, M.Sc. “Molecular, Cell and Genetics Biotechnology”. ETSIAM, Genetics Department, University of Córdoba, Spain
CoA 3.6

Name: Susanne DREISIGACKER

Role in WHEAT: CoA 3.6 co-leader

Expertise
- Bridging genetic and genomic tools via new approaches into crop improvement.
- Understanding the genetic basis of biotic (rust, septoria, tan spot, fusarium) and abiotic (drought, heat) stress responses.
- Project participation: Genomic & Open-source Breeding Informatics Initiative (GOBII), 2015-2020, Technology development initiative aims to facilitate the routine use of genomic data.
- Project participation: BMZ-large grant, 2013-1015, Increasing the productivity of the wheat crop under conditions of rising temperatures and water scarcity in South Asia.
- Project lead: BMZ-small grant, 2015-2016, Understanding cross pollination ability to improved seed production for future hybrid wheat.

Employment including current position
- 2013-to date: Head of Wheat Laboratory, Global Wheat Program, CIMMYT, Mexico (Previously Senior Scientist)

Education
- 2004, Ph.D. Plant breeding and Genetics, University of Hohenheim, Stuttgart, Germany
- 2000, M.S. Agriculture Biology, University of Hohenheim, Stuttgart, Germany
Name: Ayed AL-ABDALLAT

Role in WHEAT: CoA 3.6 co-leader

Expertise

- Plant biotechnology
- Functional genomics
- Abiotic stresses
- Molecular markers
- Bioinformatics

Employment including current position

- Senior biotechnologist, ICARDA
- Associate Professor of Plant Molecular Biology, The University of Jordan

Education
CoA 3.7

Name: Zewdie BISHAW

Role in WHEAT: CoA 3.7 co-leader

Expertise

- Trained as a Seed Technologist with a Ph.D. from Wageningen University, the Netherlands.
- He has broad managerial and technical knowledge with 35 years of experience in the sector, and is currently leading the Seed Unit of ICARDA, where he is responsible for strengthening the national seed systems targeting both the formal (public and private seed sector) and informal (community/farmer-based) seed sectors.
- Authored and co-authored over 60 scientific and technical publications including training manuals and audio-tutorials with ICARDA and national seed program scientists.

Employment including current position

- 2006—to date: Head, Seed Section and International Nurseries, ICARDA

Education

- 2004, Ph.D., Production ecology and sustainable conservation, Wageningen University, the Netherlands
- 1984, M.Sc., Seed technology, School of Agriculture, Edinburgh University, Scotland
- 1979, B.Sc., Plant sciences, College of Agriculture, Addis Ababa University, Ethiopia
Name: Arun JOSHI

Role in WHEAT: CoA 3.7 co-leader

Expertise

- 30 years of experience in wheat research.
- A DAAD and INSA fellow, he has contributed to development and release of more than three-dozen wheat varieties in south Asia. He has been engaged in fast track dissemination of agronomically superior rust (Ug99) resistant wheat varieties in south Asia and Africa using innovative approach of pre-release multiplication.
- Jeanie Borlaug Laube Women in Triticum Mentor Award 2014 from Borlaug Global Rust Initiative, Cornell, USA.
- His research findings are published in 111 refereed journal articles; 8 books, book chapters, and reviews, and 65 symposia proceedings. He holds one patent. Joshi has trained three dozen Masters and PhD students in his career.

Employment including current position

- Principal Scientist, Global Wheat Program, CIMMYT
- Professor, genetics and plant breeding, BHU, India

Education

- M.S. and Ph.D., Banaras Hindu University
FP4 Sustainable intensification of wheat-based farming systems

Name: Bruno GERARD

Role in WHEAT: FP4 co-leader, WHEAT MC Member

Expertise

- Sustainable Intensification Flagship leader of WHEAT Phase I
- Research leadership in CIMMYT (team of 42 internationally recruited scientists)
- Coordination of multi-center research under CGIAR system-wide initiative (SLP)
- Research interests in geospatial topics, land use, soil fertility and resource management at farm and landscape levels, multi-disciplinary approaches

Employment including current position

- 2011–to date: Director, Sustainable Intensification Program, CIMMYT, Mexico
- 2005-2008: Visiting Scientist seconded from ICRISAT to Université Catholique de Louvain, Belgium
- 2000-2005: Principal Scientist International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Niger

Education

- 2000, Ph.D. from the plant nutrition department at the University of Hohenheim, Germany
- 1990, M.Sc. in Irrigation Engineering, Utah State University, USA
Name: Richard THOMAS

Role in WHEAT: FP4 co-leader

Expertise

- Scientific coordinator, Global Economics of Land Degradation Initiative
- Integrated soil, water and nutrient management in crop-livestock systems
- 2001 CGIAR Excellence in Science Award for Outstanding Partnership
- Author of over 100 refereed journal articles, more than 41 book chapters, co-editor of 4 books and 26 articles

Employment including current position

- 2014—to date: Program Director, CRP Drylands System
- Assistant Director, United Nations University Institute for Water, Environment and Health, McMaster University, Canada
- Director, Natural Resources Management Programme, ICARDA
- Program Leader, CIAT

Education

- Ph.D., botany and microbiology, University of Wales, UK
- M.Sc., botany and microbiology, University of Wales, UK
CoA 4.1

Name: Frédéric BAUDRON

Role in WHEAT: CoA 4.1 co-leader

Expertise

- Areas of expertise: farming systems research, sustainable intensification, impact of agriculture on biodiversity, and participatory innovation development
- Coordination (currently) of a regional project (FACASI - Farm Mechanization and Conservation Agriculture for Sustainable Intensification) project implemented in Ethiopia, Kenya, Tanzania and Zimbabwe.

Employment including current position

- 2011-to date: Systems agronomist, CIMMYT Ethiopia
- 2010-2011: Research fellow, CIRAD France
- 2010-2010: Private consultant
- 2007-2010: Research fellow, CIRAD Zimbabwe

Education

- 2011, Ph.D., from the Graduate School ‘Production Ecology and Resource Conservation’, Wageningen University, The Netherlands

Thomas: CoA 4.1 co-leader, see FP4
CoA 4.2

Name: Jens A. ANDERSSON

Role in WHEAT: CoA 4.2 co-leader

Expertise

- Anthropology of development in Africa
- Development and implementation of on-farm research methodologies, focusing on multi-scale analyses, farmer decision-making and technology integration
- Coordination of innovation research and external support to innovation approaches in CRP WHEAT

Employment including current position

- 2012-to date: Innovation scientist, CIMMYT (working globally), The Netherlands
- 2005-2011: Research coordinator, southern Africa, Wageningen University, The Netherlands
- 2004-2006: Postdoc Research Fellow, University of Amsterdam.

Education

- 2002, Ph.D. (cum laude), Social Sciences, Wageningen University
- 1993, M.Sc. (cum laude), Sociology of Rural Development, Wageningen University
Name: Somanagouda PATIL

Role in WHEAT: CoA 4.2 co-leader

Expertise

Employment including current position

- Agronomist, ICARDA

Education
CoA 4.3

Name: Yashipal SINGH SAHARAWAT

Role in WHEAT: FP 4.3 Leader

Expertise

- Long-term research platforms on sustainable intensification across South Asia
- Conservation Agriculture in wheat based systems
- Precision Agriculture for efficient water and nutrient management in wheat based systems
- Dry land wheat systems agronomy

Employment including current position

- Agronomist and Country Manager- ICARDA (2014-till date)
- Senior Scientist – Indian Council of Agricultural Research (2012-2014)
- Senior Agronomist- International Rice Research Institute (2009-2012)
- Soil Scientist- International Fertilizer Development Centre, USA (2008-2009)
- Soil Scientist- International Rice Research Institute (2005-2008)

Education

- PDF- IRRI
- PDF- IFDC USA
- MBA- (Finance and HR)- India
- Ph.D. (Soils)- University of Hohenheim Stuttgart Germany
- M.Sc. (Soils) – CCS Haryana Agricultural University Hisar Haryana
- Post Graduate Diploma in Computer Application (PGDCA)- India
Name: ML JAT

Role in WHEAT: CoA 4.3 co-leader

Expertise
- Systems Research with special focus on Conservation Agriculture, Precision Farming and Climate Smart Agriculture in wheat based systems.
- Leading CCAFS Flagship project on Climate Smart Agriculture in South Asia and coordinating CIMMYT’s CCAFS research portfolio in South Asia.

Employment including current position
- 2010-to date: Senior Cropping Systems Agronomist, CIMMYT
- 2007-2010: Senior Cropping Systems Agronomist, Indian Council of Agricultural Research, (ICAR), India
- 1998-2007: Agronomist, Indian Council of Agricultural Research, (ICAR), India

Education
- 1999, Ph.D., Agronomy, Indian Agricultural Research Institute (IAR), Pusa New Delhi
- 1996, M.Sc., Agronomy, Rajasthan Agricultural University, Bikaner, India
CoA 4.4

Name: David KAHAN

Role in WHEAT: CoA 4.4 co-leader

Expertise
- Agribusiness development
- Business modeling
- Innovation Systems
- Agricultural extension
- Farm business management
- Farm economics
- Natural resource management
- Marketing and value chain development

Employment including current position
- 2013–to date: Agribusiness/ Scaling up Specialist, CIMMYT, Addis Ababa, Ethiopia
- 2012–2013: Principal Officer, Agricultural Innovation and Extension, FAO Rome, Italy
- 2010–2012: Senior Officer, Agribusiness and Agro-enterprise Development, FAO, Regional Office for Asia and the Pacific, Bangkok, Thailand
- 2001–2010: Senior Officer, Agribusiness and Agro-enterprise Development, FAO, Rome, Italy

Education
- 1982, Ph.D Rural Development, University of Reading, UK
- 1976, M.Sc. Farm Management, University of Reading, UK
- 1976, M.A Agricultural Economics, University of Wisconsin, USA
- 1973, B.Sc. Agricultural Economics, University of Reading, UK

Bishaw: CoA 4.4 co-leader, see CoA 3.7
Cross-cutting (ex FP5, 5.3) Capacity development for the next generation of researchers and farmers

Name: Joachim STAHL

Role in WHEAT: Cross-cutting co-leader

Expertise

- Capacity development
- Project management and M&E
- Change management

Employment including current position

- Since 2011: Planner change management and methodological approaches, GIZ, Germany
- 2006-2011: Quality assurance referent, German Development Service (DED), Germany
- 2003-2005: Quality assurance consultant, DED, Tanzania
- 1997-2002: Adult education consultant, DED, Ecuador

Education

- 1990, PhD, Philosophy, Goethe University Frankfurt, Germany
- 1986, MA, Philosophy and Sociology, Goethe University Frankfurt, Germany
Name: Amor YAHYAOUI

Role in WHEAT: Cross-cutting co-leader

Expertise

Main research teaching interests include disease resistance in wheat and barley, genetic diversity in cereal crops, host-parasite interactions, genetic diversity in fungal populations, virulence shifts in plant pathogens, and disease epidemics. Major area of teaching includes plant pathology, epidemiology, integrated pest management, and crop breeding.

- Research and Research-development on field crops cereals in particular
- Training young scientists in applied filed research
- Training young scientists in disease diagnosis
- Advise farmers on crop and pest management and farmers’ field schools
- Conducting workshops on plant protection, agronomy, breeding, integrated pest and crop management, disease epidemiology, and breeding for disease resistance
- Project development on various research & development areas
- Disease monitoring

Employment including current position

- Senior scientist and training officer, CIMMYT
- 2015-to date: Adjunct Professor Kef College of Agriculture, Univ.of Jendouba, Tunisia
- 2014-to date: Coordinator Tunisia “WHEAT CRP”-Septoria Precision Phenotyping platform
- 2011-to date: Sr. Scientist, Wheat training Officer, Global Wheat Program, CIMMYT
- 2008-2010: Coordinator, ICARDA-CIMMYT Wheat Improvement Program in CWANA
- 2005-2007: Senior Cereal Pathologist (IGM), and IPM Coordinator, ICARDA
- 2002-2004: Manager of Integrated Pest Management (IPM) Project, Senior Cereal Pathologist, Germplasm Program, ICARDA
- 1998-2001: Senior Cereal Pathologist, Germplasm Program at ICARDA
- 1993-1998: Professor, Director of Kef College of Agriculture (University of Tunis II), Regional Coordinator Dry land Research in North West Tunisia
- 1993-1998: Professor Plant Breeding and Pathology, and Director of Kef College of Agriculture Univ. Tunis II, Tunisia
- 1989-1993: Associate Professor in Plant Breeding and Pathology; Director of Kef College of Agriculture, Univ. Tunis II, Tunisia
- 1987-1993: Assistant Professor of Plant Breeding and Pathology; Head of Plant Breeding Department at Kef College of Agriculture University

Education

- 1986, Ph.D., Plant Pathology, Montana State University, USA
- 1981, M.Sc., Plant breeding and genetics, Oregon State University, USA
- 1979, B.Sc., Agronomy, Oregon State University, USA
Name: Charles KLEINERMANN

Role in WHEAT: Cross-cutting co-leader

Expertise
- Capacity development
- Partnerships development
- Project management

Employment including current position
- 2014--to date: Head of Capacity Development Unit, ICARDA, Amman, Jordan
- 2012—2014: Technical Training Officer, ICARDA, Amman, Jordan
- 2009—2012: Deputy Secretary General – European Movement International and Secretary General, MEDEA Institute, Brussels, Belgium

Education
- 2003, Diplome d Etude Applique (DEA) in Political Science and International Relations (equivalent to first year Ph.D.) from Agence Universitaire de la Francophonie (AUF), Beirut, Lebanon
- 2001, Diplome d Etude Specialise (DESS) in European Studies from the Catholic University of Louvain-la-Neuve, Belgium

Selected Recent Peer-reviewed publications
- Please see http://wheat.org/download/wheat-publications/
  (comprehensive publications list for all WHEAT Flagship and Cluster of Activities leads)
3.9 Open Access and Data strategy

Planning for and implementing OA/OD: Critical issues and anticipated challenges

Open Access and Open data planning, according to the CGIAR Open Access and Data Management Policy ("CG OADMP"), is driven by the target date of implementing Policy mandates by the end of 2018. By then, full Open Access and Open Data should be a reality (CG OADMP is effective as of October 2, 2013).

Key challenges are:

- **Culture change:** Since scientists are compelled by the CG OADMP to make their information products immediately, irrevocably, unrestrictedly and freely accessible online, they are going to confront a challenge for changing the way they used to operate in that regard in the past, so that they can adapt to current and future requirements. This challenge is closely related to:

- **Availability and commitment of resources for implementing Open Access and Open Data:** To be compliant with the CG OADMP requires investments and thus budgets. Cost drivers are:
  
  - The implementation, maintenance and improvement of suitable repositories, which includes hardware infrastructure as well as staff costs for development, maintenance and population. [CG OADMP § 4.1.2]
  
  - The implementation, maintenance and improvement of interoperability, which includes the cost of properly tagging all the information products with metadata based on controlled vocabularies. [CG OADMP § 4.1.3]
  
  - Data storage, format conversion and adequate preservation for future use, which includes the costs related to storage volumes, backup storage and disaster recovery plans. [CG OADMP § 4.1.4]
  
  - Copyright and Open Licenses, which includes the royalties paid for publishing articles under the Gold or Green Open Access ways. [CG OADMP § 4.1.5]
  
  - Incentives and professional expertise in all areas of Open Access and Data Management. [CG OADMP § 4.1.6]
  
  - Translations of key documents and other media into pertinent languages. [CG OADMP § 4.1.7]

Planning and implementation

To be compliant with the CG OADMP, CRP-Management should consider the following issues during project planning and implementation:

- Allocate staff and material resources for proper implementation, maintenance and improvement of suitable repositories and tools, implementation of interoperability (including metadata tagging), data curation and data quality control, data storage, license management (including royalties for Gold and Green Open Access publishing), counselling on information product management, and translations. [CG OADMP § 4.1.2 to § 4.1.7]

- Properly design and put in place coordination mechanisms among participating centers and/or units for ensuring proper Open Access and Open Data implementation. [CG OADMP § 2]

- Establish and implement procedures and workflows for accomplishing the deadlines for making information products Open Access, according to the CG OADMP. [CG OADMP § 4.2]
Data Management Plan (DMP – high level)

- Expected information product types
  WHEAT expects to produce the following types of information products: Annual reports, books and monographs, brochures, databases, datasets, fact sheets/flyers, financial management documents, financial statements, guidelines and manuals, grey literature, journal articles, newsletter/bulletins, non-conventional literature, photographs, posters, presentations, proceedings, reports, reprints, research highlights, research plans, research reports, software, special publications, speeches and presentations, technical bulletins, thesis, trip reports, videos/film.

- Formats
  Currently most of the information products are natively created in digital formats, so they can be immediately stored in proper repositories for “into perpetuity” archiving. Nevertheless, WHEAT will perform special efforts in order to transform relevant legacy information products into digital formats, as a way to preserve the institutional knowledge. Moreover, WHEAT will do its best for archiving its information products in commonly used and highly compatible digital file formats, like PDF, CSV, JPG, MP4, etc.

- Storage and preservation of information products
  Currently WHEAT uses the following state-of-the-art digital repositories:
  - CIMMYT Institutional Multimedia Publications Repository
  - CIMMYT Institutional Research Data and Software Repository
  These repositories ensure not only preservation and backup but openness of research outputs via FAIR principles as well. Since the partner center does not have such repositories in place, it will be necessary to implement similar ones for preserving FAIR principles CRP-wide as well as center’s independency.

- Licensing
  CIMMYT has already in place different licenses for all its information products publicly available. Those licenses have been approved by its Legal Unit and are shown to the users of the repositories before they can download any information product. Since the partner center has not fully implemented a licensing system, it will be necessary to cover all information products coherently CRP-wide.

- Procedures, workflows and embargo periods
  All procedures, workflows and embargo periods regarding information products must observe the regulations given in the CG OADMP. CRP WHEAT will review current procedures, workflows and embargo periods currently in place in both centers and will adapt them to be compliant with the CG OADMP if necessary.

Technical considerations

The information products stored in the repositories cited in the DMP can be discovered by search engines, and their contents indexed via standard protocols. Those state-of-the-art repositories provide syntactic and semantic interoperability by means of internationally widely used standards like OAI-PMH, Agrovoc, Dublin Core, etc., and they are hosted in first-class cloud servers so the content is properly backed-up and archived “into perpetuity”. The partner center has not implemented such kinds of interoperable repositories, so this should be one of the priority actions to be taken.

The following table summarizes the repositories currently used in the CRP.
Table 3.9-1. WHEAT-related information product repositories.

<table>
<thead>
<tr>
<th>Name</th>
<th>Repository Technology</th>
<th>URL</th>
<th>FAIR compliant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIMMYT Institutional Multimedia Publications Repository</td>
<td>DSpace</td>
<td><a href="http://repository.cimmyt.org/">http://repository.cimmyt.org/</a></td>
<td>Yes</td>
</tr>
<tr>
<td>CIMMYT Institutional Research Data and Software Repository</td>
<td>Dataverse</td>
<td><a href="http://data.cimmyt.org/">http://data.cimmyt.org/</a></td>
<td>Yes</td>
</tr>
<tr>
<td>ICARDA Publications &amp; Resources</td>
<td>Non-specific</td>
<td><a href="http://www.icarda.org/publications-resources">http://www.icarda.org/publications-resources</a></td>
<td>No</td>
</tr>
</tbody>
</table>

Technical Operations

Given the above considerations, personnel and infrastructures will be allocated for ensuring the proper development of the following routine and on-demand operations:

- Implementation of suitable repositories and tools (on-demand). [CG OADMP § 4.1.2]
- Maintenance and improvement of suitable repositories and tools (routine). [CG OADMP § 4.1.2]
- Implementation of interoperability (on-demand). [CG OADMP § 4.1.3]
- Maintenance and improvement of interoperability (routine). [CG OADMP § 4.1.3]
- Implementation of hardware infrastructure, storage volumes, backup storage, and disaster recovery plans (on-demand). [CG OADMP § 4.1.4]
- Maintenance and improvement of hardware infrastructure, storage volumes, backup storage, and disaster recovery plans (routine). [CG OADMP § 4.1.4]
- Translations of key documents and other media into pertinent languages (on-demand). [CG OADMP § 4.1.7]
- Data curation, metadata tagging, and data quality control (routine). [CG OADMP § 4.1.3 and § 4.1.4]
- Periodic evidence-based review of the implementation of the relevant regulations in force (routine). [CG OADMP § 5]
- Continuous coordination among participating centers to ensure proper Open Access and Open Data implementation (routine). [CG OADMP § 2]
- Training activities covering relevant topics to ensure proper staff knowledge and engagement to accomplishing envisaged Open Access and Open Data objectives (on-demand).

Coordination and decision making

The CIMMYT Knowledge Management, Data Management, Geographic Information Systems and Intellectual Property working group, which holds periodic meetings regarding Open Access and Open Data Management activities, should be extended with relevant equivalent staff from the partner center, as well as with the CRP Program Manager and other relevant staff, in order to jointly define workflows, procedures and governance recommendations that should be followed CRP-wide.
Narrative for required resources (e.g. human and financial)

On top of existing resources (material and human), the following tables show additional resources forecasted for OA/OD activities for WHEAT (see Uplift budget).

Table 3.9-2. Additional WHEAT OA/OD budget proposed.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Resource</th>
<th>Average estimated yearly extra cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Locally Recruited Staff for data curation, data quality assurance prior to final publication, metadata tagging, data storage, coordination with other centers and units and implementation of procedures and workflows related to information products management.</td>
<td>USD 48,700</td>
</tr>
<tr>
<td>0.5</td>
<td>Locally Recruited Staff for license management, data storage, counselling on information product management and coordination with other centers and units, shared by both MAIZE and WHEAT.</td>
<td>USD 17,000</td>
</tr>
<tr>
<td>0.5</td>
<td>Locally Recruited Staff for the design, development and implementation of trainings, shared by both MAIZE and WHEAT.</td>
<td>USD 17,000</td>
</tr>
<tr>
<td>N/A</td>
<td>Server rental and maintenance, storage volumes, backup storage and server disaster recovery set-up, shared by both MAIZE and WHEAT.</td>
<td>USD 26,000</td>
</tr>
<tr>
<td>N/A</td>
<td>Implementation of suitable publicly accessible repositories (outsourcing).</td>
<td>USD 4,000</td>
</tr>
<tr>
<td>N/A</td>
<td>Implementation of a FAIR Integrated Library Management System (outsourcing).</td>
<td>USD 2,500</td>
</tr>
<tr>
<td>N/A</td>
<td>Maintenance of repositories and Information Library Management Systems.</td>
<td>USD 6,000</td>
</tr>
<tr>
<td>N/A</td>
<td>Improvement of suitable publicly accessible repositories, mainly regarding interoperability and dissemination features and channels/pipelines (outsourcing).</td>
<td>USD 50,000</td>
</tr>
<tr>
<td>N/A</td>
<td>Translations of key documents and other media into pertinent languages.</td>
<td>USD 20,000</td>
</tr>
<tr>
<td>N/A</td>
<td>Training materials and fees (books, fees for attending courses, etc.)</td>
<td>USD 15,000</td>
</tr>
<tr>
<td>N/A</td>
<td>Fees for publishing in Open Access (see tables below)</td>
<td>USD 654,895</td>
</tr>
<tr>
<td>Total average estimated yearly extra cost</td>
<td></td>
<td>USD 861,095</td>
</tr>
</tbody>
</table>

Total estimated extra cost for 2017-2022 for CRP WHEAT = USD 5,166,570

The following tables show estimates for WHEAT publishing fees in Open Access, based on the assumption that all articles published in 2015 have been published as Gold Open Access. A 15% annual increase is added, to compensate increments both in scientific production and publishers’ prices.

Table 3.9-3. WHEAT Open Access publishing costs for CIMMYT and ICARDA.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost (CIMMYT)</th>
<th>Cost CIMMYT and ICARDA (CRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>USD 212,908</td>
<td>USD 354,847 (60%-40%)</td>
</tr>
<tr>
<td>2016</td>
<td>USD 234,199</td>
<td>USD 390,331 (60%-40%)</td>
</tr>
<tr>
<td>2017</td>
<td>USD 269,328</td>
<td>USD 448,880 (60%-40%)</td>
</tr>
<tr>
<td>2018</td>
<td>USD 309,727</td>
<td>USD 516,212 (60%-40%)</td>
</tr>
<tr>
<td>2019</td>
<td>USD 356,186</td>
<td>USD 593,643 (60%-40%)</td>
</tr>
<tr>
<td>2020</td>
<td>USD 409,614</td>
<td>USD 682,690 (60%-40%)</td>
</tr>
<tr>
<td>2021</td>
<td>USD 471,056</td>
<td>USD 785,093 (60%-40%)</td>
</tr>
<tr>
<td>2022</td>
<td>USD 541,714</td>
<td>USD 902,857 (60%-40%)</td>
</tr>
<tr>
<td>Total cost estimate 2017-2022</td>
<td>USD 2,357,625</td>
<td>USD 3,929,375 (60%-40%)</td>
</tr>
<tr>
<td>Average annual cost estimate 2017-2022</td>
<td>USD 392,937</td>
<td>USD 654,895 (60%-40%)</td>
</tr>
</tbody>
</table>
Explanatory note for above tables:
The “total average estimated yearly extra cost” in Table 3.9-2 is the result of dividing by 6 (2017 to 2022) the “total estimated extra cost for 2017-2022 for WHEAT” (5,166,570 / 6 = 861,095).

The numbers shown in Table 3.9-3 were calculated as follows:

1. The cost for year 2015 is the hypothetical cost of having published all 2015 CIMMYT CRP WHEAT publications in Gold Open Access.

2. The cost for year 2016 is the result of applying a 15% increase to the cost for 2015. The cost for year 2017 is the result of applying a 15% increase to the cost for year 2016 and so on.

3. The “total cost estimate 2017-2022” is the sum of costs from 2017 to 2022: 269,328 + 309,727 + 356,186 + 409,614 + 471,056 + 541,714 = 2,357,937.

4. The “average annual cost estimate” is the result of dividing by 6 (2017 to 2022) the “total cost estimate 2017-2022” (2,357,625 / 6 = 392,937).

5. We assume that CIMMYT will contribute 60% and ICARDA 40% of total publications production. For example, since USD 309,727 was estimated for CIMMYT Open Access publications for 2018, this means that ICARDA Open Access publications for 2018 would amount to USD 206,485. The total cost for Open Access publications for the whole CRP for 2018 would be USD 516,212.
3.10 Intellectual Asset Management (see section 1.12) max 4p

I. Relevance of IA management for CRPs

All WHEAT participants (Lead and the Participant Center(s), as well as other partners, to the extent that those are able to align) will treat research results and products developed under WHEAT following the appropriate implementation of the CGIAR Principles for the Management of Intellectual Assets and the CGIAR Open Access and Data Management Policy as described below.

II. Critical issues to address in CRP implementation from IA perspective

<table>
<thead>
<tr>
<th>Barriers to Full Adoption</th>
<th>Actions implemented to address critical issues</th>
<th>Envisioned improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring CGIAR IA Principles, Center Policies, and Center contracts are in compliance with local legislation, local markets, and local practices.</td>
<td>Preparing agreements to align with CGIAR Principles for the Management of Intellectual Assets and with LEA and RUA requirements when local laws and practices differ. Revising internal Policies to address critical issues, as well as to align them with local legislation standards and when possible, with local markets/practices.</td>
<td>Monitoring and training of partners of local laws and revise internal and CGIAR policies in view of local laws, potentially as part of CRP “Policies and Markets”. Focusing on local seed laws and regulations that affect dissemination of research outputs.</td>
</tr>
<tr>
<td>Lack of incorporation of IA management principles into the project lifecycle.</td>
<td>Including tools in the project management lifecycle to assist with tracking of intellectual assets. Preparing freedom to operate analysis for dissemination of CRP outputs. Formulating flow down obligations and standards from internal and CGIAR Policies to Participant Center(s) and other partners, according to their capacities.</td>
<td>Standardizing such practices in WHEAT projects. Monitoring and training of partners.</td>
</tr>
<tr>
<td>Aligning CGIAR IA Principle with private sector partner interests.</td>
<td>Drafting and negotiating agreements with private partners, in light of CGIAR Principles, and if necessary drafting exceptions while ensuring appropriate justification for appropriate dissemination along with the appropriate search and emergency exceptions.</td>
<td>Continue revising internal policies and extending such policies within the CGIAR.</td>
</tr>
</tbody>
</table>

III. Challenges for CRP implementation as they related to IA management

1. CGIAR Policy requirements are at odds with private sector interests and stewardship for GMO technologies. This applies for both outputs created through use of private sector technology or outputs created solely by a Center.
2. There are concerns about confidentiality obligations in order to maintain trade secrets and delay disclosure of information to provide ample time for enablement of patentable inventions in view of the CGIAR IA Principles.
3. Ensuring that CRP Wheat has adequate human resources, funding and capacity development to timely implement all actions needed for a proper IA management.
4. Lack of knowledge among NARs of IA practices from Centers.
5. Nonexistence of IP Policies within the various NARs.
IV. Project planning and implementation

1. The Lead Center IP & Legal will intervene in the following parts of the project management lifecycle:

<table>
<thead>
<tr>
<th>Project phase</th>
<th>Intervention from IP &amp; Legal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Direct and/or participate in drafting of documents for work plan, data management, knowledge management, and dissemination of results. IP &amp; Legal will handle contractual obligations including subgrants to ensure appropriate planning. If appropriate prepare preliminary FTO assessment for dissemination of results.</td>
</tr>
<tr>
<td>Implementation, monitoring and evaluation</td>
<td>Draft and Negotiate agreements, including material transfer agreements. As needed, monitor work scope, risk issues and legal issues in moving forward with project. Draft commercial licenses, if necessary, for dissemination of outputs. Assist with any audits, if necessary. If appropriate prepare preliminary FTO assessment for dissemination of results. Assist in implement methods and tools such as legal documents and legal language to be incorporated into documents used in the project lifecycle.</td>
</tr>
<tr>
<td>End of the project</td>
<td>Administrative closeout, ensure sharing of information and/or materials and closing out contract and tracking finalization of any confidentiality clauses.</td>
</tr>
</tbody>
</table>

2. Accountability for the appropriate implementation of the CGIAR Principles will be handled as follows:
   a. Participant Centers are also CG Centers and therefore, their policies and procedures should also be consistent to those of the CGIAR; additionally, the Lead Center will ensure this approach by contractual obligation and the right to audit the Participant Center;
   b. The Lead Center will encourage compliance by non-CGIAR partners, to the extent possible, for example through Subgrant contractual obligations.
   c. The Lead Center will create appropriate stewardship issues so not to expose third parties to not be in compliance with IA principles. It is the exception, rather than the rule, that any new language will be needed. For example, in germplasm, CIMMYT does not disclose confidential pedigree information. Additionally, in data and information products management, CIMMYT repositories and management plans will be applicable to results generated by partners and up to the extent possible, CIMMYT will lead such management.

3. Implementation is subject to available budget; capacity building for incorporation of CGIAR Policies into project planning & implementation will be developed and provided through guidelines, trainings, etc.
V. Key dissemination pathways for maximizing global impact.

<table>
<thead>
<tr>
<th>Type of Intellectual Asset</th>
<th>Dissemination pathway</th>
<th>IP + Legal contributions</th>
</tr>
</thead>
</table>
| Data & Information Products (databases, publications, multimedia, reports, training materials, software, algorithms, maps) | - Multi-lingual Open Access repositories  
- Adapted information dissemination channels to specific target groups e.g. farmers  
- Licensing | • Development of global licenses for dissemination as ‘International Public Goods’  
• Legal advice on:  
  - access to third party technologies/ data/software/information;  
  - agreements to publish information products through publishers and/or scientific journals;  
  - freedom to operate opinions; and  
  - development of IA management strategies to achieve a higher impact. |
| Know how (protocols, how to guides, best practices) | - OA repositories,  
- Partnership approaches and capacity development  
- NARs  
- Extension specialists  
- Partners & collaborators | Legal advice on:  
- development of IA management strategies to achieve a higher impact;  
- dissemination strategies & global licenses for that purpose;  
- access to third party know how; and  
- management of confidential/ proprietary information; |
| Germplasm (physical, dissemination) | As International Public Goods/through NARs  
- Public and Private Partnerships  
- Networks  
- Participatory development | • Preparation of licenses and other kind of applicable agreements to access and give access to germplasm, including SMTA/MTAs;  
• Legal advice on:  
  - Collection of germplasm and exportation of germplasm;  
  - Transfer of germplasm;  
  - contract negotiation for PPP;  
  - freedom to operate opinions;  
  - dissemination strategies for scaling up and out; and  
  - dissemination of data. |
| Agronomic technologies (SI) | - On-farm management/ Participatory research | Legal advice on:  
- farmer’s rights, collection and transfer of germplasm, use of traditional knowledge & Prior Informed Consent;  
- freedom to operate opinions;  
- Ethics in research & privacy matters;  
- contract negotiation for accessing third party technologies and/or for collaborations/ use of patents; and  
- dissemination of data. |
| Agronomic special category: Specialized machinery | - Scaling up and out  
- Networks | Legal advice on  
- contract negotiation and drafting, including for accessing third party technologies and/or for granting access to third parties, collaborations/ use of patents;  
- dissemination strategies for scaling up and out; and  
- dissemination of data. |
| New Tools such as newly discovered DNA, RNA, enzymatic and analytical methods and processes for use in biotechnology discovery and/or trait development, including but not limited to transformation tools and methods, promoters, introns, enhancers, DNA and RNA modification tools ect. | - Licensing  
- Partnerships | Legal advice on  
- contract negotiation and drafting, including access to third party technologies;  
- freedom to operate opinions;  
- use of patents; and  
- dissemination strategies. |
| Traits | - Licensing  
- Partnerships | Legal advice on  
- contract negotiation and drafting, including access to third party technologies;  
- freedom to operate opinions;  
- use of patents; and  
- dissemination strategies. |
### VI. Operations (technical infrastructure, planned activities).

<table>
<thead>
<tr>
<th>IA/IP Operations category</th>
<th>Policy, procedure, work process Status (provide ref docs if apt)</th>
<th>Policy, procedure, process owner</th>
<th>Est cost core budget</th>
<th>Additional invest, budget needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorporation into Leader Center project cycle</td>
<td>Project Management lifecycle (in draft)</td>
<td>Project Managers + IP &amp; Legal</td>
<td>IP &amp; Legal: 5% FTE of one IP Counsel + 3% FTE of General Counsel</td>
<td>+ 5% FTE of one IP Counsel + 2% FTE of General Counsel</td>
</tr>
<tr>
<td>Incorporation into project cycle for participating centers, non-CGIAR partners</td>
<td>In accordance with CIMMYT Policies and decisions taken in the CRP-MC; Subgrant</td>
<td>CRP Managers + Participating Centers/ non-CGIAR partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IA/IP tracking</td>
<td>Project Management lifecycle (in draft)</td>
<td>Project Leader + IP &amp; Legal</td>
<td>IP &amp; Legal: 5% FTE of one IP Counsel</td>
<td>+15% FTE of one IP Counsel</td>
</tr>
<tr>
<td>Negotiation of partner agreements</td>
<td>IP Policy &amp; IP Manual (approved, under revision for update)</td>
<td>Project Leader + IP &amp; Legal</td>
<td>IP &amp; Legal: 15% FTE of each IP Counsel (2)</td>
<td>+10% FTE of each IP Counsel (2)</td>
</tr>
<tr>
<td>Convention on Biological Diversity/Farmer’s Rights/Nagoya Protocol /International Treaty for Plant Genetic Resources for Food &amp;Agriculture</td>
<td>Germplasm Policy (in draft)</td>
<td>Project Leader + IP &amp; Legal</td>
<td>IP &amp; Legal: 5% FTE of one IP Counsel</td>
<td>+15% FTE of one IP Counsel</td>
</tr>
<tr>
<td>Ethics in Research &amp; Privacy Protection</td>
<td>Ethics in Research Policy (in draft)</td>
<td>Project Leader + IP &amp; Legal</td>
<td>IP &amp; Legal: 5% FTE of one IP Counsel</td>
<td>+15% FTE of one IP Counsel</td>
</tr>
<tr>
<td>Policy development, update of existing IP Policy; IP Manual; Copyright &amp; Authorship Policy; Germplasm Policy (in draft); Ethics in Research Policy (in draft); Project Management lifecycle;</td>
<td>IP + Legal</td>
<td>IP &amp; Legal: 10% FTE of each IP Counsel (2) + 5% FTE of General Counsel</td>
<td>+ 15% FTE of each IP Counsel (2) + 5% FTE of General Counsel</td>
<td></td>
</tr>
<tr>
<td>CGIAR Coordination</td>
<td>CRP management</td>
<td>Project Managers</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### VII. Coordination and decision making (i.e. Policies, procedures, committee, task force)

<table>
<thead>
<tr>
<th>Topic that triggers coordination of MC with IP + Legal for decision making</th>
<th>Coordination /decision making procedure</th>
<th>Applicable Policy &amp; Status</th>
<th>Est cost core budget</th>
<th>Additional invest, budget needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessing technology that have or may have restrictions for results dissemination</td>
<td>Legal advice during the project through participation in the MC meetings / application of polices in documents produced</td>
<td>CIMMYT Intellectual Property Policy &amp; Manual (approved, under revision for update)</td>
<td>5% FTE of each IP Counsel (2)</td>
<td>+ 3% FTE of each IP Counsel (2)</td>
</tr>
<tr>
<td>Granting limited exclusivity agreements for commercialization, whether as part of a partnership or a dissemination strategy,</td>
<td>Legal advice during the project through participation in the MC meetings / application of polices in documents produced</td>
<td>CIMMYT Intellectual Property Policy &amp; Manual (approved, under revision for update) CGIAR Principles for the Management of IA</td>
<td>5% FTE of each IP Counsel (2)</td>
<td>+ 10% FTE of each IP Counsel (2)</td>
</tr>
<tr>
<td>Partnership or strategies that include the possibility of registering IPRs</td>
<td>Legal advice during the project through participation in the MC meetings / application of polices in documents produced</td>
<td>CIMMYT Intellectual Property Policy &amp; Manual (approved, under revision for update) CGIAR Principles for the Management of IA Germplasm Policy (in draft);</td>
<td>5% FTE of each IP Counsel (2)</td>
<td>--</td>
</tr>
</tbody>
</table>
Planning direct/specific research activities, particularly if they involve:
- Collection and transfer of germplasm;
- Licensing of Tools and Traits Interaction with Human Subjects/communities;
- Scaling up and out;
- Dissemination of Data through non-standard platforms.

Legal advice during the project through participation in the MC meetings / application of policies in documents produced

Policies applicable to all matters:
- CIMMYT Intellectual Property Policy & Manual (approved, under revision for update);
- CGIAR Principles for the Management of IA;
- For specific topics:
  - Collection of Germplasm: CIMMYT Germplasm Policy (in draft);
  - Interaction with Human Subject/Communities: CIMMYT Ethics in Research Policy (in draft);
  - Dissemination of Data: CIMMYT Research Data & Information Management Policy & cigar Open Access Policy.

<table>
<thead>
<tr>
<th>Planning direct/specific research activities, particularly if they involve:</th>
<th>Legal advice during the project through participation in the MC meetings / application of policies in documents produced</th>
<th>Policies applicable to all matters:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection and transfer of germplasm; Licensing of Tools and Traits Interaction with Human Subjects/communities; Scaling up and out; Dissemination of Data through non-standard platforms.</td>
<td>Policies applicable to all matters: CIMMYT Intellectual Property Policy &amp; Manual (approved, under revision for update) CGIAR Principles for the Management of IA; For specific topics: Collection of Germplasm: CIMMYT Germplasm Policy (in draft); Interaction with Human Subject/Communities: CIMMYT Ethics in Research Policy (in draft); Dissemination of Data: CIMMYT Research Data &amp; Information Management Policy &amp; cigar Open Access Policy.</td>
<td>10% FTE of each IP Counsel (2)</td>
</tr>
</tbody>
</table>

* Additional decisions made by the Lead Center-MC will be made in accordance with the CGIAR and Lead Center relevant Policies.

VIII. Indicative resources (HR & budget statement)

CIMMYT Human Resources that will support CRPs implementation include:

1. CIMMYT General Counsel to focus on general coordination and oversight of legal implications. (10% FTE devoted to CRPs).
2. CIMMYT IP Counsel with background in legal matters related to germplasm development and deployment. (10% FTE devoted to CRP Wheat, in addition to 25% FTE approximately to be invested in projects that are linked to CRP Wheat and 20% FTE approximately devoted to policy drafting and implementation as well as capacity building for CIMMYT that will have a direct impact in CRP Wheat).
3. CIMMYT IP counsel with background in legal matters related to data and information products development and deployment. (10% FTE devoted to CRP Wheat, in addition to 25% FTE approximately to be invested in projects that are linked to CRP Wheat and 20% FTE approximately devoted to policy drafting and implementation as well as capacity building for CIMMYT that will have a direct impact in CRP Wheat).
4. CIMMYT Legal specialist to support IP Counsel’s activities. (5% FTE devoted to CRPs in addition to 20% FTE approximately to be invested in projects that are part of CRP Wheat).
5. CIMMYT Administrative support (as needed).
Additional Annexes
**Annex 4.1 Geographic, climatic and biotic stress characterization (12 Mega environments)**

<table>
<thead>
<tr>
<th>ME</th>
<th>Lat N and S</th>
<th>Wheat area (M ha)</th>
<th>Importance for WHEAT</th>
<th>Climatic characterization</th>
<th>Major biotic and abiotic stresses</th>
<th>Representative locations/regions</th>
<th>Change in ME due to climate change and consequences for germplasm development; N=negative P=positive U=unknown (adopted from Hodson and White, 2008).</th>
</tr>
</thead>
</table>
| 1  | <40°        | 33.0              | High                 | Low rainfall irrigated, coolest quarter (3 consecutive months) mean min temp > 3°C < 11°C | Lodging tolerance, Leaf yellow and stem rust, Karnal bunt, Alternaria | Yaqui Valley, Mexico Indo Gangetic Plains, Egypt, Central Iran, SE Turkey, China | N–Rising temperatures result in large areas evolving to ME5; reduced precipitation in subtropical regions restricts irrigation; suppl. irrigation with temporary drought periods requires high yielding wheat with drought tolerance (adapted to ME1 and ME4); increasing insect problems in part aphids
P–Reduced irrigation due to positive impact of elevated CO₂ on water use efficiency |
| 2A | <40°        | 2.9               | High                 | High rainfall in summer; wettest quarter mean min temp > 3°C < 16°C, wettest quarter (3 consecutive wettest months) precipitation > 500mm; elevation > 1500m | Lodging, 3 rusts Septoria spp., Root diseases BYD, Sprouting | Highlands East Africa and Mexico, Andes | Rising temperatures result in some areas evolving to ME5
Reduced precipitation result in areas evolving to ME4 |
| 2B | <40°        | 2.7               | High                 | High rainfall winter rain > 500mm; coolest quarter mean min temp >3°C <16°C; elevation < 500m | Lodging, Leaf Yellow Stem rust, FHB, BYD, Septoria spp., Root diseases, Sprouting | Mediterranean Coast, Caspian Sea | N–Frequency of climate extremes at one location over years increases requiring wheat varieties combining high yield potential, wide spectrum of disease resistance and tolerance to temporary drought |
| 3  | <40°        | 1.7               | Low                  | High rainfall acid soil; climate as in ME2 and pH < 5 | As for ME2 + acid soil tolerance | Passo Fundo, Brazil | U–Changes in precipitation patterns in areas will have variable effects |
| 4A | <40°        | 10.0              | High                 | Low mostly winter rainfall, coolest quarter mean min temp >3°C <11°C; wettest quarter precipitation > 100 mm < 400mm | Drought and heat tolerance, Septoria spp., yellow stem and leaf rust, Bunt Hessian fly, Sawfly, root diseases, nematodes | N-Africa, Syria; SE Turkey, Iraq, Iran, N-Afghanistan | N–Rising temperatures exacerbates water deficits, reducing yields or making production uneconomical
P–Reduced water deficits through impact of elevated CO₂ on water use efficiency |
## WHEAT CRP: Annexes

<table>
<thead>
<tr>
<th>ME</th>
<th>Lat N and S</th>
<th>Wheat area (M ha)</th>
<th>Importance for Wheat</th>
<th>Climatical characterization</th>
<th>Major biotic and abiotic stresses</th>
<th>Representative locations/regions</th>
<th>Change in ME due to climate change and consequences for germplasm development; N=negative P=positive U=unknown (adopted from Hodson and White, 2008).</th>
</tr>
</thead>
<tbody>
<tr>
<td>4B</td>
<td>&lt;40°</td>
<td>5.0</td>
<td>High</td>
<td>Low mostly summer rainfall (200-500mm); coolest quarter mean min temp &gt;30°C &lt;11°C;</td>
<td>Drought tolerance, Septoria spp., leaf and stem rust, FHB</td>
<td>Marcos Juarez, Argentina</td>
<td>N–Changes in precipitation patterns likely to increase drought risk</td>
</tr>
<tr>
<td>4C</td>
<td>&lt;40°</td>
<td>7.0</td>
<td>High</td>
<td>Mostly residual moisture; coolest quarter mean min temp &gt;30°C &lt;16°C; wettest quarter precipitation &gt; 100 mm &lt; 400mm</td>
<td>Tolerance to drought, and heat in seedling stage, Stem rust,</td>
<td>Central India</td>
<td>U–Changes in precipitation patterns in areas will have variable effects</td>
</tr>
<tr>
<td>5A</td>
<td>&lt;40°</td>
<td>11.5</td>
<td>High</td>
<td>Hot and humid, high rainfall/ irrigated, coolest quarter mean min temp &gt;11°C &lt;16°C;</td>
<td>Heat tolerance, FHB, Helminth. spp., leaf rust, sprouting; Brazil Bolivia Paraguay wheat blast</td>
<td>Eastern Gangetic Plains in Nepal India Bangladesh Londrina, Brazil;</td>
<td>N–Rising temperatures result in large areas becoming unsuitable for wheat; cropping systems and agronomy practices allowing early sowing of wheat paramount; increasing biotic stress</td>
</tr>
<tr>
<td>5B</td>
<td>&lt;40°</td>
<td>3.2</td>
<td>High</td>
<td>Irrigated, low humidity; coolest quarter mean min temp &gt;11°C &lt;16°C;</td>
<td>Heat tolerance, stem and leaf rust</td>
<td>Gezira, Sudan; Kano, Nigeria, S-Egypt,</td>
<td>N–Rising temperatures result in large areas becoming unsuitable for wheat; increasing biotic stress</td>
</tr>
<tr>
<td>6</td>
<td>&gt;45°</td>
<td>12.8</td>
<td>Medium</td>
<td>Spring sown; moderate summer rainfall; coolest quarter mean min temp &lt; -13°C; warmest quarter mean temp &gt;9°C;</td>
<td>Drought tolerance, stem and leaf rust, tan spot, FHB, photoperiod sensitivity</td>
<td>Kazakhstan, Siberia, N-China</td>
<td>P–Rising temperatures allow wheat production in higher latitudes - wheat area expansion likely; lengthen growing season permits marginal areas to become productive; Reduced risk of winter-kill may allow sowing of more productive winter wheat</td>
</tr>
</tbody>
</table>

### Facultative Wheat

| 7 A  | 30°-45°     | 3.5               | Medium               | Irrigated                    | Rapid grain fill, cold tolerance, yellow & leaf rust, Powdery Mildew, BYD, Bunt, Loose Smut | Henan China; | U–Reduced cold stress allows fall sown spring wheat, possibly reducing yield potential but shortening growing season offering more options for diversifying cropping systems; P–Reduced irrigation due to impact of elevated CO2 on water use efficiency |
| 7 B  | 30°-45°     | 3.5               | High                 | Irrigated, often only supplementary irrigation | Yellow, leaf and stem rust, Bunt, Loose Smut | Turkey, Iran, Central Asia, Afghanistan | P–Reduced cold stress allows fall sown spring wheat, possibly reducing yield potential but shortening growing season offering more options for diversifying cropping systems; reduced irrigation due to impact of elevated CO2 on water use efficiency; N–suppl. irrigation with temporary exposure to drought requires germplasm adapted to ME7 and ME9 |
### WHEAT CRP: Annexes

<table>
<thead>
<tr>
<th>ME</th>
<th>Lat N and S</th>
<th>Wheat area (°)</th>
<th>Importance for WHEAT</th>
<th>Climatical characterization</th>
<th>Major biotic and abiotic stresses</th>
<th>Representative locations/regions</th>
<th>Change in ME due to climate change and consequences for germplasm development; N=negative P=positive U=unknown (adopted from Hodson and White, 2008).</th>
</tr>
</thead>
<tbody>
<tr>
<td>8A</td>
<td>35°-45°</td>
<td>0.2</td>
<td>Low</td>
<td>&gt; 600 mm rainfall, medium cold, photosensitive</td>
<td>Yellow Rust, Septoria spp., Powdery Mildew, FHB, Root Diseases</td>
<td>Chillan, Chile;</td>
<td></td>
</tr>
<tr>
<td>8B</td>
<td>30°-45°</td>
<td>1.2</td>
<td>Medium</td>
<td>More than 600 mm rainfall</td>
<td>Yellow and Leaf Rust Bunt, Root Diseases, Powdery Mildew</td>
<td>Transitional Zones and Trace, Turkey, S-Kazakhstan</td>
<td>N-frequency of climate extremes increase requiring germplasm with high yield potential, wide spectrum of disease resistance and tolerance to drought</td>
</tr>
<tr>
<td>9</td>
<td>30°-45°</td>
<td>8.4</td>
<td>High</td>
<td>Low rainfall &lt; 400 mm, winter /spring rainfall dominant</td>
<td>Tolerance to drought, cold, heat at grain fill, Yellow and leaf rust Bunt; insects, nematodes</td>
<td>West and Central Asia, North Africa, mainly non-dwarf cultivars grown</td>
<td>N–Rising temperatures exacerbates water deficits, either further reducing yields or making production uneconomical; P–Reduced water deficits through impact of elevated CO2 on water use efficiency</td>
</tr>
</tbody>
</table>

**Winter Wheat**

| 10A | 30°-45°     | 3.8            | Medium               | Irrigated | Tolerance to winterkill, Yellow and leaf rust, Powdery Mildew BYD, | Beijing, China, | P–Reduced winterkill, increasing yields, Red. Irrig. due to impact of elevated CO2 on water use efficiency; N–Warmer spring and summer hasten grain-filling |
| 10B | 30°-45°     | 1.5            | Medium               | Often supplementary irrigation | Tolerance to winterkill, Yellow and leaf rust, BYD, Bunt, Smut, Root diseases complex | Turkey, Iran, Central Asia | P–Warmer winters reduce severity of winter-kill, increasing yields, Reduced irrigation due to impact of elevated CO2 on water use efficiency N–Warmer spring and summer hasten grain-filling |
| 11A | 35°-55°     | Area in LDC insignificant | High rainfall/ irrigated, long season | Septoria spp., FHB, Yellow and leaf rust, Powdery Mildew, Root disease complex, BYD, | Central and Western Europe, NW US, Pacific North West, | P–Warmer winters reduce severity of winter-kill |
| 11B | 35°-55°     | Area in LDC insignificant | High rainfall/ irrigated, short season | Leaf and stem rust, Powdery Mildew, FHB, Septoria, BYD, Tolerance to winterkill, sprouting tolerance | Europe, N-Korea, China | P–Warmer winters reduce severity of winter-kill |
| 12  | 30°-45°     | 12.8           | High                 | Low rainfall between 300-450 mm, | Cold; drought, heat tolerance; yellow rust, bunt, nematodes, Root disease, Zn def. In Turkey/Iran non-dwarf varieties dominant | Turkey, West and Central Asia, China; | P–Warmer winters reduce severity of winter-kill P–Reduced water deficits through impact of elevated CO2 on water use efficiency N–increased frequency of years with severe drought N increased insect problems |
| Tot |             |                |                      |                       |                                    |                     | 124.7 |

**Winter Wheat**

- **10A**: Medium, Irrigated
  - **Importance for WHEAT**: Medium
  - **Climatical characterization**: High rainfall, irrigated
  - **Major biotic and abiotic stresses**: Tolerance to winterkill, Yellow and leaf rust, Powdery Mildew BYD
  - **Representative locations/regions**: Beijing, China
  - **Change in ME due to climate change and consequences for germplasm development**: P–Reduced winterkill, increasing yields, Red. Irrig. due to impact of elevated CO2 on water use efficiency; N–Warmer spring and summer hasten grain-filling

- **10B**: Medium, Often supplementary irrigation
  - **Importance for WHEAT**: Medium
  - **Climatical characterization**: High rainfall, irrigated
  - **Major biotic and abiotic stresses**: Tolerance to winterkill, Yellow and leaf rust, BYD, Bunt, Smut, Root diseases complex
  - **Representative locations/regions**: Turkey, Iran, Central Asia
  - **Change in ME due to climate change and consequences for germplasm development**: P–Warmer winters reduce severity of winter-kill, increasing yields, Reduced irrigation due to impact of elevated CO2 on water use efficiency N–Warmer spring and summer hasten grain-filling

- **11A**: Area in LDC insignificant, High rainfall/ irrigated, long season
  - **Importance for WHEAT**: High rainfall/ irrigated
  - **Climatical characterization**: Septoria spp., FHB, Yellow and leaf rust, Powdery Mildew, Root disease complex, BYD
  - **Representative locations/regions**: Central and Western Europe, NW US, Pacific North West
  - **Change in ME due to climate change and consequences for germplasm development**: P–Warmer winters reduce severity of winter-kill

- **11B**: Area in LDC insignificant, High rainfall/ irrigated, short season
  - **Importance for WHEAT**: High rainfall/ irrigated
  - **Climatical characterization**: Leaf and stem rust, Powdery Mildew, FHB, Septoria, BYD, Tolerance to winterkill, sprouting tolerance
  - **Representative locations/regions**: Europe, N-Korea, China
  - **Change in ME due to climate change and consequences for germplasm development**: P–Warmer winters reduce severity of winter-kill

- **12**: High, Low rainfall between 300-450 mm, Cold; drought, heat tolerance; yellow rust, bunt, nematodes, Root disease, Zn def. In Turkey/Iran non-dwarf varieties dominant
  - **Importance for WHEAT**: High
  - **Climatical characterization**: Low rainfall between 300-450 mm, Cold; drought, heat tolerance; yellow rust, bunt, nematodes, Root disease, Zn def. In Turkey/Iran non-dwarf varieties dominant
  - **Representative locations/regions**: Turkey, West and Central Asia, China
  - **Change in ME due to climate change and consequences for germplasm development**: P–Warmer winters reduce severity of winter-kill P–Reduced water deficits through impact of elevated CO2 on water use efficiency N–increased frequency of years with severe drought N increased insect problems

- **Tot**: 124.7

---

**Notes:**
- ME: Major environmental groups
- Lat N S: Latitude and Longitude
- Wheat area (): Wheat area in millions of hectares
- Importance for WHEAT: Importance of wheat area
- Climalatical characterization: Climatic conditions
- Major biotic and abiotic stresses: Major biotic and abiotic stresses
- Representative locations/regions: Representative locations/regions
- Change in ME due to climate change and consequences for germplasm development; N=negative P=positive U=unknown (adopted from Hodson and White, 2008).
### Annex 4.2: Regional priority of non-rust diseases under anticipated climate change

<table>
<thead>
<tr>
<th>Biotic stress</th>
<th>East Asia</th>
<th>South Asia</th>
<th>West Asia</th>
<th>Middle East</th>
<th>North Africa</th>
<th>Central Asia</th>
<th>Caucasus</th>
<th>Sub-Saharan Africa</th>
<th>Latin Amer. Incl. Mex.</th>
<th>Developed countries</th>
<th>Significant loses area (million ha)</th>
<th>Likely impact of climate change</th>
<th>Negative impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Rust Major Diseases Attacking Wheat at Global Scale</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fusarium head blight</td>
<td>+++</td>
<td>0</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0</td>
<td>++</td>
<td>+++</td>
<td>12</td>
<td></td>
<td>***</td>
<td>Yield, quality, mycotoxin contamination</td>
<td></td>
</tr>
<tr>
<td>Septoria tritici blotch</td>
<td>+</td>
<td>0</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>12</td>
<td></td>
<td>*</td>
<td>Yield, quality</td>
<td></td>
</tr>
<tr>
<td>Spot blotch</td>
<td>+</td>
<td>++</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
<td></td>
<td>**</td>
<td>Yield, quality</td>
<td></td>
</tr>
<tr>
<td>Tan spot</td>
<td>0</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>+++</td>
<td>0</td>
<td>++</td>
<td>++</td>
<td>7</td>
<td></td>
<td>*</td>
<td>Yield, quality</td>
<td></td>
</tr>
<tr>
<td>Wheat blast</td>
<td>0</td>
<td>+++</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>++</td>
<td>0</td>
<td>2</td>
<td></td>
<td>***</td>
<td>Yield, quality</td>
<td></td>
</tr>
<tr>
<td>Nematodes</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>0</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>10</td>
<td></td>
<td>**</td>
<td>Yield, quality</td>
<td></td>
</tr>
<tr>
<td>Root diseases</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>9</td>
<td></td>
<td>***</td>
<td>Yield, quality, mycotoxin contamination</td>
<td></td>
</tr>
</tbody>
</table>

| **Non-Rust Major Insects Attacking Wheat at Global Scale** |           |            |           |             |              |              |          |                     |                        |                      |                                  |                                  |                                   |
| Sunn Pest                              | 0         | 0          | +++       | +           | +++          | 0            | 0        | +                   | 10                     |                      | ***                              | Yield, quality                  |                                  |
| Hessian Fly                            | 0         | 0          | 0         | +++         | +            | 0            | 0        | +++                 | 6                      |                      | ***                              | Yield                          |                                  |
| Aphids                                 | ++        | ++         | +         | ++          | +            | ++           | ++       | +++                 | 10                     |                      | ***                              | Yield                          |                                  |
| Wheat stem saw fly                     | 0         | 0          | ++        | ++          | +            | 0            | 0        | ++                  | 5                      |                      | ***                              | Yield                          |                                  |
Annex 4.3: Overview CRP Budget, Value for Money, Use of W1&2 and Uplift Budget

Budget and value for money

Despite its importance and performance, the WHEAT budget has been administratively capped by the Consortium both in Phase I and in the call for full proposals for Phase II (true for other CRPs; See 19 Dec 2015 document, Table 2). In addition, parts of the Dryland Systems CRP are to be integrated in Phase II without a proportional increase in the budget. WHEAT can use more resources in a strategic manner and productively to achieve the SLOs. The budget proposal below adheres to the caps imposed both on the core and uplift budgets.

The core budget below is based on the pre-proposal budget minus 30% (as per Fund Council guidance, November 2015). Reviewers and Fund Council members should note the consequent provisos:

1. Total W1&2 is based on agreed upon 2017 estimates and equal W1 distribution to all CRPs, are indicative and depend on end 2016 System Council decisions and donor W2 allocations for the 2017 budget. W3/Bilateral figures are based on 2012-16 annualized average plus 5% p.a.

2. ‘Supplementary to CRP’ refers to CRP-aligned downstream, scaling-out/up projects that are not considered in the CRP WHEAT budget, because the Consortium Office during 2013/2014 encouraged CRPs to take such type of funding out. We now see that only CIMMYT followed that advice. Currently, the CGIAR does not have a shared definition for supplementary/non-CRP and this caused the low indicative budget for WHEAT (CRP guidelines, Dec 19, Table2).

3. The figures reflect W1&2 (ca. $1.25M) and bilateral funding (ca. 2.8M) that is required to integrate three Dryland Systems CRP action research sites into WHEAT.

In the uplift budget scenario, WHEAT II calls for more investment being made for strategic research (see Tables 13 & 14). The budget considers the importance of wheat for food security for the poor, well-documented returns on investment, and still marginal R&D investments by the private sector in developing countries. It also considers investments in new opportunities linked to donor and partner priorities (see Table 9a, Section 1.8.). Additional W1&2 would be invested in:

- Develop a phenotyping and breeding platform in Bangladesh to develop wheat lines for S-Asia, which are tolerant to wheat blast and humid heat.
- Analysis of the farm-to-fork value chain to assess post-harvest losses including wheat nutritional and end-use quality related interventions with high returns to investment in wheat agro-food systems.
- Stronger support to gender research to provide new opportunities for women in regions with deeply entrenched gender roles and social norms – and build competence, capacity and partner networks related to youth in agriculture R4D and WHEAT.
- Further strengthen foresight and targeting work (including wheat crop and bio-economic modelling capacity and scope) and associated strategic partnerships.
- Build the global Heat & Drought Wheat Improvement Consortium (HeDWIC) to develop climate change resilient wheat and develop further the heat and drought screening hub in Obregon, Mexico.
- Expand investments in breeding for higher yield potential
- Expand collaboration with JIRCAS within the BNI Consortium on biological nitrification inhibitors to reduce N₂O emissions and improve N-use efficiency in wheat systems. Wheat receives around 20% of all N applied and N-use efficiency is with 30% at global average low.
WHEAT CRP: Annexes

- A stronger impact assessment and M&E framework that strengthen programmatic learning and support focused investments and increased scope of impact assessments (including more strategic country case impact studies and panel data).
- Systematizing and modeling lessons learned across sustainable intensification projects aligned with other agri-food systems CRPs.
- Support for a WHEAT Learning Platform to develop the next generation of wheat scientists.

Additional W3/Bilateral (see also Table 12):

- Genomics selection, genetic resource utilization and big data, and the development of a phenotyping network with NARS partners to accelerate breeding gains and reduce reliance on CGIAR centers (linkage with Genetic Gains and Genebanks Platforms).
- Pursuit of approaches (hybrid wheat, seed systems) that increase private sector investment in wheat R&D and reduce wheat’s vulnerability to shortfalls in public sector R&D.

CRP Management Budget uplift scenario is estimated at $2.890M p.a. (versus 1.9M core). Additional W1&2 funds would be deployed to support IA/IP (100k), as per Annex 3.10, improved open access for wheat researchers globally (613k, as per Annex 3.9) and improved MEL outcomes-to-impact (250k, for collaboration with national partners).

The joint working group of Fund Council representatives, center members and Consortium Board summarized examples of the strategic use of W1-2 funds in a Memorandum for Fund Council discussions on December 11, 2015. It features strategic uses of W1-2 Funding, with multiple drivers affecting the identification and prioritization of these uses. The three broad categories of use of W1-2 funds are: (i) ensure effective management and optimization of the use of the gene bank collections; (ii) setting the direction of a CRP and creating coherence in a CRP, by which the whole is more than the sum of the parts (more impact); or (iii) providing crucial support for ‘One System’ building actions that deliver the foundations for improved impact on the ground.

WHEAT core W1&2 funds will be deployed using the prioritization logic shown below:

Table 11. Focus of W1&2 use in different phases (upstream to downstream).

<table>
<thead>
<tr>
<th>Phases</th>
<th>Strategic, longer-term research, seed invests</th>
<th>Rapid response (incl flexibility)</th>
<th>Cross-Portfolio, -CRP learning for impact</th>
<th>CRP Gov. &amp; Mgmt.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discovery (upstream)</strong></td>
<td>FP1, 4: New knowledge for better targeting, prioritizing; ARI, national partners</td>
<td>FP3 new diseases &amp; pests (e.g. wheat blast in S-Asia)</td>
<td>FP2-3: Germplasm improvement methodologies, methods, data mgmt (e.g. Genetic gain, cross-crops)</td>
<td>WHEAT-ISC, WHEAT-MC Apply CGIAR Standards, Policies Manage linkages at Portfolio level</td>
</tr>
<tr>
<td></td>
<td>FP2-4: Generate new knowledge for R-to-D pipeline (e.g. FP2 New traits, HeDWIC, BN1); R&amp;D partners</td>
<td></td>
<td>FP4: Research on scaling out, innovation pathways</td>
<td></td>
</tr>
<tr>
<td><strong>Validation</strong></td>
<td>FP3: New traits into elite lines, Precision Phenotyping Platforms with NARS partners; expanded yield testing</td>
<td></td>
<td>FP4: Country coordination, systems research approaches</td>
<td></td>
</tr>
</tbody>
</table>
Scaling out (downstream) | FP1, 4: Research on adoption dynamics, scaling out, targeting, prioritizing, M&E approaches | FP3: Research on farmer adoption, seed systems innovation | FP3.4: post-conflict emergency support | FP3.7, 4.4: Country coordination, companion crops into wheat-based systems, capacity development

CGIAR-SRF Cross-cutting themes | FP1-led: Gender strategic research incl. youth | | FP1, 4: AFS-CRPs & CCAFS | FP3: WHEAT & A4NH on improved nutrition, Inter-CRP: How to improve gender mainstreaming into research

Budget management is under the guidance of the ISC, directed by the WHEAT Director and discussed/recommended by the WHEAT-MC. It is principally based on the prioritization and approval of distinct work packages. New work packages are advertised on www.wheat.org and allocated through a competitive process. Further resource allocation depends on the achievement of milestones.

Table 12. WHEAT Core Budget (US$ M) for 2017-2019.

<table>
<thead>
<tr>
<th>US$’000</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP Mgmt</td>
<td>1,936</td>
<td>2,023</td>
<td>2,124</td>
</tr>
<tr>
<td>FP1</td>
<td>3,604</td>
<td>3,784</td>
<td>3,973</td>
</tr>
<tr>
<td>FP2</td>
<td>7,576</td>
<td>7,956</td>
<td>8,356</td>
</tr>
<tr>
<td>FP3</td>
<td>16,515</td>
<td>17,341</td>
<td>18,203</td>
</tr>
<tr>
<td>FP4</td>
<td>13,378</td>
<td>14,047</td>
<td>14,750</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43,000</strong></td>
<td><strong>45,150</strong></td>
<td><strong>47,408</strong></td>
</tr>
<tr>
<td>Funding Sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W1&amp;2</td>
<td>15,000</td>
<td>15,750</td>
<td>16,538</td>
</tr>
<tr>
<td>W3</td>
<td>10,831</td>
<td>11,372</td>
<td>11,941</td>
</tr>
<tr>
<td>Bilateral</td>
<td>17,169</td>
<td>18,028</td>
<td>18,929</td>
</tr>
<tr>
<td>Other sources (in addition to Total)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementary to CRP</td>
<td>13,70</td>
<td>14,40</td>
<td>15,10</td>
</tr>
</tbody>
</table>

The 3-year snapshot is based on the full 6 year budget provided to the Consortium via the submission tool. W1&2 figures shown include those for CRP Management and Governance. More detailed information about budgets per Flagship, as per Full Proposal Guidance requirements, are provided to reviewers by the Consortium Office.
WHEAT-MC allocates W1&2 to FPs, including for competitive and commissioned grants (e.g. WHEAT Partner Budget). WHEAT-MC is guided by Use of W1&2 as per Table 11. Any major variance in W1&2 total and per FP budgets is discussed and managed at WHEAT-MC level. WHEAT flexibility in reacting to annual budget variations downwards is driven by its ability to replace W1&2-funded activities with bilateral funding and adjust to changes in the per FP bilateral project portfolio. Upward variations would trigger R4D activities to be identified in the uplift budget, as prioritized by the WHEAT-Management Committee.

Dedicated (W1&2) Partner Budget: WHEAT-MC manages a partner budget, to assign competitive and commissioned grants to non-CGIAR R&D partners every year, to fill gaps in the CRP research-for-development portfolio. This budget is currently planned to be around $1.4M (core) to 2.1M (uplift) p.a. During Phase 1, such partner grants added significant value to the WHEAT project portfolio and only one grant was not successful (e.g. project objectives not achieved).

WHEAT has performed a 2015 W1&2 budget prioritization exercise based on the following criteria: A) Supports CGIAR cross-cutting (gender, youth, cap dev, climate change, other), B) matches recent ISPC or WHEAT-ISC guidance or feedback (to extension period proposal, pre-proposal, other) and C) is at core of CRP strategy (rated low, medium or high). This prioritization exercise will be repeated by WHEAT-MC on a needs basis (e.g. if W1&2 budget much lower than expected).

Major W1&2-funded capital investments are mainly likely in the context of the Global Precision Phenotyping Platforms Network, which is funded by WHEAT Partner Budget and NARS partner co-investments, on the basis of sub-grant agreements, which include annual or bi-annual budget plans.

Cross-cutting themes Intellectual Assets, Open Access and Impact Assessment are centrally managed by WHEAT-MC, by deploying the CRP Management and CRP Partner budgets (see above). Budgeting for cross-cutting themes: Gender research and mainstreaming is coordinated by FP1.3. Capacity development activities are coordinated or monitored by the cross-cutting CoA under the CRP Director. Improvement in project development and planning (e.g. project life cycle) will aid better monitoring of gender and capacity development-relevant activities. WHEAT applies the DAC marker approach adapted from UNPD, to account for both gender and capacity development-relevant activities in the different projects under the different FPs. CRP-level and per FP cross-cutting budgets shown in this Full Proposal were developed based on the DAC marker criteria below:

<table>
<thead>
<tr>
<th>Levels</th>
<th>Criteria/Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 - Projects with gender equality as the SOLE objective</td>
<td>100% Sole use for (strategic) gender research. Budgets of gender specialists.</td>
</tr>
<tr>
<td>3 - ... a PRINCIPAL objective</td>
<td>75% Majority are women beneficiaries and they are selected and will be likely the main partners/beneficiaries/users of the project results.</td>
</tr>
<tr>
<td>2 - ... a SIGNIFICANT objective</td>
<td>25% Gender is mainstreamed in these projects and significant/substantive benefit by women is will be achieved and documented.</td>
</tr>
<tr>
<td>1 - ... with SOME CONTRIBUTION to gender equality</td>
<td>10% Projects with evidence that they work on women prioritized constraints (eg processing, quality, HH food security) or generate products/outcomes that are particularly relevant for women (eg lower wheat prices). Effort to reach women needs to be made.</td>
</tr>
</tbody>
</table>
Projects that do not expect to contribute significantly to gender equality | 0% | Gender neutral research; Examples: Genebank, molecular breeding, bioinformatics.


The WHEAT CRP Team (PMU) tracks W1&2 budget and expenditure in collaboration with CIMMYT and ICARDA program managers, per FP, once WHEAT-MC has endorsed and assigned the annual W1&2 budget. In the case of CIMMYT and ICARDA, FP Leaders are also Center Program Directors, which aligns CRP/FP financial and technical management with Centers' financial and technical management.
### Table 13. Overview of Uplift Budget-funded additional research scope, R4D outputs or outcomes.

<table>
<thead>
<tr>
<th></th>
<th>Discovery</th>
<th>Validation</th>
<th>Scaling out</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FP1</strong></td>
<td>Further strengthen foresight and targeting work (including wheat crop and bio-economic modelling capacity and scope) and associated strategic partnerships.</td>
<td>Comprehensive farm-to-fork value chain analysis to support seed system innovation (FP3.7) and business models (FP4.3)</td>
<td>Increased scope of impact assessments (including more strategic country case impact studies and panel data).</td>
</tr>
<tr>
<td><strong>FP2</strong></td>
<td>Expand scope of heat &amp; drought research (HeDWIC) Gene editing partnerships</td>
<td>Genetic approach to reduce N₂O emissions and improve NUE (BNI); Optimal selection indices for wheat breeding (Genomic selection)</td>
<td></td>
</tr>
<tr>
<td><strong>FP3</strong></td>
<td>Expand precision phenotyping platform network with national partners, yield testing</td>
<td>Global diseases and pests observatory covers more high likelihood &amp; impact diseases, pests</td>
<td></td>
</tr>
<tr>
<td><strong>FP4</strong></td>
<td></td>
<td>Comprehensive agronomic approach to lowering N₂O emissions, improve NUE along N lifecycle (inter-FP, inter-CRP, partners) Inter-CRP: Systematize lessons learned across sustainable intensification projects</td>
<td>Improved outputs-to-development outcomes MEL Build in more ‘companion crops’ (inter-CRP)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>Greater CGIAR and partner capacity for applied research across PPs and projects</td>
<td>Research on new opportunities for women in regions with deeply entrenched gender roles and social norms</td>
</tr>
<tr>
<td>Youth</td>
<td></td>
<td></td>
<td>Build competence, capacity and partner networks related to youth in agriculture R4D and WHEAT AFS</td>
</tr>
<tr>
<td>Capacity Development</td>
<td></td>
<td></td>
<td>Greater scope, more access to WHEAT Learning Platform</td>
</tr>
<tr>
<td>Intellectual Assets and Open Access</td>
<td>More policy development, improved approaches to PPP (see Annex 3.10)</td>
<td></td>
<td>More open access to more partner researchers (see Annex 3.9)</td>
</tr>
<tr>
<td>CRP Management and Governance</td>
<td>Improved (better aligned) outputs-to-outcomes MEL with more national partners</td>
<td></td>
<td>Improved outcomes-to-impact MEL (inter-CRP)</td>
</tr>
</tbody>
</table>

Further detail on additional investment needed is also shown in inter-CRP collaboration tables in Annex 3.7.
Table 14. Uplift budget (6 years) per Flagship Project and additional 2022 outcome.

<table>
<thead>
<tr>
<th>FP</th>
<th>Discovery Validation Scale Out</th>
<th>associated subIDO</th>
<th>associated SLO target</th>
<th>Additional 2022 outcome</th>
<th>Total Uplift $ per FP</th>
<th>Total uplift $ per outcome 6Yrs</th>
<th>of W1 &amp; 2 in %</th>
<th>which W3 in %</th>
<th>Bilat in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D</td>
<td>1.10 Farmers have greater awareness and access to, and increased adoption and adaptation of improved technologies</td>
<td>1.1, 1.2, 2.1, 3.4</td>
<td>Greater capacity and scope for foresight &amp; targeting partnerships, including inter-CRP, improves CRP prioritisation and targeting, incorporating trade-off analysis across gender, climate change</td>
<td>16,349,531</td>
<td>4,087,383</td>
<td>45</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>1</td>
<td>V</td>
<td>1.9 Last mile provider (extension partners, farmer organization, community-based organizations, private sector) increased access and promotion of technologies to farmers</td>
<td>1.1, 1.2, 2.1</td>
<td>Greater capacity and scope of farm-to-fork value chain assessments contribute to more and better value chain innovation / transformation projects, incorporating gender, youth and nutrition dimensions</td>
<td>8,174,765</td>
<td>10</td>
<td>10</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>S</td>
<td>1.10 Farmers have greater awareness and access to, and increased adoption and adaptation of improved technologies</td>
<td>1.1, 1.2, 2.1</td>
<td>Improved baseline knowledge and greater capacity improves CRP/inter-CRP learning with partners about impact pathways, ToC</td>
<td>4,087,383</td>
<td>50</td>
<td>15</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>D</td>
<td>2.4 Crop researchers worldwide increase use of novel germplasm and tools ...; 2.5 Breeders have tools to develop improved varieties faster ...</td>
<td>2.1, 3.1</td>
<td>Earlier and greater knowledge and results-sharing of heat and drought research with breeders and researchers worldwide, leading to earlier genetic gain impacts on farmers’ fields</td>
<td>28,071,382</td>
<td>14,035,691</td>
<td>40</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>V</td>
<td>2.5 Breeders develop improved varieties more efficiently ...</td>
<td>2.1, 3.2, 3.4</td>
<td>Expand capacity and scope on biological nitrification research to contribute to long-term N₂O emission and N leakage reduction</td>
<td>7,017,845</td>
<td>25</td>
<td>10</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>V</td>
<td>2.5 Breeders develop improved varieties more efficiently through greater access and use of documented germplam and tools</td>
<td>2.1, 3.1, 3.2</td>
<td>Expand research on genomic selection to contribute to faster CGIAR breeding cycle earlier</td>
<td>7,017,845</td>
<td>20</td>
<td>10</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>
## WHEAT CRP: Annexes

<table>
<thead>
<tr>
<th>3</th>
<th>D</th>
<th>1.4.3 Enhanced genetic gain</th>
<th>Expand precision phenotyping platform network with national partners (to min. 15 countries) to contribute to faster and more precise breeding cycle for CGIAR and major national partners, leading to outcome of enhanced genetic gain</th>
<th>64,956,139</th>
<th>38,973,683</th>
<th>30</th>
<th>20</th>
<th>50</th>
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<tbody>
<tr>
<td>3</td>
<td>V</td>
<td>1.1.2 Reduced production risk &amp; 1.4.1 Reduced pre- and post-harvest losses, including those caused by climate change</td>
<td>Expand global diseases and pests observatory (monitored diseases; # of partners) to reduce production risk and pre-harvest losses</td>
<td>25,982,455</td>
<td>50</td>
<td>20</td>
<td>30</td>
<td></td>
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<tr>
<td>4</td>
<td>V</td>
<td>3.2.2 Agricultural systems diversified and intensified in ways that protect soils and water &amp; 1.3.4 More efficient use of inputs</td>
<td>Greater collaboration with CCAFS, other CRPs and private sector on effective scaling out of combination of NUE-improving technologies</td>
<td>49,588,919</td>
<td>19,835,567</td>
<td>25</td>
<td>25</td>
<td>50</td>
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<td>4</td>
<td>V</td>
<td>C.1.1. Increased capacity of beneficiaries to adopt research outputs</td>
<td>Increase capacity and scope of inter-CRP learning on systems research in priority target regions, with long-term outcome of beneficiaries’ improved capacity to adapt and adopt combination of technologies</td>
<td>7,438,338</td>
<td>60</td>
<td>10</td>
<td>30</td>
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<tr>
<td>4</td>
<td>S</td>
<td>D.1.1. Enhanced institutional capacity of parter research organizations</td>
<td>Expand capacity to better partner with NARES and non-NARES partners on implementing comprehensive system of monitoring outcomes of sustainable intensification research outputs</td>
<td>7,438,338</td>
<td>50</td>
<td>40</td>
<td>10</td>
<td></td>
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<tr>
<td>4</td>
<td>S</td>
<td>1.4.2 Closed yield gaps through improved agronomic &amp; animal husbandry practices</td>
<td>Expand capacity and scope of large downstream sustainable intensification projects to include other crops (rotation, dual use), agroforestry and livestock components, to close yield gaps more comprehensively</td>
<td>14,876,676</td>
<td>10</td>
<td>10</td>
<td>80</td>
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<tr>
<td>GEND</td>
<td>V</td>
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<td>tbd</td>
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<td>YOU</td>
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<td>CRP Partner Budget</td>
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<td>CAP</td>
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# WHEAT CRP: Annexes

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<th>IAIP</th>
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<th>CRP Mgmt Budget</th>
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<tr>
<td>IAIP</td>
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<td>CRP Mgmt / Partner Budget</td>
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<td>MGMT</td>
<td>V</td>
<td>CRP Partner Budget</td>
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<tr>
<td>MGMT</td>
<td>S</td>
<td>CRP Mgmt Budget</td>
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Annex 4.4 Follow-up of ISPC pre-proposal review and FC caveats

Summary (10th November 2015) of WHEAT response/follow-up of Fund Council guidance and ISPC review of pre-proposal

Regarding FC Principles Portfolio and CRP levels

i. WHEAT supports the establishment of a CRP “Genetic Gains” with clear focus on cross-commodity interventions. Crop specific pre-breeding activities characterization and utilization of genetic resources will stay within AFS CRPs closely linked to respective crop breeding program. **CIMMYT LEADS ON FULL PROPOSAL DEVELOPMENT**

ISPC review

ii. Complete IPs/ToCs at CRP and FP level in terms of approach to monitoring progress on outcomes (RBM/M&E framework) and verifying assumptions. **DONE**

iii. Complete the definition of impacts and identification of CRP IDO targets and indicators: Needs to be inter-(AFS)CRP effort; M&E specialists have taken the initiative; describe how WHEAT will monitor its contribution to SLO-level targets. (External Evaluation Recommendation). **IN PROGRESS**

iv. Public private partnership opportunities to translate some of this cutting edge research into outcomes for the benefits of resource-poor farmers: Make clearer in Full Proposal, is already stated there. Take into consideration WHEAT-ISC comments on critical international public goods role of WHEAT. **DONE**

v. Establish an inter-FP special traits team to accelerate delivery of multiple genes for multiple traits into multiple high performance lines, which WHEAT-ISC believes coincides with the Breeding Review recommendation to better integrate physiology with the mainstream breeding program. (External Evaluation Recommendation). **DONE**

vi. Together with Dryland Systems, define where/what more research is needed on the dynamics, actors and interactions of sustainable innovation systems; provide more details on the components of the ongoing Dryland Systems CRP integrated into WHEAT. (External Evaluation Recommendation). **IN PROGRESS**

vii. Substantially revise FPS: Coherent theory of change and impact pathway, focus on taking WHEAT outcomes to scale through a focus on seed systems, scaling sustainable intensification and associated capacity building; how to build, expand a W3/bilateral base with only limited W1/W2 support, via FP5-focused collaboration with GIZ and others. Integrate WHEAT gender and youth strategy into FP5, clearly articulating entry points and its relevance for scaling; develop overall WHEAT capacity development strategy, identify needs for different FPs, cognizant of limited W1/2 resources. **DONE SEE FP3.7, FP4.4**

viii. How WHEAT is/will manage its partnership and major regional collaboration initiatives; further develop its partnership strategy: Follow up in Full Proposal. (External Evaluation Recommendation). **DONE SEE SECTION 1.8, ANNEX 3.2**

ix. Perspectives on site integration opportunities: Elaborate on which ones WHEAT will concentrate, how, during Phase II, in coordination with other CRPs’ country coordination planning. **DONE SEE 1.7, 3.7**
**WHEAT follow-up to ISPC pre-proposals review, ISPC on CRP portfolio**

<table>
<thead>
<tr>
<th>No</th>
<th>ISPC or SPPC review/proposal Item</th>
<th>WHEAT-ISC &amp; -MC Response</th>
<th>Action taken</th>
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<tbody>
<tr>
<td></td>
<td><strong>Portfolio-level issues</strong></td>
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<tr>
<td>FC1</td>
<td>Position regarding: “Genetic Gains framing and the resulting consequences for the agri-food systems programs” (FC14). See CB-SPPC p.21-24: FP on modernizing genebanks, Diversity for Genetic Gain CRP: Harness economies of scale, avoid duplication, exploit inter-crop opportunities with regard to GWAS, GS, Genome editing for trait discovery (pre-breeding), crop modelling (cultivar design) &amp; informatics support to breeding (BMS, db, query tools, data analysis, genomic back-office; FP on Big Data/ICT See also Genetic Gains Platform proposal by CIMMYT/IRRI</td>
<td>Overall: Transformational research is high risk, not CGIAR system’s competitive advantage, which lies with ARIs, universities. Focus should be to leverage rather than duplicating in CRPs. CG should be clear on what % of its outlay it would like to deploy in these high risk transformational areas. WHEAT supports the establishment of a CRP “Genetic Gains” with clear focus on cross-commodity interventions, which are not already underway, represent efficiency gains from collaboration, and are likely to deliver cost-effective impact on breeding efficiency and progress. Crop specific pre-breeding activities characterization and utilization of genetic resources will stay within AFS CRPs closely linked to respective crop breeding program. Private sector is moving to teams that are integrated across the entire product development pathway, to ensure higher success rates. Breaking out pre-breeding would be disastrous. Genebank CRP should remain separate as it is not a research CRP but a stewardship obligation under the ITPGFA that needs appropriate support. See also Genetic Gains Platform proposal developed, Lessons Learnt from GCP applied. Cross-commodity interventions from AFS CRPs (e.g BMS) removed Note: Durum wheat global effort in merging all existing GWAS panels under the umbrella of WI- EWG (to date, over 2,000 entries from 12 countries).</td>
<td>Genetic Gains Platform proposal developed, Lessons Learnt from GCP applied. Cross-commodity interventions from AFS CRPs (e.g BMS development) removed</td>
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<tr>
<td>FC4</td>
<td>See CB-SPPC p.24: Dryland systems rainfed mixed cropping systems CRP including FPs from WHEAT, DCL, MAIZE, FTA (dryland tree species)</td>
<td>Given the good performance of Systems Research under WHEAT &amp; MAIZE (SSA) during CRP Phase I, it is not advisable to detach it from WHEAT AGFS in Phase II. Detaching SI research would weaken the overall CRP and its coherent holistic approach in wheat based systems. The SI work under WHEAT led to significant scientific achievements in term of science and publications had impact at scale in South Asia and LAC. It has received good attention from the donors through W3/bilateral funding which did not prevent cross-center/cross CRP collaboration. Lateral learning needs to take place on systems research frameworks, methodology and approaches; this can be realized through low cost mechanisms outside of Systems CRPs which show limits to deliver and somehow having been lost in ‘complexity’. Plan for integration of Dryland Systems’ specific Action Sites on sustainable intensification of wheat-based systems into WHEAT FP4 finalized; transition steps 2016 agreed; see section on FP4</td>
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<td></td>
<td><strong>Operationalization of SRF, inter-CRP collaboration</strong></td>
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<td>4</td>
<td>ISPC: “Overall, the ToC is consistent with SRF but further details are needed in the full proposal as was also noted by the IEA evaluation. WHEAT has responded that priorities are still in the process of being aligned with IDOs and SLOs which have been a moving target during 2012 to 2015... (was rated A). – IEA Ext Eval Recommend 1: ... Validation of assumptions and progress along the impact pathway should be used by WHEAT management for learning and adjusting plans, Complete IPs/ToCs at CRP and FP level in terms of approach to monitoring progress on outcomes (RBM/M&amp;E framework) and verifying assumptions</td>
<td>See Full Proposal Chapter on FPs, sections 2.3</td>
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WHEAT CRP: Annexes

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<td>and re-prioritizing projects when assumptions prove wrong or better options arise.</td>
<td>Requires inter-(AFS)CRP effort; M&amp;E specialists will take initiative; describe how WHEAT will monitor its contribution to SLO-level targets...</td>
<td>See section 1.2; limited progress by MEL CoP so far</td>
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<td>5</td>
<td>ISPC: complete the definition of impacts and identification of CRP IDO targets and indicators –</td>
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<td></td>
<td>Requires inter-(AFS)CRP effort; M&amp;E specialists will take initiative; describe how WHEAT will monitor its contribution to SLO-level targets...</td>
<td>See section 1.2; limited progress by MEL CoP so far</td>
</tr>
<tr>
<td>7</td>
<td>ISPC: Show more convincing integration across the Portfolio: Key connecting points to Global Integrating Programs, horizontal integration among AF5-CRPs (e.g. science of impact/scaling out; aspects of systems research), show how overlaps are complementary, not duplicative (relates chiefly to site integration / country coordination)</td>
<td>Build on June 2015 Montpellier definition/identification of connecting points. Requires inter-CRP planning effort</td>
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<td>FP-specific</td>
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<td>10</td>
<td>ISPC on FP2: “Major lessons from previous research are noted. However, the pre-proposal does not elaborate on what relevant research gaps are being addressed by FP2, based on the comparative advantage of the CGIAR.”</td>
<td>Make clear impact pathway of germplasm and knowledge flow from genebank to farmers; various possible new tools to make it more efficient, where they might fit, what their chances of success — in parallel to ongoing, central role of existing successful core breeding activities.</td>
</tr>
<tr>
<td>11</td>
<td>ISPC on FP2-3: “The proposers state that “Private sector incentives to invest in wheat are dampened by the self-pollinating nature of wheat...”; however, multinationals and others in the private seed sector –particularly in the EU– invest in wheat [hybrid] breeding (and genetic engineering), and WHEAT could take advantage of partnership opportunities to translate some of this cutting edge research into outcomes for the benefits of resource-poor farmers.” –</td>
<td>Make clearer in Full Proposal, is already stated there</td>
</tr>
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<td>12</td>
<td>ISPC on FP2-3: As recommended by the IEA evaluation (2015), better coordination of pre-breeding efforts is needed among existing FP2 projects and with FP3 breeding programs to ensure complementarities, synergies and lateral learning; and establishing inter-FP special trait teams would further increase the chances of success for this approach. – Note WHEAT-ISC: Implement External Eval Recommendation 6, “to establish an inter-FP special traits team to accelerate delivery of multiple genes for multiple traits into multiple high performance lines”, which W-ISc believes coincides with the Breeding Review recommendation to better integrate physiology with the mainstream breeding program.</td>
<td>Make clearer in Full Proposal, is already stated there</td>
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<td>14</td>
<td>ISCP: FP3: Impact pathway appears feasible with a minor concern about seed systems ... noted that FP3 is linked to FP 5.1 on seed systems; the link is important but breeding research and the seed systems research are separated into two different FPs. Other CRPs e.g. RAFS and RTB have included them in the same FPs to keep the</td>
<td>See To Do below (W-MC decision on Scaling out FP incl. for seed systems or not)</td>
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**WHEAT CRP: Annexes**

<table>
<thead>
<tr>
<th>No.</th>
<th>ISPC</th>
<th>Text</th>
<th>Dec 2015 workshop on WHEAT &amp; MAIZE with CRP-DS and HT; see revised FP4 section</th>
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</thead>
<tbody>
<tr>
<td>17</td>
<td>ISCP: FP4</td>
<td>“As argued by proposers, more research is also needed on the dynamics, actors and interactions of locally embedded, sustainable innovation systems … need to provide more clarity and details on the components of the ongoing Dryland Systems CRP that will be integrated into WHEAT and how and where this will be implemented (target areas).”</td>
<td>Take up in Full Proposal development Greater farmer adoption impact remains key goal. Still massive scope to improve productivity and livelihoods in target areas through better varieties and agronomy (e.g. large parts of India are still under 20+ year old varieties).</td>
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<td>21, 22</td>
<td>ISCP: FP5 needs to be substantially revised, to articulate clearly its theory of change and impact pathway, building on the expertise and comparative advantage of the proposers and a specific partnership strategy that would take the CRP outcomes to scale”</td>
<td>FPS will be substantially revised and strengthened with a coherent clear theory of change and impact pathway and focus on taking WHEAT outcomes to scale through a focus on seed systems, scaling sustainable intensification and associated capacity building. The FPS will build and expand a W3/bilateral base with only limited W1/W2 support – incl. a clear and specific partnership strategy that will leverage additional support such as the proposed closer collaboration with GIZ and others. Given good inter FPS-5 coordination, seed systems scaling-out should remain part of FPS. The WHEAT gender and youth strategy (also see next item) will clearly articulate entry points and its relevance for scaling under FPS. FPS will develop the overall WHEAT capacity development strategy and identify needs for different FPS building on the CapDev framework – again being cognizant of the limited W1/2 resources.</td>
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<tr>
<td>24</td>
<td>ISPC: “Much more attention is needed by WHEAT to strengthen its gender strategy, and how it will address the problems facing youth in the wheat agri-food system and target regions … Apart from mentioning that age will be taken into account in gender research and analysis, the coverage of youth is still poor.</td>
<td>Strengthening the WHEAT gender strategy and its implementation is high on the priority list – but suffered a severe setback due to the demise of Paula Kantor in 2015. Youth will receive more attention both as an integral part of the WHEAT gender strategy and as a key entry point for scaling (FPS) and the transformation of wheat AFS. The operationalization of the WHEAT gender and youth strategy will again be cognizant of the limited W1/2 resources.</td>
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<td>25</td>
<td>ISPC: ‘need to document how the CRP is managing its partnership and major regional collaboration initiatives (… should include an analysis of motivations, needs, capabilities and working relationships). As recommended by the IEA evaluation, WHEAT still needs to further develop its partnership strategy “WHEAT perspectives on site integration opportunities are described in a comprehensive matrix … does not elaborate further on this … not clear how many activities have already been</td>
<td>Follow up in Full Proposal development and in contributions to site integration / country coordination planning with other CRPs. Focus on important partnerships are with NARES, SMES and farmer groups and others, if it makes real sense for efficient and sustainable impact.</td>
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**Cross-cutting**

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<tr>
<th>No.</th>
<th>ISPC</th>
<th>Text</th>
<th>See sections 1.4, 1.5, Annexes 3.4, 3.5. WHEAT asked YPARD to review its youth strategy.</th>
</tr>
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<tbody>
<tr>
<td>24</td>
<td>ISPC: “Much more attention is needed by WHEAT to strengthen its gender strategy, and how it will address the problems facing youth in the wheat agri-food system and target regions … Apart from mentioning that age will be taken into account in gender research and analysis, the coverage of youth is still poor.</td>
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<td>Follow up in Full Proposal development and in contributions to site integration / country coordination planning with other CRPs. Focus on important partnerships are with NARES, SMES and farmer groups and others, if it makes real sense for efficient and sustainable impact.</td>
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**WHEAT participated (and co-led for Nepal) in country coordination meetings – key challenge is resourcing such coordination! See Annex 3.7:** Partnership
agreed, and most of the investments seem to be from bilateral funds

| strategy documented, see section 1.8, annex 3.2 |
WHEAT Accountability Matrix – Fund Council Caveats to address

As set out in Annex 1 to the Final Guidance for the 2nd Call for Full Proposals, the collective portfolio submitted by the Centers/partners in response to this call for full proposals must be accompanied by a summary of how the 23 caveats raised in that annex by the respective stakeholders have been addressed. This annex sets out those caveats, grouped by the body putting forward the topic for added attention in the full proposals.

1.1 Caveats expressed by the Joint Consortium Board/Centers/Fund Council Working Group, in its Memorandum to the Fund Council to express support for a ‘green light’ to move to full proposal development, dated 30 November 2015

Recognizing the advances already made in the re-submitted portfolio in the highly constrained time available, the full proposals submitted by 31 March 2016 for ISPC review must address to the satisfaction of the ISPC, and contributors, the points set out below, to strengthen further the rationale and coherence of the planned research agenda. Thereby delivering increased confidence that with funding from 2017 onwards, it has the capacity to deliver on SDGs in general and the Results Framework and CGIAR targets as set out in the SRF:

<table>
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<tr>
<th>No</th>
<th>Item to address</th>
<th>Relevant CRP(s)</th>
<th>Summary of how the matters has been adequately addressed (Full Proposal sections are referenced)</th>
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| 1  | Greater attention to discerning the role of regionally focused yield-gap closing/sustainable intensification research in the system, as distinct from and a complement to global public goods research in areas such as crop breeding, livestock health, food policy, and others. | AFS programs; genetic gain platform)    | ✓ Changes to FP4, namely new p’ship on scaling out with GIZ, incorporate Dryland Systems ‘systems research’ in 3 action sites. See section 1.1, 1.6 and section on FP4, annex 3.7 on relevant collaboration with other CRPs:  
✓ “The theory and practice of scaling out will receive more attention in FP4, in collaboration with other CRPs working in these systems. Significant impact is based on successfully dealing with a level of complexity that is greater than that associated with farmer adoption of improved cultivars. Even with new tools … substantial resources will be needed.” |
| 2  | More clearly articulating the strength of the arguments for maintaining genebanks and genetic gain as two separate platforms rather than an integrated effort6 | Genebank; Genetic gain platforms       | Not relevant for WHEAT. See Genetic Gains Platform proposal. |

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6 There were a number of different views expressed during working group deliberations on this topic. Whilst there was no fundamental opposition to separate platforms, there was a call for making a much stronger case as to why they should be separate.
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<th>Summary of how the matters has been adequately addressed (Full Proposal sections are referenced)</th>
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</table>
| 3  | Crosschecking that consolidation at the cluster of activities or flagship level has not delivered unintended adverse consequences such as removing clarity for key research priorities and/or increasing transaction costs | All            | ✓ WHEAT-MC decided to integrate FP5 into FP3 and FP4. Advantages and disadvantages were considered. FP5 lacked critical mass of resources. Seed systems innovation / scaling-out is clearly linked to FP3, whilst complex scaling-out interventions build on other FP4 CoAs.  
✓ November 2015 (Rome workshop) approach to reducing total # of Flagships was rushed, thus faulty. Did not consider difference between organizing research activities and resources (e.g. FPs, CoAs) AND defining reasonably distinct domains (research areas), nor ‘critical mass’.  
Major caveat: Bilateral funding dominates most FPs and CoAs, limiting the opportunity to better align an FP/CoA project portfolio and better link with other CRPs’ projects. Unpredictable W1&2 funding makes it worse. |
| 4  | Providing a clearer understanding of National Partners’ requirements, and how the scientific and financial program elements support them | All            | ✓ Not a deficit for WHEAT (see IEA External Evaluation).  
✓ See Partnership strategy, section 1.8 and Annex 3.2; Capacity Development strategy, Annex 3.3 |
| 5  | Setting out more clearly the interconnection and resources available for the proposed Communities of Practice in gender/youth and capacity development, with particular attention to ensuring engagement of partners in the respective Communities of Practice. Specifically, ensuring that the proposed communities of practice operate in a way that will result in meaningful progress towards sustainable engagement and impact | All            | ✓ See PIM FP6 (Cross-cutting Gender Research and Coordination)  
Major caveat: Communities of Practice rely on voluntary commitments by people who have a full-time job. Expectations about their ‘impact’ must be commensurate with this level of investment. |
| 6  | Reducing as many transaction costs as possible, particularly regarding management burden | All            | ✓ If at CGIAR Consortium-level progress has been made by summer 2016 (based on Rome November 2015 workshop discussions/initial ideas), WHEAT-Independent Steering Committee will consider this issue in their Sept 2016 or early 2017 meeting. |
### WHEAT CRP: Annexes

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| 7  | Providing greater emphasis on soils, animal genetic conservation and the potential impact of big data across the portfolio, not limited to genetic gain | WLE, all AFS, Livestock, Big Data platform                                     | ✓ WHEAT identified key Big Data opportunities per Flagship in section 1.7; Soils has been in scope for FP4 since CRPs Phase I.  
   |                                                                                   |                                                                                  | ✓ See Big Data Platform proposal (IFPRI/CIAT).  
   |                                                                                   |                                                                                  | PS: This seems like a mixed bag of priority issues that are not shared among all FC members.      |

### 1.2 Caveats expressed by the ISPC, dated 9 December 2015

ISPC comments on the portfolio (a paraphrase of a longer document)

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<th>Centers’ summary of how the matters has been adequately addressed</th>
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<td>8</td>
<td>Seek explicit prioritization within CRPs (and also between CRPs); balancing research on ‘upstream’ science with research on how to scale out and up relevant new knowledge and technologies (while leaving the delivery of impact at scale to organizations with that remit)</td>
<td>All</td>
<td>✓ WHEAT explains its up-/downstream research mix in section 1.3 and use of W1&amp;2 for upstream (e.g. discovery) in Annex 4.3</td>
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| 9  | Important to capture synergies between CRPs so that the System delivers more than the sum of the CRPs (the One System One Portfolio mantra) | All (statement of portfolio synthesis required)                                 | ✓ WHEAT proposes a net increase in inter-CRP collaboration, much of which would depend on sufficient ‘coordination’ funding, see tables in annex 3.7. See sections 1.7 (in particular WHEAT approach to ‘country coordination’) and 1.8, annexes 3.2 and 3.7.  
<p>|                                                                                   |                                                                                  | Major concern: The CGIAR Consortium and its donors would be well advised to apply the principles of ‘less is more’ and ‘within our circle of influence’. The current notion of ‘site integration’ (e.g. country coordination) is quite CGIAR Center-centric, whilst in fact, national actors will be the drivers and leaders of such coordination |</p>
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<td>efforts. Also, the costs of coordinating with many actors in a particular country are systematically underestimated.</td>
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<td>10</td>
<td>Clearer explanations of what W1&amp;2 funding will be used for</td>
<td>All</td>
<td>✓ See Annex 4.3, as well as section 1.3 and annex 3.7 (tables on inter-CRP collaboration indicating need for W1&amp;2 and/or bilateral investments)</td>
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| 11 | CRPs should not be expected to adhere to the ‘prioritization’ undertaken in a very short time-frame to produce the ‘Refreshed’ submission, but should hold serious discussion with their partners on which activities to prioritize according to the principles which were agreed at FC14                                                                                     | All           | ✓ WHEAT has done so before: Global Partners Meeting, December 2014 and Partner Priorities Survey 2013-14.  
✓ Priorities were clearly stated in WHEAT Extension Period Proposal (2015-16), including for ‘additional W1&2’ funding requested. W1&2 funding in 2015-16 was lower than 2014. Thus, the same priorities will be included in the Full Proposal.                                                                                                                                 |
| 12 | 2 new platforms are proposed: Genebanks and Genetic gains. The ISPC is comfortable with the platform on Genebanks                                                                                                                                                                                                                              | Not applicable | NA                                                                                                                                                                                                                                                                                                                                                                                          |
| 13 | Have concerns about the focus of the proposed Genetic Gains and what the creation of such a platform will mean for the AFS CRPs (and theories of change). The ISPC also found the title of ‘Genetic gains’ to be inappropriate as what is proposed is only part of the research required to deliver ‘genetic gains’. The budget needs to be reviewed                                                                                   | Genetics Gain platform | NA                                                                                                                                                                                                                                                                                                                                                                                          |
| 14 | Supports the concept of an initiative in Big Data and does not want to see this de-emphasized                                                                                                                                                                                                                                                 | Big Data platform | Major Concern: WHEAT does see a CGIAR competitive advantage in contributing to a Big Data initiative for IAR4D/ARD, but not leading one.                                                                                                                                                                                                                                                           |
| 15 | Identify where budget is placed for other arrangements to meet cross cutting system work originally considered through Expressions of Interest at the pre-proposal stage                                                                                                                                                                                   | All c.f. Guidance doc | NA                                                                                                                                                                                                                                                                                                                                                                                          |
### AFS CRPs

<table>
<thead>
<tr>
<th>No</th>
<th>Item to address</th>
<th>Relevant CRP(s)</th>
<th>Centers’ summary of how the matters has been adequately addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>DCLAS: The rationale for DCLAS receiving a ‘C’ rating overall (from the ISPC) related to the breadth of species being considered; the funders are requested to indicate their priorities for this CRP</td>
<td>This addressed to funders not to CRPs</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>FTA has moved tenure and rights to PIM – although PIM don’t mention that. FTA also wants to move the restoration work to WLE. Given the decreased budgets overall, these 2 CRPs may not accept these moves and the topics may hence disappear. Clarity on the potential loss of these areas is required</td>
<td>FTA, PIM, WLE</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Livestock and FISH both wish to move some genetics research across to the new platform as may other CRPs, yet the budget sources for those moves are not clear</td>
<td>Livestock, Fish, Genetic Gain platform</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Maize propose to move some bilateral projects out of the CRP due to budget cuts. What is an appropriate balance of W1/2 bilateral at the base funding scenario?</td>
<td>MAIZE</td>
<td></td>
</tr>
</tbody>
</table>
| 20 | RAFS (and presumably other CRPs) proposes to reduce the number of targeted IDOs and sub-IDOs – and both RAFS and Wheat make reference to cutting back on capacity development due to budget cuts. Realistic adjustments to current funding and base scenario funding will need to be considered by CRPs and funders | RAFS, WHEAT.                                                                 | ✓ Based on per FP theory of change workshops with scientists, WHEAT has reduced number of subIDOs targeted (and thus IDOs, SDGs), driven by need for credibility, the differentiation between multi-CRP (portfolio) versus per-CRP impacts and by need for realism about capacity to monitor progress towards impact.  
✓ WHEAT proposed core Phase II budget is equivalent to average annual budgets during Phase I. Proposed uplift budget is nearly identical to proposed budget in Extension Period Proposal.  |
### WHEAT CRP: Annexes

<table>
<thead>
<tr>
<th>No</th>
<th>Item to address</th>
<th>Relevant CRP(s)</th>
<th>Centers’ summary of how the matters has been adequately addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>The ISPC is glad that PIM has agreed to take on the role of co-ordination of a System-wide platform or Community of Practice for gender work, although we hope that it will be possible to reinstate the original budget. It is hoped that down-rating gender from a Flagship to ‘Cross-cutting work’ does not reflect diminishing importance of gender</td>
<td>PIM re role of the FP on gender</td>
<td>NA</td>
</tr>
<tr>
<td>22</td>
<td>A4NH and WLE seem to be following the ISPC recommendations (through additional steps for integration with CRPs through defined flagships, while the CCAFS Summary in Annex 2 suggests the budget cuts: ‘need a totally new business model’, the ISPC understands that only minor changes are now being proposed</td>
<td>A4NH, WLE, CCAFS, PIM</td>
<td>✓ WHEAT proposes increased collaboration with A4NH, CCAFS and WLE, depending on additional W1&amp;2 and/or bilateral investments. See Annex 3.7</td>
</tr>
</tbody>
</table>

#### 1.3 Additional caveats expressed by the Fund Council during its ad hoc meeting on 11 December 2015.

The Fund Council noted that its granting of a ‘green light’ to move to full proposal development was subject to the caveats noted by the Working Group and ISPC (in their written submission) and the Fund Council’s request for enhanced focus on gender and capacity building. The Fund Council also specifically acknowledged that CGIAR is engaged in an incremental process and some concerns raised by Fund Council members will require additional time and attention before the new portfolio of CRPs is approved.

<table>
<thead>
<tr>
<th>No</th>
<th>Item to address</th>
<th>Relevant CRP(s)</th>
<th>Summary of how the matters has been adequately addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Enhanced focus on gender and capacity building</td>
<td>All</td>
<td>WHEAT describes priority investments under gender in section 1.4 and annex 3.4 WHEAT describes priority investments under capacity development in section 1.10 and annex 3.3</td>
</tr>
</tbody>
</table>
Annex 4.5. References (per section)

Section 1.1: Rationale and Scope and 1.2


- Geographic distribution of producers/exporters and major consumer countries raises strategic issues for the next decades: Abis predicts increasing importance of international wheat trade. India will becomes net importer around 2030. He describes the enormous challenge of North African & Middle Eastern (MENA) food security with per capita wheat consumption is highest globally. Points to need to improve conditions for long-term investment in ag productivity to feed world’s wheat-eating population by 2050. Note that wheat global trade is special case: 20-25% of global prod traded, compared to 10% rice, 5% fruits and vegetables.


Centre for Science and Policy (CSap), University of Cambridge: Climate change—A Risk Assessment.


Foley et. al., 2011. Solutions for a cultivated planet, Nature 478, 337–342 (20 Oct 2011) http://www.nature.com/nature/journal/v478/n7369/full/nature10452.html#ref-link-25. Four food security and four environmental goals are identified in Figure 2.


Lantican et al., in press. Impacts of International Wheat Improvement Research, 1994-2014. CIMMYT.


NASA Satellites Unlock Secret to Northern India’s Vanishing Water.


Subbarao et al., 2016 Biological Nitrification Inhibition (BNI) in Plants - Implications for Improving Nitrogen-use Efficiency and Reducing Nitrous oxide Emissions from Agricultural Systems

Stevenson J. R., N. Villoria, D. Byerlee, T. Kelley, and M. Maredia. PNAS 2013 110(21)8363-68;doi:10.1073/ pnas.1208065110 Green Revolution research saved an estimated 18 to 27 million hectares from being brought into agricultural production


Wageningen FSC, 2016. Multi-level Mapping and Exploration of Wheat production and consumption and their potential contribution to alleviation of poverty, malnutrition and gender inequality. Wageningen University Food Security Center study. WHEAT competitive grant. Final Report to be published by end 2016. For more information, see section on Flagship Project 1. WHEAT works with several universities and their socioeconomic modeling teams.

- Analyses of worldwide impacts of wheat production, consumption and nutrition scenarios with their global economic modelling tool (MAGNET), with a maximum of four scenarios.

- Note that the overview of countries with high production and consumption but low welfare indicators includes countries with missing data for specific indicators. Central Asian countries appear repeatedly, as well as Egypt, Pakistan, Syria and Morocco.

- “Gender inequality is a problem in a substantial share of countries in all production and consumption terciles.”


- “Over the last decade, apart from developing countries in Europe and Central Asia, low- and middle-income countries in general are increasing land under cereal production….Since most of the land available for current and future food requirements is already in production ….further expansion will likely involve fragile and marginal land … .”

1.4%: We calculate: 1.0 for popln + 0.4 for per capita demand across half the world (2 x 0.4 x half).

Section1.3


The 2015 review of the CIMMYT Breeding Program noted: “The breeders are also very aware of the need for fast cycle systems and use SSD and ‘shuttle breeding’ to great effect. The cycle time for varieties is just 5 years....” See FP3.

Van Wart, 2013: Agro-ecological framework developed for the Global Yield Gap Atlas (www.yieldgap.org), expanded to include key socioeconomic and nutrition data (Van Wart et al., 2013; van Bussel et al, 2015)

WHEAT and Gender (section 1.4, annex 3.4)


Ashrafi, H. 2009. Gender dimension of agriculture and rural employment: Special focus on Afghan rural women’s access to agriculture and rural development sector. FAO, IFAD, ILO.


Section 1.7 (country coordination)

“CGIAR-SRF: “The CRPs will coordinate with each other to ensure that, in key geographies, their activities are aligned for maximum impact. The CRPs’ collective, coordinated commitments in these geographies will be summarized in site integration plans to enable transparent interaction with local stakeholders. The consultation process will be pursued through the GCARD.”

Definition of country coordination (site integration) in the CGIAR-SRF: “The CRPs will coordinate with each other to ensure that, in key geographies, their activities are aligned for maximum impact. The CRPs’ collective, coordinated commitments in these geographies will be summarized in site integration plans to enable transparent interaction with local stakeholders. The consultation process will be pursued through the GCARD.”


Section 1.9


In developing countries there are at most 5 competitive private wheat breeding programs that meet international standards in terms of use of marker technology, scale of operation etc. By far the most important provider of wheat cultivars continues to be the public sector and CIMMYT/ICARDA. This will only change if hybrid wheat becomes a reality or policies are developed that allow collection of royalties.

Section on FP1 References


FP2 References

FP2.3


**FP3 References**

**FP3.3**


**FP4 References**


Annex 3.3 References


Breeding Program Review: “... on-going activity that CIMMYT has with the ‘hubs’ across the world. These hubs generate good agronomic information (using a range of inputs). A recent Report ‘(Measuring the Effectiveness of Crop Improvement research in Sub-Saharan Africa from the Perspectives of Varietal output, Adoption, and Change: 20 Crops, 30 countries and 1150 Cultivars in Farmers’ Field (July 2014) is an example of the follow up that takes place. ... CIMMYT distributes a range of nurseries with high value traits as well as genetic material for development by cooperators. This program is sophisticated and extremely important.” See: Accelerating Plant Breeding Program Outcomes: Findings from CIMMYT Review Visit 26th March – 1st April 2015 Bill & Melinda Gates Foundation.

G-20 Wheat Initiative: “Created in 2011 following endorsement from the G20 Agriculture Ministries, the Wheat Initiative provides a framework to establish strategic research and organization priorities for wheat research at the international level in both developed and developing countries.” Note the focus is currently on developed countries and globally relevant research challenges. See http://www.wheatinitiative.org/

Youth Strategy (Annex 3.5) References


Annex 4.6: Performance Indicator Matrix Tables B, C & D

**WHEAT Full Proposal: PIM Tables B, C**

WHEAT targeted subIDOs, matched to key research outcomes, broken down into achievement milestones over 2017-2022

<table>
<thead>
<tr>
<th>Sub-IDOs</th>
<th>% total FP budget 2017-2022</th>
<th>absolute 2017-2022</th>
<th>2022 R&amp;D Outcomes from CRP ToCs</th>
<th>%outcome per subIDO</th>
<th>absolute 2017-2022</th>
<th>Absolute per FP outcome</th>
<th>W1&amp;2</th>
<th>W3/Bil</th>
<th>Total dedicated to Cap Dev</th>
<th>Total dedicated to gender, youth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flagship 1: Enhancing WHEAT’s R4D strategy for impact</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals per FP $M</td>
<td>24.514281</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.4 More efficient use of inputs</td>
<td>40</td>
<td>9.806</td>
<td>1.10 Farmers have greater awareness and access to, and increased adoption and adaptation of improved technologies</td>
<td>100</td>
<td>9.806</td>
<td>17.160</td>
<td>5.99</td>
<td>11.17</td>
<td>1.8</td>
<td>5.5</td>
</tr>
<tr>
<td>B.1.3 Improved capacity of women and young people to participate in decision-making</td>
<td>30</td>
<td>7.354</td>
<td>1.10 Farmers have greater awareness and access to, and increased adoption and adaptation of improved technologies</td>
<td>100</td>
<td>7.354</td>
<td>see above</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.1.1 Increased capacity of beneficiaries to adopt research outputs</td>
<td>30</td>
<td>7.354</td>
<td>1.9 Last mile provider (extension partners, farmer organization, community-based organizations, private sector) increased access and promotion of technologies to farmers</td>
<td>50</td>
<td>3.677</td>
<td>3.677</td>
<td>1.28</td>
<td>2.39</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>1.8 National and regional policy makers improved policy-making and increased investment based on evidence</td>
<td>50</td>
<td>3.677</td>
<td>1.9 Last mile provider (extension partners, farmer organization, community-based organizations, private sector) increased access and promotion of technologies to farmers</td>
<td>50</td>
<td>3.677</td>
<td>3.677</td>
<td>1.28</td>
<td>2.39</td>
<td>0.9</td>
<td>0.9</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>279</th>
<th>97</th>
<th>182</th>
<th>25</th>
<th>47</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>65</td>
<td>9</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>
### Flagship 2: Novel diversity and tools

<table>
<thead>
<tr>
<th>Totals per FP $M</th>
<th>51.531135</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.4.3 Enhanced genetic gain</th>
<th>40</th>
<th>20.612</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 Crop researchers worldwide increased use of novel germplasm and tools for validation, refinement and development of products</td>
<td>50</td>
<td>10.306</td>
</tr>
<tr>
<td>2.5 Breeders develop improved varieties more efficiently through greater access and use of documented germplams and tools</td>
<td>50</td>
<td>10.306</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.4.4 Increased conservation and use of genetic resources</th>
<th>40</th>
<th>20.612</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2 Crop researchers world-wide and across disciplines access more novel germplams and tools</td>
<td>100</td>
<td>20.612</td>
</tr>
<tr>
<td>2.3 Genebanks enabled to increase utilization of accessions by crop researchers</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D.1.1 Enhanced institutional capacity of partner research organizations</th>
<th>20</th>
<th>10.306</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 Crop researchers worldwide increased use of novel germplasm and tools for validation, refinement and development of products</td>
<td>100</td>
<td>10.306</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assign to Genebanks Platform</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.06</td>
<td>5.2</td>
</tr>
</tbody>
</table>

### Flagship 3: Better varieties reach farmers faster

<table>
<thead>
<tr>
<th>Totals per FP $M</th>
<th>112.333818</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.1.2 Reduced production risk</th>
<th>30</th>
<th>33.700</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6 National regulators of crop variety release improved enabling environment to speeding-up release of improved varieties (merge with 3.5 National partners increased improved variety release)</td>
<td>50</td>
<td>16.850</td>
</tr>
<tr>
<td>3.7 Extension partners (universities, national /state / provincial governments) increased access and promotion of adoption of improved varieties to farmers, and increased investment in emerging private sector circumstances (merge with: 3.8 Farmer organizations increased access and promotion of adoption of improved varieties to farmers)</td>
<td>50</td>
<td>16.850</td>
</tr>
</tbody>
</table>

| 1.69 | 1.69 |
| 4.21 |  |

| 17.98 | 33.56 |
| 2.06 | 5.15 |
### 1.4.1 Reduced pre- and post-harvest losses, including those caused by climate change

<table>
<thead>
<tr>
<th>Action</th>
<th>Impact</th>
<th>Impact Reference</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3 Partner breeding teams improved breeding processes by adopting new technologies, methodologies, genetic resources</td>
<td>50</td>
<td>11.233</td>
<td>28.0834545</td>
</tr>
<tr>
<td>3.12 Non-and -subsistence farmers adopted improved varieties</td>
<td>50</td>
<td>11.233</td>
<td>11.23</td>
</tr>
<tr>
<td>3.1 Partner breeding teams improved exchange and utilization of germplasm and data</td>
<td>50</td>
<td>11.233</td>
<td>11.23</td>
</tr>
<tr>
<td>3.2 Partner breeding teams increased multidisciplinary and multi-institutional collaboration (merge with: 3.3 Partner breeding teams improved breeding processes by adopting new technologies, methodologies, genetic resources)</td>
<td>50</td>
<td>11.233</td>
<td>11.23</td>
</tr>
</tbody>
</table>

### 1.4.3 Enhanced genetic gain

<table>
<thead>
<tr>
<th>Action</th>
<th>Impact</th>
<th>Impact Reference</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3 Partner breeding teams improved breeding processes by adopting new technologies, methodologies, genetic resources</td>
<td>100</td>
<td>16.850</td>
<td>see above</td>
</tr>
</tbody>
</table>

### A.1.4 Enhanced capacity to deal with climatic risks and extremes

<table>
<thead>
<tr>
<th>Action</th>
<th>Impact</th>
<th>Impact Reference</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7 Extension partners (universities, national /state / provincial governments) increased access and promotion of adoption of improved varieties to farmers, and increased investment in emerging private sector circumstances (gender and other social identities as customer attributes in relation to seed diffusion interventions, including varietal promotion and replacement)</td>
<td>100</td>
<td>16.850</td>
<td>16.85</td>
</tr>
</tbody>
</table>

### B.1.2 Technologies that reduce women's labor and energy expenditure developed and disseminated

<table>
<thead>
<tr>
<th>Action</th>
<th>Impact</th>
<th>Impact Reference</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.8 Farmer organizations increased access and promotion of adoption of improved varieties to farmers (gender and other social identities as customer attributes in relation to seed diffusion interventions, including varietal promotion and replacement)</td>
<td>100</td>
<td>16.850</td>
<td>112.334</td>
</tr>
</tbody>
</table>
### Flagship 4: *Sustainable intensification of wheat-based farming systems*

<table>
<thead>
<tr>
<th>Totals per FP $M</th>
<th>90.99911</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.3.4 More efficient use of inputs</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>1.4.2 Closed yield gaps through improved agronomic &amp; animal husbandry practices</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>3.2.2 Agricultural systems diversified and intensified in ways that protect soils and water</strong></td>
<td>20</td>
</tr>
<tr>
<td>A1.4 Enhanced capacity to deal with climate risks and extremes</td>
<td>20</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4.9 Smallholder farmers increased their capacity to adopt and adapt SI practices and products (associated with crosscutting sub-IDO) &amp; 4.6 Private sector (and public sector) increased provision of services to smallholder farmers to increased their ability to adopt SI practices and products &amp; 4.3 Local and regional actors (NGOs, farmer groups, extension agents, private sector) increased promotion of SI practices and products</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.1.1. Increased capacity of beneficiaries to adopt research outputs</th>
<th>10</th>
<th>9.100</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7 Actors in SI increased participation in feedback loops via monitoring, evaluation and sharing of lessons learned &amp; 4.8 Actors in SI increased consideration of gender and social inclusion into policies, processes and practices</td>
<td>100</td>
<td>9.10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D.1.1. Enhanced institutional capacity of parter research organizations</th>
<th>10</th>
<th>9.100</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.6 Private sector (and public sector) increased provision of services to smallholder farmers to increased their ability to adopt SI practices and products &amp; 4.4 NARS increased use of participatory approach in system research, enhanced capacity and knowledge to create awareness and develop improved technologies</td>
<td>100</td>
<td>9.10</td>
</tr>
</tbody>
</table>

| 90.999 | 91.00 | 90.999 | 31.74 | 59.25 | 10.92 | 21.84 |
## Table D. 2017-2022 Milestones per 2022 Outcome per Flagship.

**WHEAT Full Proposal: PIM Table D**

WHEAT targeted subIDOs, matched to key research outcomes, broken down into achievement milestones over 2017-2022

see also Annex 3.6

<table>
<thead>
<tr>
<th>Table C</th>
<th>Tables B, D</th>
<th>Milestones per R&amp;D Outcomes</th>
<th>Means of verifying performance against outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-IDOs</td>
<td>2022 R&amp;D Outcomes from CRP ToCs</td>
<td></td>
<td>Pathway-1: Enhancing WHEAT’s R4D strategy for impact</td>
</tr>
<tr>
<td>1.3.4 More efficient use of inputs</td>
<td>1.10 Farmers have greater awareness and access to, and increased adoption and adaptation of improved technologies</td>
<td>Rapid value chain assessments with proper gender lens conducted to identify opportunities and bottlenecks in WHEAT</td>
<td>Beneficiaries in 3 WHEAT target regions, plus 6 target countries exposed to more appropriate innovations through better targeting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.1.3 Improved capacity of women and young people to participate in decision-making</td>
<td>1.10 Farmers have greater awareness and access to, and increased adoption and adaptation of improved technologies</td>
<td>Gender / social inclusion lenses will be applied to 2 to 4 WHEAT innovation pipelines and assessments</td>
<td>Measure of women’s empowerment quantified based on global recognized indicators (baseline)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C.1.1 Increased capacity of beneficiaries to adopt research outputs

<table>
<thead>
<tr>
<th>Flagship 2: Novel diversity and tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4.3 Enhanced genetic gain</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**WHEAT CRP: Annexes**

1.9 Last mile provider (extension partners, farmer organization, community-based organizations, private sector) increased access and promotion of technologies to farmers

Ex-ante impact assessments identify potential opportunities, threats and game changes for WHEAT to support outcomes 1.1, 1.2, 1.3

Adoption and impact studies on technologies—rolling plan based on progress of technologies along the theory of change

Adoption and impact studies on technologies—rolling plan based on progress of technologies along the theory of change

Adoption and impact studies on technologies—rolling plan based on progress of technologies along the theory of change

Adoption and impact studies on technologies—rolling plan based on progress of technologies along the theory of change

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Climate change and other dynamics integral to foresight research, showing how they transform agri, rural landscapes

value chain research identifies new entrepreneurial, job opportunities, options to address (post-)harvest losses

Ex-ante impact assessments assess future preferences of wheat producers and consumers and implications for wheat innovation to support outcomes 1.9 and 1.10

Supporting publications: Reports, policy briefs, dissemination documentation

Reports, policy briefs, dissemination documentation
| 1.4.4 Increased conservation and use of genetic resources | 2.2 Crop researchers worldwide and across disciplines access more novel germplams and tools | Greater number (compared to 2016) of breeder-ready markers/high-value haplotypes for prioritized traits identified and validated (under FP2) and deployed in CGIAR breeding programs (FP3) | FP2-developed tools and methods that enable more efficient management of breeding programs used by all WHEAT breeders | Greater number (compared to 2016) of breeder-ready markers/high-value haplotypes for prioritized traits identified and validated (under FP2) and deployed in non-CGIAR breeding programs (FP3; partners) | FP2-developed tools and methods that enable more efficient management of breeding programs used by 20% of national partner breeders | Marker deployment tracking, tool use tracking |

| assign to Genebanks Platform | 2.3 Genebanks enabled to increase utilization of accessions by crop researchers | New alleles for heat and drought, other climate change-related traits identified and moved into breeding pipeline | international multi-location testing of new allelic combinations provides best bets | Comprehensive characterization of genebank accessions incl. geospatial, adaptive distribution | in-situ conservation successfully implemented with 3-SNARS in major centers of diversity | molecular characterization used by more CGIAR and non-CGIAR breeders to investigate uncharacterized germplasm |

| D.1.1 Enhanced institutional capacity of partner research organizations | 2.4 Crop researchers worldwide increased use of novel germplasm and tools for validation, refinement and development of products | Shared low cost high throughput SNP-genotyping platform for low density markers (1-200) for CG centers and partners | More partners use IWYP Platform for precision phenotyping | enhanced researchers access to accessions (easier, more targeted across different criteria) | Integration of gender and youth-based preference data for germplasm into breeding management informatics systems | Global phenotyping data curated and made available to global community through integrative system | More interoperable data in more data sets exchanged, used by researchers, using efficient procedures | Database usage/user monitoring (e.g. platforms available/used, open access databases, reports) | Change # of markers used by non-WHEAT scientists |
### Flagship 3: Better varieties reach farmers faster

<table>
<thead>
<tr>
<th>1.1.2 Reduced production risk</th>
<th>3.6 National regulators of crop variety release improved enabling environment to speeding-up release of improved varieties (merge with 3.5 National partners increased improved variety release)</th>
<th>National regulators of variety release and seed supply provide enabling environment to speed up release of improved varieties and farmers’ access to quality seed, in 2-3 target countries</th>
<th>national variety release process 1-3 years shorter in 2-4 WHEAT target countries</th>
<th>policy change tracking</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7 Extension partners (universities, national /state / provincial governments) increased access and promotion of adoption of improved varieties to farmers, and increased investment in emerging private sector circumstances (merge with: 3.8 Farmer organizations increased access and promotion of adoption of improved varieties to farmers)</td>
<td>New options, approaches piloted to fast track release of varieties, accelerated seed multiplication and dissemination</td>
<td>improved, documented understanding of specific wheat seed systems (farmer’s seed commercial behavior, seed demand and marketing, economics of seed production) / 2-3 NARES identified performance gaps, capacity development needs, to identify, realize relevant cap dev interventions at apt levels</td>
<td>sustainable functional seed units for early generation seed multiplication established with plus 2-3 NARS (public, private sector)</td>
<td>change in sustainable farmer access to improved seeds; farmer uptake of seeds (vs own); Number of farmers with access to quality seeds / change in degree of commercialisation of seed sector (public, private) / change in scaling-up of new technologies and practices through Agricultural Innovation Platforms, innovation hubs</td>
</tr>
<tr>
<td>1.4.1 Reduced pre- and post-harvest losses, including those caused by climate change</td>
<td>3.3 Partner breeding teams improved breeding processes by adopting new technologies, methodologies, genetic resources</td>
<td>public or private sector seed producer investment increased in 2-3 target countries, compared to 2016</td>
<td>broad genetic-based germplasm resistant/ tolerant to pests, diseases predicted to become worse with climate change</td>
<td>variety adoption increases protection from post-harvest losses (e.g. mycotoxins, other) in 2-3 sites (incl value chain FP1, FP4)</td>
</tr>
<tr>
<td>3.12 Non-and -subsistence farmers adopted improved varieties</td>
<td>greater farmer adoption of released varieties (based on CGIAR research) in specific WHEAT target countries, compared to 1994-2014 average</td>
<td>sustainable seed system optimised in 2-3 countries (pilots, with scaling-out potential)</td>
<td>nitrogen-use efficient varieties adopted, reducing water pollution in 3-6 target countries/sites</td>
<td>faster replacement rate (farmers use same variety fewer years before replacing) in specific WHEAT target countries</td>
</tr>
</tbody>
</table>

| 1.4.3 Enhanced genetic gain | 3.1 Partner breeding teams improved exchange and utilization of germplasm and data | All molecular markers linked to traits of agronomic importance converted onto SNP-based platforms. SNP-based low and high density genotyping hubs established | fully operational, integrated network of 15 precision phenotyping platforms, germplasm exchange between NARS platforms | SNP-based markers transferred to sequence based markers for genomics-assisted breeding | increased on-farm genetic diversity of farmer-adopted varieties in 3 key target regions | increased cultivar replacement rates in 2-3 key target regions |
| 3.2 Partner breeding teams increased multidisciplinary and multi-institutional collaboration (merge with: 3.3 Partner breeding teams improved breeding processes by adopting new technologies, methodologies, genetic resources) | initiate Global Pests & Diseases Observatory with user inputs, to monitor, assess races/biotypes of key diseases and pests | sustainable seed system optimised in 2-3 countries (pilots, with scaling-out potential) | pest, disease-resistant varieties adopted and less chemicals used in 3-6 target countries/sites | nitrogen-use efficient varieties adopted, reducing water pollution in 3-6 target countries/sites | functional Global Pests & Diseases Observatory with user partners (geographies tbd) | no of cooperators (data contributors) and users |

Performance of superior resistant germplasm in multi-location/year disease/pest trials

Effects of markers and genes linked to target traits in diverse genetic backgrounds; rates of genetic gain by incorporating and combining new alleles (genetic studies) / Change in cultivar replacement rates Change in income attributable to yield gain/stability, quality traits

release and adoption data, via national focal point network, documented in wheatatlas.org

WHEAT CRP: Annexes
<table>
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<tr>
<td><strong>A.1.4 Enhanced capacity to deal with climatic risks and extremes</strong></td>
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<tr>
<td>3.3 Partner breeding teams improved breeding processes by adopting new technologies, methodologies, genetic resources</td>
</tr>
<tr>
<td>improved knowledge of genetic basis of climate change adaptation on global scale thru combination of GS, platforms, unified databases</td>
</tr>
<tr>
<td>high quality phenotypic data &amp; germplasm with heat, drought tolerance, putative traits into CGIAR and NARS breeding programs</td>
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<tr>
<td>better climate change-adapted lines used by wheat breeders globally, early farmer adoption successes</td>
</tr>
<tr>
<td>effect of applying genomic tools to improve CC-relevant traits / Rate at which high-quality phenotypic data, associated germplasm with heat, drought tolerance available for wheat breeders globally</td>
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| **B.1.2 Technologies that reduce women’s labor and energy expenditure developed and disseminated** |
| 3.7 Extension partners (universities, national / state / provincial governments) increased access and promotion of adoption of improved varieties to farmers, and increased investment in emerging private sector circumstances (gender and other social identities as customer attributes in relation to seed diffusion interventions, including varietal promotion and replacement) |
| develop disease/pest resistant germplasm that do not lodge, and have high vigor and test weight |
| elite lines validation of labour, energy reduction (farmer evaluation, PVS) |
| Move to FP4.3: Combine with agronomic, farm mgmt tools |

| **3.8 Farmer organizations increased access and promotion of adoption of improved varieties to farmers (gender and other social identities as customer attributes in relation to seed diffusion interventions, including varietal promotion and replacement)** |
| Develop wheat with enhanced healthy properties: reduce chronic diseases risk (incl high content of dietary fiber to address obesity) |
| Improve consumer acceptability of high flour extraction rate and whole grain flour |
| prebreeding lines with high iron, zinc and inulin and low phytic acid concentration, lines with high total AX and WE-AX content developed |
| studies conducted to understand effect of increased resistant starch on grain yield, industrial quality |

With A4NH: Verify if consumption of wheat varieties with enhanced nutritional and healthy components reduces malnutrition rates, cardiovascular diseases, type 2 diabetes, cancer in CGIAR target geographies
# Flagship 4: Sustainable intensification of wheat-based farming systems

<table>
<thead>
<tr>
<th>1.3.4 More efficient use of inputs</th>
<th>4.2 Donors, policy-makers (local, regional and national), advocacy NGOs and private sector increased investment and improved enabling environment for adoption of SI practices and products &amp; 4.3 Local and regional actors (NGOs, farmer groups, extension agents, private sector) increased promotion of SI practices and products &amp; 4.4 Private sector (and public sector) increased provision of services to smallholder farmers increased their ability to adopt SI practices and products</th>
<th>Increase resource use efficiencies (irrigation water, N, P) while maintaining high, stable yields: NW Mexico, the Indo-Gangetic Plains</th>
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<tr>
<td>1.4.2 Closed yield gaps through improved agronomic &amp; animal husbandry practices</td>
<td>4.7 Actors in SI increased participation in feedback loops via monitoring, evaluation and sharing of lessons learned &amp; 4.8 Actors in SI increased consideration and integration of gender and social inclusion into policies, processes and practices &amp; 4.10 Smallholder farmers adopted and adapted SI practices and products</td>
<td>increased adoption of combinations of SI strategies, technologies in specific target geographies compared to 2016</td>
<td>Adaptive research improves understanding of gender, youth and adoption, adaptation and scaling-up processes, with focus on market demand as trigger of innovation</td>
</tr>
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<td>3.2.2 Agricultural systems diversified and intensified in ways that protect soils and water</td>
<td>4.2 Donors, policy-makers (local, regional and national), advocacy NGOs and private sector increased investment and improved enabling environment for adoption of SI practices and products &amp; 4.3 Local and regional actors (NGOs, farmer groups, extension</td>
<td>better understand smallholder farming systems diversity and trajectories (which drive adoption) and feedback</td>
<td>Decision support, mechanization and other tools, processes improve target groups’ ability to seize opp’s and avoid losses</td>
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<tr>
<td></td>
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<td>Smart mechanization lessons learnt routinely applied in other FP4 projects</td>
<td>Extent of crop management practices that arrest soil degradation</td>
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<tr>
<td></td>
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<td>System health (nutrient cycling, biodiversity, biomass)</td>
<td>Intensified, diversified farming systems developed, with increased systems intensity, reduces pressure on land</td>
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<td></td>
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<td>Landscape scale: Land-use change; Soil loss/degradation; Soil health (AFSIS); Net productivity (vegetation, biomass);</td>
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CRP Commissioned External Evaluation, project/donor-driven impact studies; partner self-assessments
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<td>4.9 Smallholder farmers increased their capacity to adopt and adapt SI practices and products (associated with crosscutting sub-IDO) &amp; 4.6 Private sector (and public sector) increased provision of services to smallholder farmers to increased their ability to adopt SI practices and products.</td>
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<td>Between farming systems and their operating landscapes</td>
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<tr>
<td>Water-saving benefits of farmers using most water-efficient cultivars and optimum agronomy and irrigation systems validated for 2 WHEAT target regions</td>
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<td>Farmers in 2 WHEAT (irrigated) target regions, using most water-efficient cultivars and optimum agronomy and irrigation systems, achieve water use efficiency of ca 450 l/ kg grain can be achieved (50% water saving over 2015)</td>
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<td>More resilient farms and landscapes with doubled NUE reduce GHG emissions in 2-4 WHEAT target geographies</td>
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<td>Farmers in a further 2-3 WHEAT (irrigated) target regions, using most water-efficient cultivars and optimum agronomy and irrigation systems, achieve water use efficiency of ca 450 l/ kg grain can be achieved (50% water saving over 2015)</td>
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<td>Better understand and model farmer perception, farmer diversity, and farm-level integration of technologies</td>
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<td>Improved understanding translated into ICT for improved farmer decision making projects</td>
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<th>Ecosystem services (biodiversity, water); Documentation review, Survey of private sector CRP Commissioned External Evaluation</th>
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<td>% change in nitrate losses, P losses % change in herbicide/pesticide use per unit of production % change from baseline for fertilizer N consumption, soil C indices, erosion indices, soil biological properties SDSN 15: NUE in food systems (FAO, IFAD as lead monitoring) SDSN 16: Crop water productivity (tons of harvested product per unit irrigation water, FAO lead monitor)</td>
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<th>Change in: Food sufficiency &amp; security; - Income &amp; Assets; - Investment &amp; ROI of technology</th>
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