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ISPC Commentary on Revised CRP 3.5: Grain Legumes

(proposal date 15 August 2012)

In previous commentaries on earlier submissions of CRP 3.5, the ISPC highlighted the need to strengthen justification for a CRP on grain legumes (GLs) and the approach used to prioritize across crop species, regions and constraints in the context of delivering impact. Issues related to narrowing the focus (fewer product lines), clearer articulation and justification of impact pathways and more effective integration with other CRPs were also highlighted. In response to these concerns, CRP 3.5 proponents have fully revised and restructured the proposal attempting to address each of the must-haves identified by the ISPC and FC. Substantial changes found in the new version attest to serious effort and commitment by proponents to address these concerns, and to the value of some key steps taken to revise the document: (i) the assembly of data on grain legumes for analysis of trends and setting of priorities, (ii) an assessment of past research, and (iii) an analysis of the constraints to adoption of improved legume technologies. The ISPC agrees with the proponents that this process has resulted in a substantially improved proposal that addresses the must-haves.

Some of the major improvements found in the current version include:

- New Justification section (pp7-24) establishes a much stronger case for research on GLs.
- A more explicit logical framework with a hierarchical structure is used to identify target regions and GL crop species, based on an analysis of trends in productivity, production and consumption of GLs in each region and constraints to adoption of improved GLs.
- A new strategic component on analyzing demand and setting research priorities (SC 1) has been created to focus on assembling quality data on GL adoption and use and filling key information gaps.
- The earlier three strategic objectives on genetic resources/genomics, crop improvement, and crop management has been merged into a single strategic component (SC2) providing scope for better integration of the crop improvement and NRM work.
- Eight key product lines (PLs) have been developed that serve as a focus of activities and target critical outputs and outcomes. PLs define a global program that encompasses research across GLs, regions and institutes.

While the CRP responses under each of the must-haves are deemed adequate, some further issues such as lack of detail on impact pathways warrant attention. Critically important will be implementation of a rigorous monitoring and evaluation system as the program gets underway to maintain focus and to support future impact assessment. These issues and concerns are discussed in the narratives below under each of the must-haves.

In summary, CRP 3.5 proponents should be congratulated on producing a much improved document, which provides a clearer and more convincing justification, focus, content, and implementation of proposed research. It is evident that significant and substantive revisions were made in response to the ISPC and FC comments. **Recommendation: The ISPC recommends that CRP 3.5 be approved. While there remain several issues requiring careful monitoring and evaluation during implementation**

phase, and a few weaknesses requiring attention in early stages of the program, the program should begin.

ISPC must-have 1. Provide a much stronger description of the potential of research on GLs to decrease poverty and hunger as a basis for prioritizing crop-region-constraint combinations.

Adequately addressed. The overall justification for a CRP on grain legumes (pp7-24) has been expanded and considerably strengthened. In particular, this CRP’s potential for leading to improvements in the diets of the poor has been more clearly and accurately presented, and the critical role GLs can play in terms of enhancing sustainability and resilience in cereal-based and niche production systems is highlighted. The prioritization framework is also much stronger. The text provides greater specificity with regard to assumptions, recent production trends, and the description of the process used in setting research priorities (see below). Importantly, the CRP now includes a new Strategic Component (SC 1) on analyzing demand and setting research priorities which will focus on assembling quality data on GL adoption and use and filling key information gaps.

1a. Objectively demonstrate the relative importance of these crops in the CG portfolio, drawing on information related to GL-specific producers and consumers in the different target regions

A more comprehensive review of GL production and consumption trends – regionally (and sometimes nationally) differentiated – is provided in the Justification section. This includes a new sub-section describing the multiple benefits of GL cultivation, especially related to sales and consumption. In low-income, food deficient countries (LIFDCs), besides having roughly equivalent total production value, the eight targeted GLs also have a larger cultivated area than that of either maize or wheat. Consumption trends – past and future – are also analyzed. While demand trends vary considerably by geographic region and over time, GLs continue to be an important nutritional component in households’ diets in LIFDCs. The narrative more clearly and accurately assesses the CRP’s potential for contributing to improvements in diets of the poor, and emphasizes the critical role GLs can play in terms of enhancing sustainability and resilience in cereal-based and niche production systems.

Table 2 is a helpful presentation. But given the correct emphasis on the importance of legumes for the poor, there is actually very little discussion of which classes of poor households are being targeted – poor subsistence producers, poor non-producing (mostly urban) consumers, or perhaps somewhat poor (potential) producer-sellers. There are several other gaps in characterization and analysis which should be addressed early on, presumably under the new SC 1 (analyzing demand and setting research priorities). Examples include:

- Dietary studies from countries besides India illustrating GL consumption by income class.
- Identification and characterization of GL producers vs sellers. Given that SC4 is devoted to market opportunities, it would be useful to have data on who sells, what proportions of total production enter marketing chains, and prospects for the future?
- Studies assessing current and possible future soybean utilization in SSA. Specifically, does the CRP aim at Nigeria-style home consumption or Zimbabwe-style marketing? (Fig. 4 indicates the former; p.129 the latter.) In either case, what are the implications for the poor, and which poor?
- PL7, which concentrates on innovations for very commercial and more likely large-scale agriculture (including herbicide tolerance and mechanical harvesting), makes no reference to poverty analysis, except to mention “reducing drudgery of women”. Which women, farmers or hired laborers are being targeted, and who, if any, could be adversely affected?

The proponents highlight the value of exploring and leveraging commonalities across the eight GLs with coordinated research efforts, which is indeed a compelling rationale and central objective of the CRP. While such efforts will not attain a singular research focus on a sole legume species, nevertheless, the proponents argue that substantial gains are expected in improving performance of multiple legumes in terms of yield, adoption rates and other advances along the value chain. A more explicit analysis showing examples of these cross-GL commonalities, with a description of where cost savings might occur, should be performed early in the implementation phase and opportunities for leveraging should be continually on the radar screen.

In making the case for these eight GLs, it is important to consider the role that international markets can and do play in supplying the consumption demand for these commodities. Groundnut and soybean may be important sources of vegetable oil and/or protein in much of South Asia, the Middle East, or sub-Saharan Africa, but that does not mean the production needs to take place in the same region where the consumption will occur. Does it make sense to invest in soybean or groundnut improvement in these regions? Or should they instead rely on highly efficient mechanized production from South America, and produce (and perhaps export) other crops? The answer will depend in part on improving the productivity of these GL crops, which is a desired outcome of this CRP. The nutritional value of legumes for the poor does not necessarily imply that these are the crops that the poor should produce.

1b. Undertake a comprehensive assessment of past research efforts and current barriers to adoption of technology, as a basis for identifying key constraints and opportunities that could be influenced by CRP 3.5 research products.

The analysis of constraints, barriers and threats (specific request from the previous review) is presented beginning at the bottom of p12. This ‘pan-grain legume and analysis’ relied on use of national and international partners knowledge of GL farming systems in each relevant LIFDC and GL experts’ judgments to estimate for each crop-region-farming system: (a) yield losses from specific major biotic (disease, insects), abiotic (drought, heat) and other factor (water-logging, soil fertility) constraints addressed in the PLs; (b) yield gains from PLs adopted within a specific production context; and, (c) likely adoption rates. Table 5 is the summary. Table 6 shows the estimated gross value of production increases per Product Line¹.

While a number of non-trivial questions related to the process used to identify constraints and adoption barriers come to mind (no reference to how this was done appears in the document), the proponents should be commended for undertaking this attempt to quantify systematically a large number of different potential payoffs and research opportunities in a relatively short period of time. The quantification which used both qualitative and quantitative analyses is impressive, but it is also important to understand the dangers in a strict and absolute interpretation of these results and their application based on an exercise of this kind.² While this initial effort is worthwhile, the analysis should not at this stage be represented as an objective assessment of the potential underlying payoffs. The need to rely on an ad hoc elicitation process to obtain relevant data illustrates how little literature exists with comprehensive analyses of production constraints for these crops. In this respect, SC 1 is highly pertinent to CRP success.

¹ Information about calculations of expected production increases and many other critical sources of information cited in the text (e.g., yield gains and adoption rate increases per crop/country/farming system; comprehensive reviews of past research by crop; case made for soybeans) is said to be available at the GrainLegumes website (p. 16) but the site does not appear to be functional yet.

² For example, the scores will be highly susceptible to differences among individuals and to the non-random population of people doing the scoring. There are no standard errors or confidence intervals, so we do not know whether differences in expected benefits across potential product lines are statistically meaningful or not.

Oddly, there seems to be little effort to map the results in Table 5 onto the priorities and selected PLs of the CRP. Diseases generally score high across the board, but are not a prominent feature of the PLs - only one of the eight explicitly treat disease tolerance. Weeds score low (except lentil), but there is a PL devoted to weed control. Faba bean gets a “0” for heat, but heat-tolerant faba bean is in PL2. Seed availability appears less a problem for groundnuts than for common beans. Faba beans appear to have fewer marketing problems than soybean (marketing codes are unclear). These are all anomalies that can surely be explained, but there isn’t any effort to do so.

The revised proposal provides a stronger analysis of past research successes in terms of research outputs by legume species and region, and in terms of successes in adoption (pp. 19-26). But there is also explicit recognition that overall, adoption of improved GL varieties has been slow. The text needs to be more consistent in this respect as elsewhere it states that the CG and its partners of GLs “have achieved remarkable impacts in all target regions” (p2). Appendix 8 (past research outputs) and Appendix 9 (analysis of adoption rates)³ provide the basis for these analyses. That being said, there is still relatively little analysis of past *failures* and the reasons for greater or less adoption and impact⁴. The major difference in yield growth of GLs in WCA versus much slower growth in ESA is an example. This type of analysis is critical to have when setting research priorities. Likewise, there would seem to be tremendous opportunity to evaluate the relationship between rate of yield gain for specific GLs and countries (e.g., data from yield trends in Appendix 3) versus adoption of improved cultivars using existing data from Appendix 9. This may provide evidence of where research may have had impact, which would support follow up studies to verify and understand why. Finally, it will be important to buttress the summary analysis of constraints to adoption of improved cultivars and production technologies in GLs (p22) with rigorous studies and meta-analysis to arrive at general conclusions and insights for supporting continuous efforts on prioritization within this CRP.

The bottom line is that there will need to be strong efforts in M&E of this program to maintain appropriate focus and to support future impact assessment.

1c. Establish targets for outcomes in a crop by region matrix to account for actual situations and current status from a regional and crop species perspective, and strengthen capacity to prioritize allocation of resources for GL research within this CRP and within the CGIAR

In the revised version of the CRP, a more explicit logical framework with hierarchical structure is used to identify targeted regions and GL crop species as follows:

Tier 1. Harvested area and level of poverty

Tier 2. End uses, alternative providers, and potential spillover effects

Tier 3. Recent trends in production and the potential of research outcomes to impact hunger and poverty in targeted regions.

The latter part of Tier 3 relies on use of national and international partners knowledge of GL farming systems in each relevant LIDC and GL experts’ judgments to estimate key parameters for each crop-region-farming system as described above. Government programs focused on specific GLs and standing commitments of funding from donors such as the BMGF and USAID are also factored into the equation.

³ A concern with many of the studies found in Appendix 9 is that the authors are often imprecise about the nature of the result, giving the impression of wider uptake than may be the case. In a number of instances the studies are based on small samples or results of project interventions or questionable methodologies, but their presentation gives the impression of national-level uptake. In one case (groundnut in WA) this is acknowledged.

⁴ Note, the constraints on pp19-22 are simply a list of bullet points, with no obvious prioritization. While the constraints to adoption (pp22-23) are surely correct, this is just a brief narrative. This probably indicates that available data on the subject are sparse - more justification for SC 1.

Prioritization benefits from a much stronger analysis of trends in legume production in terms of area and yields, by region (appendix 2 and 3, and associated figures and tables). This is a major improvement because it helps provide context to better understand where to invest and which grain legumes (GLs) to invest in. At the same time, some of the analyses of past trends are weak and rely on forcing linear regression through clearly curvilinear (diminishing) growth rates. A more rigorous statistical analysis of those trends within and across regions for different GLs would likely reveal important lessons and help in understanding constraints and opportunities leading to better prioritization of the research agenda, e.g., what can be learned from the fact that progress in GL yield gains is so much slower for dry bean and groundnut (and legumes in general) in ESA compared to WCA?

The case for GL investment in CWANA remains weak given the data provided in the appendices. It is not clear, for example, why peas which are grown on some 780,000 ha in SSEA where the highest number of poor live (1.3 billion) is not given priority over lentils in CWANA which is grown on some 600,000 ha in a region with only a small fraction of the number of poor. Assuming that CRP 3.5 investments in CWANA flow through ICARDA, investment in this region represents 18% of window 1 and 2 funding, and 11% of total funding requested. Will the proposed work have a comparable contribution to total impact of this CRP? This issue must be monitored as the project is implemented.

Due (presumably) to prior commitments and inter-Center agreements it is not surprising that there are almost no changes in individual Center and specific SC budgets from the previous version of the proposal, despite the presentation of a more systematic prioritization framework. The ISPC would encourage the proponents to build on the analyses presented here and to begin to make necessary changes in emphasis and resource allocation that follows from the results of the prioritization. The statement on page 9 that research priorities may shift as more data become available is reassuring, especially given incomplete data. The proponents should be commended for understanding the importance of this and dedicating SC1 to this task of priority setting and regular review.

ISPC must-have 2. A work plan with more focus and fewer product lines: that this CRP concluded with such a large number of product lines (61 crop/traits for genetic improvement) indicates the difficulty of moving from individual programs to a global program within a CRP

Adequately addressed. There is a greater focus now with a reduced number of strategic components having combined three previous SCs into one, and adding a new one “Analyzing Demand and Setting Priorities” (SC 1), which will embed the need for better data and tools to support a continuing process for improved prioritization for legume research under CRP 3.5. This is very welcome. At the same time, lingering concerns about some of the other SCs remain, along the lines alluded to in previous ISPC commentaries. SC3 focuses on seed systems, and one must question whether its objectives fall within the CRP’s areas of competence. For instance, one objective of SC3 is to “motivate small and medium seed companies to enter legume seed business.” Others are to “enhance decentralized seed systems using appropriate models” and to “engage national and regional policy makers for supportive seed policies.” It is not so clear what the CRP can do about issues like these, so this work seems overly ambitious. Similar issues arise with SC4. And SC5 seems to be a catch-all covering a wide range of communication activities. Some of these (such as scientific publications) would already fall under other activities. The issue of the CGIAR’s comparative advantage in soybean improvement relative to alternative suppliers still merits further examination and continuous monitoring.

New is the set of eight product lines (PLs) that respond to constraints and “demand-driven” opportunities. The PLs define a global program that encompasses research across legumes, regions and institutes. Each PL targets a set of focused countries, where the research activities will be conducted, plus other countries that will benefit from more downstream delivery (spillover) activities. Brief descriptions of each PL are presented in the main body of the proposal. For each PL, a short description of expected intermediate

research outputs is given as well as how these outputs fit into an impact pathway. Appendix 10 provides time frames, milestones, regions for each of the PLs. The PL development is quite useful and helps focus the targeted outputs and outcomes on some major big-ticket but discrete GL related development challenges. Overall, the PL and SC organization is sensible.

With respect to the global and integrated nature of the CRP, further elaboration and examples of cross-cutting collaboration among crops and centers would be useful. There is introductory mention of joining forces etc (p25), but there does not appear to be many instances where the document explicitly says that a certain activity will be done more efficiently by sharing resources. This should be easy to do. In PL 1, for instance, there will be shared phenotyping methods and expanded crop modeling. It is not clear if the network of phenotyping sites (p29) is managed jointly. In PL2 there will be comparative studies of heat tolerance (pp30-31). In PL4 there will be comparative physiology studies for symbiotic nitrogen fixation (p36). The final paragraph of “Innovative Contributions” of SC2 (p54) lists possible cross-species research. Under “Innovations” there seem to be more examples: comparative genomic analysis (p77); crop modeling (p78); cross-legume data bases (p80). There could be more discussion of collaboration in the description of the SCs as well. SC5 seems an opportunity for pooling resources across institutes, but the language is typically vague and unfocused --
“Courses and workshops that cut across crops, regions and partners will be organized collectively focusing on the highest priority needs” (p63).

Finally, a brief comment about the rationale for selecting eight target GLs. While the basis for selecting those GLs seems reasonable, there are important considerations missing from the poverty-area matrix that underpins the selection. It would be useful to see some discussion of innovation potential for the different species. Are they all equally promising in terms of research? Are there particular opportunities for some crops that make them good research targets? Moreover, might there be some advantages in focusing research for some key constraints on a single (model) legume crop, concentrating a larger share of the CRP resources there, with the idea that advances made in one crop might eventually spill out into other crops. There was little discussion of these supply-side issues in the prioritization discussion. This is yet another candidate for a SC 1 topic.

ISPC must-have 3. Given limited success to date in the adoption of improved GL technologies, demonstrate feasible impact pathways, citing relevant references and documentation

Not fully addressed. The revised proposal includes a short section on impact pathways for each PL with specification of intermediate products. Most of these are quite non-specific and end with major responsibility of the NARS, the system CRPs 1.1 and 1.2, or other partners to drive impact at broader scales commensurate with the SLOs. For example, the pursuit of herbicide tolerance (transgenic or otherwise) does not include any discussion of the fact that such technology will almost certainly be proprietary. There is only the briefest of mention of private sector partnerships on p70. Such partnerships would also be vital for any aspirations of providing products such as bio-pesticides. In addition, very few five- and ten-year output targets are provided, typically one or two per each PL.

Assumptions underpinning these pathways and progress in moving research outputs to impact must be rigorously followed under the M & E process. The specification of intermediate outputs will help support such monitoring. The CRP should strengthen the role of the PL Coordinators in relation to ensuring an effective two-way flow of knowledge along the impact pathways. At present the PL Coordinators are responsible for delivery of agreed outputs, with M&E left to the RMC, but in order to drive the culture change required, there needs to be one individual within each PL who has responsibility for impact and ensuring that those in NARS and other bodies involved in delivering impact are kept in the loop early on.

As noted under M&E below, there is a critical need for baseline data, and thus the need to target that as a specific objective of this CRP.

Overall, the section on impact pathways (pp66-69) based on a “demand led” process is helpful, although the effectiveness and strength of the underpinning assumptions will need to be rigorously monitored and evaluated as the CRP is implemented. Additionally, some aspects described therein would benefit from more clarity, e.g.,

- The summary of successful bean seed dissemination in Africa - no attempt has been made to draw lessons, except that many different models are needed.
- Five examples of widespread adoption as examples of the value of “enhanced awareness” – but not clear in showing how enhancing awareness brought about success.
- The discussion of what constitutes an impact pathway (p67), including Figure 5, does not really shed any new light on the topic.
- PABRA bean network discussion (p68) is useful and a big success story - but no indication if the other GL partner centers will use it as a model.

In terms of technology delivery, SC3 is “seed and technology delivery” but it’s all seed. It includes many different types of things, from multinational companies (p57) to farmer groups, with no apparent prioritization or analysis. And SC3 hardly appears in any of the Output Targets in the logframes, Appendix 10. There are occasional, odd references to things such as information delivery, and the use of “cell-phone ready animation videos” for farmers (p54). In short, there is no place in the document that says clearly, “Our experience shows that A, B and C do not work and we will abandon them in favor of X, Y and Z, for which we have evidence of greater potential”.

ISPC must-have 4. This CRP should be closely allied to and integrated into the system CRPs, and particularly CRP 1.1

Adequately addressed. This is discussed on pp82-85. Particular attention has been given to describing the linkages and potential collaboration and coordination with CRP 1.1 Dryland Systems. The new CRP version also makes explicit opportunities to interact with CRP 1.2 research activities, expanding the possibilities for impact of CRP 3.5. While it is not stated specifically in the revised proposal, the CRP 3.5 response to ISPC and FC Must Haves indicates that they will be proposing that each system CRP have a representative on the management committee of CRP 3.5, and vice-versa. Also, interactions with CCAFS are now more visible as related to specific PLs that deal with heat and drought tolerance. At the same time, some of the discussion of some CRP links, e.g., the one on Livestock and Fish, reads as if the linkages are somewhat superficial, rather than showing evidence of what process would be adopted to make sure that that CRP 3.7 would be interested in the outputs from Grain Legumes rather than as currently stated: ‘*Grain Legumes will provide dual-purpose legume varieties for evaluation in crop-livestock systems.*’

Of the must-haves from the FC, all but two were covered in the above responses to ISPC must-haves. Those two are addressed below.

FC must-have 1. Further attention should be given to M&E system

Adequately addressed. Monitoring and evaluation are discussed on pp92-93. The response to this Must Have is adequate but still lacks specificity on what will be measured (i.e., the specific metrics), who will measure them, and how often. Particular concern is lack of attention to getting baseline data in first years of implementation to allow quantitative assessment of adoption of research outputs and as the basis for

later impact assessment. For this reason the ISPC feels the responsibility for M&E and impact needs to reside within the PL teams, in the first instance, rather than at the RMC level.

There are considerable data collection challenges in all of this. The subject is treated in SC1 but statements about collecting “high resolution data” (p48) by themselves are not particularly informative and begs the question of feasibility, cost, and resource implications of this kind of data collection.

FC must-have 2. Need better integration of the crop improvement aspects with resource management

Adequately addressed. This was part of the motivation for integrating the previous SCs on crop improvement and crop/pest management into a single SC (current SC 2). The PLs provide explicit links to potential NRM improvements, but implementation will require collaboration and follow through with systems CRPs 1.1 and 1.2. Key cross CRP linkages are described although follow-through must be rigorously evaluated and monitored both internally by the CRP3.5 leadership, and by the CGIAR M & E process.

The ISPC welcomes text in SC 2 that makes crop specific breeding targets explicit. Also, ISPC congratulates proponents for the CRP efforts towards developing a global breeding platform for grain legumes, making use of integrated relevant pre-breeding information coming from molecular and informatics modern tools, results being shared among partners in the process of addressing specific crop breeding targets.