

9 May 2011

**ISPC commentary on the proposal CRP 3.1: “WHEAT - Global Alliance for Improving Food Security and the Livelihoods of the Resource - poor in the Developing World”**  
*(Proposal of March 2011)*

**Summary**

Wheat is a commodity of great social and economic importance, equal to rice as a global food security crop. The proposal for CRP 3.1, WHEAT, argues convincingly for a collaborative international research effort to achieve sustainable wheat production systems and improve access to and affordability of wheat as a major food for poor consumers while reversing environmental degradation. To this end, the proposal brings together CIMMYT and ICARDA with other major players in a comprehensive global research program. The track record of these partners is impressive. The proposed program, however, takes on too large an agenda without sufficient supporting analysis of constraints and opportunities for wheat research. It does not sufficiently prioritize activities in order to focus on areas where plausibility of impact is greatest.

Defining the case for CGIAR research on wheat is more nuanced than for maize and rice because wheat is produced largely in middle income countries. Furthermore, it is a highly tradable commodity and therefore production increases do not necessarily result in lower consumer prices in the country where it is produced. These issues should be explicitly recognised and a reasonable framework developed to identify research issues and geographic regions that deserve focus of CGIAR wheat research. Regarding the expected negative effects of climate change, there are likely options such as adaptive agronomic management, crop substitution, consumption substitution and wheat imports not considered in the proposal and which would mitigate at least partially the effects of climate change.

The steady decrease in rate of gain in wheat yields, and the fact that on a global level the rate of gain is now less than required to meet projected wheat demand, is given as a major justification for this CRP. Although in some major wheat producing countries wheat yields have plateaued or have stalled significantly, the underpinning causes of these yield trends are not considered. The ISPC believes the causes need to be understood, or hypotheses put forward to explain them, to help guide research prioritization on the productivity enhancement components of this CRP.

The CRP consists of 10 Strategic Initiatives (SIs), which are generally appropriate and well articulated. The SI outputs are aligned with the System Level Outcomes of the CGIAR Strategic Results Framework (SRF). While impact targets are provided for all SIs there are no analytical justifications or assumptions for these quantitative targets. Lack of explanation about how these targets were derived reduces their credibility. Further, program-level integration, development and delivery strategies are lacking, and the management framework does not appear strong enough for integration of component elements within and across SIs for enhancing program-level outcomes. For example, the lead Center, CIMMYT, has notable dominance in program management. The Management Committee is the CRP executive and below that there is little leadership. It is not clear that this management arrangement can support program-level synergy and cohesion through integration of program components. With CIMMYT and ICARDA having responsibilities for their current regions there is risk that the new program will not bring the needed integration to the two Centers' programs. Likewise, the CRP lacks a strong mechanism for independent oversight and evaluation.

## **Recommendation**

**The ISPC recommends that CRP 3.1 be approved subject to substantial revisions and resubmission, taking into account the detailed commentary that follows, with emphasis on:**

- Clear prioritization among regions, mega-environments and alternative research interventions to target WHEAT on areas where wheat and wheat systems research provides greatest opportunities to address CGIAR System-level outcomes, where CRP 3.1 has clear comparative advantage, and where there is high probability of impact.
- Underpinning this prioritization will require careful analysis of: (i) linkages between production and consumption and the benefits to poor farmers and consumers; (ii) causes of the overall decline, and in some countries plateauing, rates of wheat yield gains; (iii) a wider array of scenarios resulting from climate change that affect wheat production and consumption. Appropriate research hypotheses should be developed from these analyses.
- Development of realistic outcomes at the SI level and impact projections at the program-level with transparent metrics and sources of data to justify these targets and appropriate assumptions that they depend on.
- Better elaboration of what is new in the proposal relative to current research efforts within the CGIAR and elsewhere; and what is the level of risk regarding the proposed research.
- Clearer integration of the SIs including: (i) SI1 with all other SIs, (ii) SIs 2 and 3 which could be merged, (iii) for research on policy, water and climate change, more explicit connections to CRPs 2, 5 and 7, and (iv) closer ties for seed systems efforts with similar work in other CRP3 food security crop proposals, and with CRP2.
- More explicit design of CRP-specific management arrangements that: (i) assure priority setting, decision making/resource allocation and evaluation are the result of more independent, program-driven perspective, and (ii) support a strong identity of the CRP3.1 as a cohesive program with effective coordination among SIs and multiple partnerships, and delivery of program-level results.
- More independent oversight and evaluation arrangements.
- Presentation of budget scenarios that include the full budget option.

### **1. Strategic coherence and clarity of Program objectives**

CRP 3.1 – WHEAT – has a clear vision of the challenges ahead to ensure: (1) increasing wheat demand is met and food is affordable for poor consumers, (2) wheat-based farming systems are more sustainable and resilient, (3) increased wheat production in developing countries is achieved mainly through higher yields, thus lessening pressure on area expansion (4) poverty and malnutrition are reduced, (5) disadvantaged farmers and countries gain better access to cutting-edge proprietary technologies, and (6) a new generation of scientists and other professionals guide national agricultural research across the developing world.

A central argument put forward by the proponents is that wheat is extremely important in the developing world as a food security crop but its production is threatened by climate change, a host of disease and pest problems, and a steady decrease in rate of yield gain. A global initiative is offered to address these wheat production and productivity challenges building on the past successes of CIMMYT and ICARDA and their partners. While the case is strong for such a program, prioritization of the proposed research agenda is weak. In particular, the proposal has not sufficiently considered the context of the current global wheat research portfolio, recent advances in science and how they affect the prioritization within WHEAT and feasibility of success.

Several key issues that underpin justification for CRP WHEAT are not adequately explored. Wheat is produced in middle-income countries, many of which have substantial research capacities. It is also a largely tradable commodity, which means that productivity increases do not necessarily result in lower grain prices for poor consumers in the country that produces it (India being a possible exception).

The effects of climate change on wheat yields are estimated to be astonishingly large, but they are likely overestimated because farmers' adaptation was not considered in the cited studies. It would seem that the degree to which the negative impact of climate change can be mitigated by adaptive management is an important researchable issue, especially for South Asia where wheat is grown in multiple cropping systems like the rice-wheat rotation. In the absence of such an analysis, the CRP focuses research efforts on genetic solutions to climate change with little effort on potential for adaptive management. Likewise, in the face of negative climate impacts both producers and consumers may seek alternatives to wheat, and wheat demand could be met by imports. CRP3.1 has a comparative advantage to improve the understanding of likely climate change impacts on global wheat production, the associated impact on food security, nutrition, and poverty alleviation, and using this knowledge to help catalyse global wheat research to mitigate negative impacts. Such work would contribute to research in CRP7 and must be coordinated with it. Until this research is further along, investment in genetic solutions to climate change are premature unless they can be justified as a priority to address major constraints to wheat production and resilience of *current wheat systems*.

Decreasing yield gains are a major justification for CRP3.1 and it is proposed that underinvestment in wheat research is a cause of the trend. The situation is actually worse than this because in a number of major wheat-producing countries and regions (e.g. India and Mexico) yields have plateaued or have stalled abruptly. Lack of understanding the underpinning causes of these trends greatly reduces capacity for good research prioritization on productivity enhancement components within WHEAT—both in terms of research on genetics and NRM.

There are ten Strategic Initiatives (SI) linked to impact targets that address the SRF's SLOs, particularly on food security. The complement of SIs is generally appropriate, but the SIs are of variable strength and not sufficiently integrated (as discussed below). Furthermore, the SIs are comprehensive rather than strategic, and the strategic coherence at the program level is missing.

The revised proposal needs to elaborate on justification for addressing the CGIAR SLOs through research on wheat productivity and wheat systems. Arguments about why wheat research is important for the CGIAR's mission should focus on the comparative advantage and value added of this program in the context of some strong national programs in both the North and the South. The proposal should present realistic propositions regarding probabilities of success for the different research components, and set clear priorities among the totality of alternative interventions. While the geographic priority on South Asia is appropriate, the emphasis on consumption and trade should be stronger. Following such a long history of wheat research, much more quantitative information should be available for prioritization, for instance among crop diseases.

## **2. Delivery focus and plausibility of impact**

The proposal emphasises delivery and impact pathways, and each SI has detailed estimates of expected impact. The plausibility of impact is not well addressed. There are variable levels of uncertainties related to SI success, which have not been elaborated. Some SIs depend on success of other SIs, and there are complex issues conditioning CRP outcomes and impacts that have not been well considered. Thus, the proposal does not provide a strategy to compile the SI component outputs into more aggregated program deliverables consistent with the CGIAR System-Level Objectives (SLOs). Development and delivery plans and associated schedules are not described, and they are complex, particularly for integrated management systems that target resource-limited farmers.

The proposal lacks a framework for prioritizing wheat research according to likelihood of success and potential impact and outcomes. Research targets are generally too vague, timeframes are unclear and productivity is used as a metric without clear definition of the productivity benchmark or units. For example, in SI2 the targets relate to total farm productivity, which is undefined and there is no timeframe. The quantitative impact estimates given for the SIs (Table 3) are not explained and methods or source of these estimates are lacking, which reduces their credibility. More clarity is

required regarding estimation on productivity increase, number of farmers affected etc. and how sensitive the estimates are to underpinning assumptions.

Gender is systematically included for each SI and there is an appropriate emphasis in “understanding livelihood strategies, the resource constraints encountered by women and men, and the roles of women and men in wheat (seed) production”. For example, consideration of women’s role in SI8 is appropriate. However, further development of gender research would be worthwhile to focus on alleviating constraints faced by women and for improving the well-being of women in wheat farming systems. For instance, what are the gender issues associated with feasibility and adoption of CA practices?

The impact assessment plan to benchmark and establish baselines for performance metrics in targeted regions is commendable. This will be a major task. In the case of benchmarking current use of wheat germplasm, for instance, there is little available data on varietal releases and adoption in most countries. While impact pathways for crop genetic improvement are quite clear, there is no discussion of the more complex impact pathways for systems-level and NRM research. The CRP will be challenged to identify relevant benchmarks for metrics and benchmarking for systems-level performance and NRM impact. Are there lessons learned from CIMMYT’s efforts on CA over the past 15 years? The proposal lists key performance indicators (KPI) for each SI that are not always consistent with the aims of the SI (in SI3, for example, the KPIs focus on N/fertilizer use efficiency but the aim is increased yield through better nutrient and water management). Furthermore purely quantitative publication targets without quality considerations present an incomplete performance metric. While a generic list of performance indicators is also provided (Table 6), these are very “activity oriented” and rather than focused on metrics associated with greatest potential for impact. Greater effort should be given to identify more appropriate metrics that capture quality, relevance, and potential for impact and outcomes.

### **3. Quality of science**

The WHEAT proposal would benefit from more detail about the science behind the SIs. What are the current knowledge frontiers and where new research initiatives can make a difference? What differentiates this CRP from previous research or research done elsewhere? In many cases researchable issues are presented as lists with little or no background justification, and there are few hypotheses, for instance regarding the underpinnings of yield trends (as discussed above).

SI1 on social science and targeting provides “the social science context” for the CRP. Part of the research on wheat markets (price stabilization, reserves, trade, etc), input markets, and risk management seems outside the capability of the proponents, and already a major focus of CRP 2 on policies. SI1 should be refocused on things that CIMMYT and ICARDA do well, and better integrating these activities the other SIs of this CRP. Important issues include institutional and policy constraints in the target regions and clarifying the role of policy/institutional interventions vs. technological ones. Strong partnerships will be needed with CRP 2 on policies and with CRP 7 on climate change issues.

Combining SI2 and SI3 seems justified because management of tillage, water and nitrogen are interlinked and there can be significant trade-offs among management options. In addition, both SI2 and SI3 require crop and ecosystem modelling to strengthen the potential to generate IPGs and for extrapolation of site-specific results to wider inference domains. Justification for SI2 is challenged by the highly site-specific nature of research on conservation agriculture (CA), and it is unclear what is new. Although limitations on adoption of “CA packages” are recognised, why not shift from the “technology package approach” to researching and testing the principles that affect soil erosion, and labour and fuel demands? The plan to test large numbers of genotypes with conservation management practices would benefit from an organizing hypothesis to help guide measurements that deepen understanding of G x M x E interactions. Likewise, the impact of weeds seems to be underplayed

given their importance in general and as a serious obstacle to adoption of CA systems in particular. For crop rotations, a broader range of break crops might be considered, in addition to legumes, and the limitations of crop simulations models to capture tillage, residue and rotation effects should be recognised.

There is little theoretical or actual evidence to suggest promise for success in genetic improvement of N use efficiency. This component of SI3 should be dropped unless stronger scientific justification can be made. N efficiency is improved indirectly, but significantly, through genetic improvement for yielding ability and higher harvest index associated with it. Efforts on innovative crop and soil management that improves congruence between N supply and demand would appear to be a better bet, and WHEAT could collaborate with GRiSP on this research. The “more crop per drop” slogan is narrow and overlooks the importance of improved water capture. The impact of water and N management options are interactive with CA practices and are generally confounded by other environmental higher order interactions. Trade-offs must be considered to quantify the potential for greater production and profit. Much of the water related research seems better done in CRP5, particularly considering complex policy and institutional issues of water. Scientific justification for research on mycorrhizae and root exudates is weak; ambiguous results from a large body of research suggest unlikely progress.

SI4 is a key initiative for the entire program as it assembles new genetic materials and outputs derived from SIs 5, 6 and 7. SI4 is an area where the research partners have a strong track record and a worldwide network exists for developing, testing and distributing wheat germplasm. Investigating the underpinning causes of declining trends of wheat yield growth rates and yield plateaus need to be included for prioritizing research on productivity enhancement. The proposed research needs better strategic focus. For instance, there is still considerable emphasis on breeding to deliver finished products to NARS and a proposal to develop hybrids (SI7) without elaboration of how the CGIAR’s comparative advantage has changed, given past failures with hybrid wheat. Because this varies depending on individual NARS capacity, more detail about country-level focus should be given.

SI5 on wheat diseases is critical to world food security. In SI5 work needs be prioritized according to the prevalence and severity of various wheat diseases and insect pests, which differ in importance by orders of magnitude. Table 5.1 can be built on for this prioritization. The importance of maintenance breeding should be emphasised as that has major consequences for sustaining wheat yield increases. For trait enhancement, transgenic options should be considered in light of their potential and the recent progress with transformation of monocotyledonous crops.

SI6 presentation is vague regarding its strategic approach, researchable issues, quality of science, and pathways to delivery and potential impact. “Adaptation to warmer temperatures” is a meaningless target without specificity and scientific justification. How specific traits might confer heat tolerance should be discussed and justification given for selected genetic targets. What about the potential to adjust genetically the thermal development clock that governs development rate so that higher temperatures would not result in such a short grain-filling period in wheat, which is a major cause of lower yield with high temperature?

There is a strong case for continuous work in lifting wheat yield potential as described in SI7 although the 50% target is completely unrealistic. This is the core business of CIMMYT and the team has expertise in key areas ranging from molecular sciences to crop physiology and breeding. New models of grain yield allow for integration and reflect the current understanding of wheat yield determination. There is a well established network and infrastructure to characterise the elusive GxE component of grain yield, and new technologies seem to be used with clear, breeding-driven focus. Enhancement of photosynthesis through manipulation of Rubisco is a weak component of this SI. Trade-offs and scaling up issues remain fundamental scientific roadblocks to this objective; without addressing them the approach is not likely to succeed and should be dropped.

Seed systems issues are presented comprehensively in SI8. After decades of wheat breeding and success in spreading improved varieties to nearly all major wheat growing areas in the developing world, it seems unlikely that seed supply would remain the major constraint. More careful analysis and diagnosis may reveal the problem is in the *demand* for seed due to information gaps on the part of farmers. Furthermore, the problems related to dependency on public sector for varietal release processes and seed certification are generic to all crops in many developing countries. Therefore the efforts to change seed policies should be common for all CRPs under CRP 3, and be integrated with CRP2 on policies.

SI9 with focus on conserving and exploiting genetic resources and characterization is well matched to WHEAT objectives. The emphasis on open access to the raw materials for crop improvement, i.e. genes and knowledge, is timely and relevant. In addition to links with SI5-7, SI9 proposes valuable linkages with S1 and S10. Efforts to refine phenotyping techniques and inclusion of field phenotyping are commendable for closing the gap between the fast advancing molecular sciences and conventional breeding.

Enhancing the research capability of partner organisations and training a new generation of scientists, technicians and farmers in SI10 is critical to WHEAT objectives and likely to generate long-term impacts. SI10 is appropriately linked to the other SIs.

#### **4. Quality of research and development partners and partnership management**

This CRP builds on current strong partnerships between the lead Centers and NARS, ARIs and the private sector. The CRP guidelines for identifying partners (pgs 30-31) are good. Appropriate partners are essential for success as most SIs depend on partnerships at both early-stage research and at the evaluation and product development phases. Existing networks are of great value to SI10 in training scientists and technicians in developing countries. The Borlaug Institute for South Asia is an exciting new collaborative initiative yet to be established. In general, however, the level of commitment from partner organizations cannot be determined from the proposal. Presumably the CRP will be drawing on outputs from partners produced outside of WHEAT.

Regarding partnership structure, three levels of potential engagement are considered—primary research partners (PRPs) that play a role on both the Management Committee and the Oversight Committee (substantial resource commitments and research contributions to the program); research partners and development partners (awarded performance contracts); and stakeholder partners (participants in priority setting and review but not under performance contract). Most of the partnerships, other than PRPs, will evolve from the strategic initiatives. A long list of partners is given for each SI, but many others are envisioned to evolve as research progresses. Within the SIs, research partners are active in planning, implementation and evaluation of the initiatives as part of formal three-year and annual planning processes. The large number of WHEAT partners (more than 150 organizations worldwide) could lead to trade-offs between management costs and coordination requirements to avoid duplication of activities and preventing important issues falling through the cracks.

The proposal includes an extended description of the potential for public-private partnerships (p.19). While the value of these partnerships is evident, it is not clear how they will be developed and incorporated into management and oversight functions.

#### **5. Appropriateness and efficiency of Program management**

Management and oversight are heavily controlled by the lead Center CIMMYT. Although a program management unit will be formed, its role appears facilitative and no particular staff expertise is identified. The CIMMYT DG, along with the Center's director of research and partnership, are

responsible for leading the program both internally and externally. This is worrisome, given that one of only three risks identified in the proposal is “inept or seriously inefficient CRP management combined with inept or seriously inefficient oversight functions” (p.58). The research agenda is divided to represent the respective institutional strengths and comparative advantages of the two Centers, but ICARDA’s role in the management of the CRP appears to be only somewhat more influential than other PRPs. The danger with this arrangement is that these two Center-driven programs continue to stand as if CGIAR reform never happened. A more proactive management framework is needed to ensure that synergies and cohesion are properly leveraged in this CRP.

Questions about the plausibility of impact have been raised above. The description of the program management does not add confidence. The CRP seems to lack sufficient active management to integrate the component elements of individual SIs to design and develop deliverable products. A well established portfolio management process is lacking. Having a CIMMYT staff member chairing the Management Committee has the risk of preventing a distinct identity for the CRP. Cost savings do not justify lack of a dedicated position. It appears that delivery of specific outputs would be delegated to partners, with only annual planning meetings to exchange knowledge on progress. The fact that individual SIs do not have clear leadership of their own, and thus budgets, reduces confidence that WHEAT can become an integrated and cohesive program. Budgets are presumably controlled by the respective Center leaders. The size of the SI teams and whether the teams will have leaders and access to specific management support (communications, technology, etc.) is not spelled out in the proposal. We conclude that overall management at the CRP-level as well as roles for the Management Committee and SI leadership should be strengthened and clarified in the revised proposal.

## **6. Clear accountability and financial soundness, and efficiency of governance**

CRP3.1 WHEAT and CRP 3.3 MAIZE assume most of CIMMYT’s budget (at 2009 level). The proponents state that implementation of WHEAT (and also CRP3.3 MAIZE) would be put at risk without management costs being covered by the CRP (p.61). This is difficult to understand, however, because these management costs are currently being covered within CIMMYT’s budget. Between the two CIMMYT-led proposals, the CRP-accrued management costs total approximately \$3.4 million a year. It appears that none of the research conducted by the partners prior to this CRP (largely the same as proposed) had any management costs associated with them other than overhead. Thus it seems unreasonable to claim that the new funding scheme will require substantially more or different management than CIMMYT required in 2009 with a similar level and mix of unrestricted and restricted funding from multiple sources.

The gap between what is described as full funding for the proposal from 2011-2013 (\$259.5 million) and even the most positive budget scenario for the same period (\$150.7 million) exceeds \$100 million (Table 7, p.61). Nevertheless, fund raising to bridge this gap is not addressed in management terms. Given the gap between projected and full funding, primary research partners are clearly expected to bring substantial resources to the table. For instance, the inclusion of GDRC of Australia, BBSRC of the UK, and ICAR as potential PRP members assumes relatively large investments from these partners to the CRP. Primary research partners, who are defined by their level of commitment to the project, will play influential roles in priority setting and resource allocation, most directly through membership in the Management Committee. It is emphasised in the proposal (Table 7) that the influence of the CGIAR is proportionate to Window 1-3 funding, which is estimated to be 33% (at most) in the budget scenarios and would plummet if the program were to be fully funded. The proposal would have benefited from a budget illustration showing the program at full funding, indicating either the allocation of additional resources by SI or by region. Although Table 3 includes estimated impacts of full funding, there is no way to gauge whether the addition of resources in one area or another would provide significant leverage in achieving these results. Risks are cited for funding at less than 75% of estimated budget (which is itself less than 60% of full funding), but the strategy and priority for adding funds above the amounts requested, would be useful to see.

The CRP lacks a strong mechanism for independent oversight and evaluation. The composition of the Oversight Committee is largely driven by geographic region. Although nominations will emerge from partners and stakeholders, no criteria for membership are listed, nor the terms of reference. The committee has no chair or other designated leader who can provide a measure of balance to the influence of the lead Center's DG or its staff, or provide an independent and knowledgeable level of scrutiny to the work of the Management Committee.

The Oversight Committee could play a critical role in fulfilling the need for more independence and fewer conflicts of interest if the proposal included:

- A mechanism by which the six regional members can be nominated and appointed in a manner not wholly influenced or controlled by the lead Center
- Term limits or a similar mechanism that provides for turnover among regional representatives and encourages individual performance
- A committee chair that is nominated from among the committee members and serves for a fixed term
- The ability to meet more than once each year, even if one meeting was a video conference
- The authority to commission periodic external evaluations of the CRP, including its management and governance