

Recommendations from the CCEE

The recommendations are welcome, although some are out-with the scope of the CRP to implement.

1. The need for a period of consistency to “raise confidence, morale and trust” within the CRP and with its partners, is accepted but the CRP can do little to change this other than to reduce its scope and ambition in order to concentrate on a smaller number of adequately funded activities as the report comments: “In the absence of long term certainty the scale of the budget allocated to each of the new CRPs should be very conservative, a feature that can only be achieved by restricting/reducing the scope, probably quite significantly.” The focus, and especially the country strategy approach planned for phase 2 will create a longer term framework and achieve some of the proposed better integration between W1/W2 and W3/bilaterally funded work. The lessons in regard to governance and management are well articulated in the report and phase 2 creates the opportunity to redress these deficiencies at all levels.
2. We accept the need to quantify (from a baseline) the health and nutritional benefits and the environmental gains from grain legumes, but recognise that this is a major challenge as legumes are not the dominant feature of diet or farm systems. An effort to calibrate this against crop area or production/consumption would seem a good strategy. However many studies related to health and nutritional benefits and long term studies related to effect of legumes on environmental health are published and available in public domain.
3. The comment that the CRP should undertake a detailed strategic review of the role of transgenics across the range of targets in the mandate crops is sound and should be implemented for the second phase CRPs
4. The discussion of and recommendations concerning governance and management are clear and constructive and we anticipate working towards these recommendations in the remainder of the extension phase and to have these processes fully and transparently implemented in phase 2
5. The report refers to “genome sequencing and the attendant publically available sequence data, and other aspects of molecular breeding” with respect to international public goods, and we fully agree that these data sets should be available as open access data.
6. As regards the potential future of the activities related to this CRP the report makes two general comments “*There is little to justify a full retention of the 8 legume species and 4 [CGIAR] centres in a CRP*” and “*Future organisation of Grain Legumes within CGIAR: it is our opinion that Grain Legumes rightly belongs in the Dryland Cereals and Legumes Agri-food Systems. The legume components should fit in with the major crops that determine production systems.*” We take this to concur with our current plans but to require a reprioritisation of activities with particular regard to measurable outcomes.

Findings of the CCEE

Integration

The failure to achieve centre-centre integration, given that the crops are (for the most part) centre-specific, is a telling comment, supported by the evidence as regards publication. However, there are centre-centre coordinated activities such as the USAID supported postgraduate training scheme and the internally organised competitive and commissioned grants scheme. For the latter 3/15 involved more than one CGIAR centre, and while this is a low proportion it should be recalled that many non CGIAR participants were involved and that this is a higher proportion than is reflected in the analysis of publications. Working together between the centres has also contributed to the success of the renewed funding for both the BMGF funded projects N2Africa and Tropical Legumes. There have also been activities related to water saving traits where phenotyping facilities of ICRISAT were used by ICARDA. There is also an on-going collaboration, with almost no funding, focused on developing crop models for all of the legumes of the CRP. The model works for peanut, chickpea, lentil, soybean

and bean. The cowpea model is under development, and well advanced, for faba bean work is ongoing. We should remind the reviewers that they won't find one publication with the 8 crops together but they would find a series of papers using the same model. To find this level of detail requires a deeper analysis than considering authors, titles and affiliations.

In addition we have to keep in mind that CRP- GL came into effect from Aug 2012 and research activities envisaged in the proposal were implemented from 2013 season only and CCEE evaluation in early 2015.

To some degree at least the measure used to assess this integration has some acquisition bias as scientific publications need to focus on a clear subject; often that will represent a single crop and therefore a single CGIAR Centre. There are other opportunities for joint activity and publication that need to be mobilized if the concept of a CGIAR Research Program, rather than a series of, possibly bundled, centre specific programs is to be achieved.

M&E

The report states *"In the original proposal it is stated that "All partners will conduct their own internal M&E of agreed research activities with the results presented to the RMC." It is not apparent that this took place"*. We accept the description of the failure to implement an M&E system at CRP level and agree with the analysis of the consequences of this for the management of the CRP.

Stability

The review comments that the sustainability of the program is critically dependent on funding stability (rather than amount). This is the major challenge for a grain legumes research program, and there remains a real risk that core expertise and institutional knowledge will be lost as will the ability to take a coordinating role at a global level as a consequence of these instabilities and the internal pressures they generate.

Students

We accept the comments made and hope to convince the centres involved to move towards the creation of a student body that is coordinated and supported as suggested. For this group to have a sense of identity at the CRP level would be important for the coordination of future Grain Legume activities.

Transaction costs

One respondent commented *"Scientists and managers spent too much energy into governance and management of the CRP"* and there was much discussion of the burden of transaction costs. It was also stated in the report that *"annual allocations to centres of W1/W2 funds to support designated CRP activities could be used by centres essentially to fill gaps in their budgets; indeed, the W1/W2 funds were reputedly used to cover salary costs leaving little over for operations. This we believe represents an important but perhaps unintended and maybe unrecognised subsidy to many of the W3/Bilaterally funded projects."* Taken together these two types of observation paint the picture that the management of activities is adequately met by the W3/Bilateral projects and that the W1W2 funds should simply support these. There is logic to this view, but it leaves no place for the CRP, hence its management is not necessary.

Incomplete scope

We note the comment that the Grain Legumes Product Lines, do not cover all the constraints and some of this research that is undertaken under the umbrella of the PLs. This was a major problem for the program at its inception and created disconnect between activities undertaken at the centres and the agenda of the CRP creating difficulties for the implementation of effective management at the CRP level. While the PLs brought a welcome outcome focus, the programmatic structure by

Flagship Projects along the trait delivery pipeline creates a more amenable and responsive management structure.

Agronomy

The review team comments that *'Treating legume crops as if they were horticultural crops we believe will increase farmer returns from investment'*. This comment is made in the context of the comment that Grain Legumes underplays the role of agronomy. Clearly the former comment requires supporting evidence and the latter is a matter of judgement. It seems likely that greater investment in inputs will increase productivity, and that capitalization of legume agriculture would improve productivity (and production), but we question whether this is feasible for the smallholders of LIFD countries that Grain Legumes seeks to serve. Nevertheless, we accept that this may be a feasible route to take in partnership with a willing development agency. As regards agronomy, FPC1.4 deals specifically with this subject while other parts of FP1 deal with related issues (e.g. FPC1.1 Integrated Pest Management) these two alone represent an annual investment of a little over \$5.6M annually, with ca. 70% of the funding coming from W3/bilateral support, broadly in line with the project as a whole.

Transgenics and the commercial sector

The report highlights a lack of interaction with the commercial sector especially in the context of herbicide tolerance, and with the approach to transgenic approaches, notably in regard to this issue and insect resistance. This criticism is accepted and there is a need to review these aspects of the program in the light of experience from the commercial sector, including, but not limited to: (i) an assessment of the availability of herbicides (and herbicide combinations) from the commercial sector for the functions envisaged by Grain Legumes this is independent of their effectiveness; and (ii) the likelihood of resistance emerging either in weeds or pests. There is work being undertaken within the Program on herbicide tolerance in lentil, faba bean and chickpea by ICARDA. There is genetic variability for herbicide tolerance within the cultivated gene pools and mutation breeding seems to be an easy and acceptable route to develop herbicide tolerance varieties in lentil, chickpea and faba bean.

Gradualism

The report comments on "gradualism" and continuity of activities within Grain Legumes with those that were in place before the CRP came into existence. This is couched as a criticism, and this would be valid if it was leading nowhere, and that "that gradualism is more prevalent than innovation" but we are of the opinion that such criticism is valid only if the program is failing to deliver on outputs and outcomes. We accept that these were difficult for the CCEE team to quantify because of deficiencies in baseline data, the absence of a comprehensive M&E System and the short time available for the review. So this criticism is accepted in so far as it suggests that gradualism should not be accepted as inertia, but neither should it be rejected on principle. The re-casting of the work of Grain Legumes within a systems approach and in a broad group of agroecologies allows this issue to be reassessed critically in the phase 2 of CRPs.

The report also comments that Grain Legumes "has enormous potential for real impact ... much of which is being realised".

Gender

The review comments on the integration of gender within the program, and notes that the gender strategy (and its implementation) is younger than the program as a whole. We take heart that "notable gender initiatives were identified during field visits" reflecting the reality of this implementation and the comment that there is a "sound sensitivity base on which to build". This is not perfect but reflects the real efforts of researchers within Grain Legumes to embrace this component of the research portfolio.

Capacity building

This is noted as “rather centre-specific” and much capacity building is undertaken by the centres, nevertheless a considerable effort was made to create a coordinated approach to post graduate training as a collaboration between Grain Legumes as a whole and the USAID funded Feed the Future Labs. This is a limited achievement but is a concerted effort that is explicitly not centre specific.

Partnerships

The report claims that these have suffered “reduction in ... emphasis”. While the finances available for redistribution from W1 and W2 have steadily declined, and in 2015 led to an unfortunate hiatus in the CRP Grants scheme, this was to some extent moderated by the USAID funded collaborations, and in general the W3/Bilateral funding which includes many partners has grown as a proportion of the CRP as a whole. In part this misperception of declining emphasis on partnerships comes from the misconstrued view of the CRP as solely its W1W2 funded activities.

EMBRAPA-Brazil

EMBRAPA-Brazil was brought on in the original proposal in hopes that the CRP could benefit from their experience with a transgenic bean resistant to a local geminivirus. As funds were limiting to facilitate engagement, and no evident benefit accrued to EMBRAPA, this relationship did not develop. Brazil is also home to several *Arachis* species, but these are not available under the international treaty.

GDAR-Turkey

GDAR-Turkey has been engaged in partnership research for herbicide tolerance and trait discovery efforts particularly for *Ascochyta* blight tolerance and cold tolerance in lentil and chickpea besides of course for evaluation of international nurseries of lentil and chickpea. Turkey is also the center of origin for chickpea and lentil and several *Lens* and *Cicer* species are existing in the natural habitat for collection and provide scope for collection in near future.

Re the comment “there is little to justify a full retention of the eight legume species and four CGIAR centres in a CRP”

This comment was engendered by the past experience of the CRP as evaluated by the panel, but it fails to consider the original logic of creating a CRP founded on a common botanical family, with cultivars that are often interplanted with cereals or root crops, with comparable physiological processes and reactions to abiotic stress, and with common problems of seed production and distribution. The shortcomings of the CRP to fulfil its potential do not necessarily negate the original logic nor the potential to realize synergies. Indeed, progress was registered in legume seed systems under and India-NFSM project funded by the Government of India the TL-II project, an effort funded by the Bill and Melinda Gates Foundation which forms part of the W3 portfolio. Moreover, ICARDA is implementing deployment of faba bean and chickpea varieties and technologies in Ethiopia supported by USAID and for grain legumes (faba bean, chickpea and lentil) in West Asia and North Africa through the support of EU-IFAD.

The CRP includes five warm-season legumes (cowpea, pigeonpea, soybean, groundnut, and common bean) and three cool season legumes (faba bean, chickpea, lentil). An 8-crop portfolio provides opportunities to small scale farmers to diversify and intensify their existing cropping systems e.g., by incorporating the relevant legume in a given cereal based farming system. The CRP accepted the responsibility to undertake the improvement of legume crops, their management and market access in the broad range of agro-climatic regions, seasons and environments that are the responsibility of the CGIAR.

ACTIONS

The CCEE Report, its recommendations and conclusions require some actions by Grain Legumes if benefit is to be accrued from this exercise. In this section we deal with these issues, while noting

that several of the conclusions are favourable of our current aims, and structure of activities. In this regard the Grain Legumes Management noted with satisfaction the team's conclusions, in particular that:

- Grain legumes has geographic and disciplinary relevance, addressing the major supply chain issues of variety development seed system and agronomy, with some attention to quality and postharvest marketing systems.
- Work in Grain Legumes has enormous potential for real impact in scientific research, commercial, farming, smallholder and household communities, much of which is being realised.
- The Grain Legumes rightly belongs in the Dryland Cereals and Legumes Agri-food Systems (DCLAS) the II phase CRP.

In the table below we indicate the actions to be taken with regard to the recommendations of the CCEE Report.

CCEE Recommendation	Management Response	Follow Up Action planned			
		Action to be taken	Responsibility	Time line	Remarks if any (including additional budget requirements for implementation of recommendation)
Relevance and Strategy					
<p>Recommendation 1: A common strategy, implemented across centres and species, as to how to address the targets through conventional and modern breeding approaches is needed, but only if adequate funding is assured and secured and if a consistency and unity of purpose can be achieved across a large scale.</p>	<p>Accepted in principle. The need for a period of consistency to “raise confidence, morale and trust” within the CRP and with its partners, is accepted but the CRP can do little to change this other than to reduce its scope and ambition in order to concentrate on a smaller number of adequately funded activities as the report comments: “In the absence of long term certainty the scale of the budget allocated to each of the new CRPs should be very conservative, a feature that can only be achieved by restricting/reducing the scope, most likely quite</p>	<p>Improve communication among researchers working in related areas; e.g. institute PL or FP wise discussion fora such as online web presentations and discussions</p>	RMC	Institute by the end of 2016	The follow-on to this in the second phase CRPs needs to be ensured
<p>Recommendation 2: In the absence of long term certainty the scale of the budget allocated to each of the new CRPs should be very conservative, a feature that can only be achieved by restricting/reducing the scope, most likely quite</p>		<p>Prioritisation of activities undertaken with W1W2 funding, and limit this according to the RMC agreed country strategies</p>	RMC	Institute by the end of 2016	

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significantly. This suggestion may be more easily managed if the focus in the Grain Legumes area moves to one or more smaller CRPs, rather than to a single larger catch-all project.	achieved by restricting/reducing the scope, probably quite significantly.” The focus, and especially the country strategy approach planned for phase 2 will create a longer term framework and achieve some of the proposed better integration between W1/W2 and W3/bilaterally funded work. The lessons in regard to governance and management are well articulated in the report and phase 2 creates the opportunity to redress these deficiencies at all levels.				

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<p>DRecommendation 3: There is a strong need to link more closely with the private sector, especially where there are financial and other comparative advantages to do so.</p>	<p>Response: The report claims that these have suffered “reduction in ... emphasis”. While the finances available for redistribution from W1 and W2 have steadily declined, and in 2015 led to an unfortunate hiatus in the CRP Grants scheme, this was to some extent moderated by the USAID funded collaborations, and in general the W3/Bilateral funding which includes many partners has grown as a proportion of the CRP as a whole. In part this misperception of declining emphasis on partnerships comes from the misconstrued view</p>	<p>Exploration of potential links to industry is needed, as noted especially with respect to herbicide tolerance and the deployment of <i>cry</i> transgenics for insect control. These deliberations need to be reported to the RMC for presentation to the IAC for their recommendations</p>	<p>Relevant PLCs & FPCs.</p>	<p>By end of 2016</p>	<p>In the second phase, private companies especially for herbicides tolerance, Rhizobium production and seed production will be potential partners. Regarding herbicides in particular, ICARDA has developed partnership with BASF for testing their new molecules for herbicide tolerance which were tested in during 2015 and will continue.</p>

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	of the CRP as solely its W1W2 funded activities.				
Governance, management and data curation					
Recommendation 4: The use of the Flagship term as specified by the CO for the crosscutting activities, impact assessment and gender analysis, informatics, and project management we believe is misplaced, and prefer the term Cross Cutting Activity.	Rejected: We accept that nomenclature and changes in nomenclature can cause confusion, nevertheless the extension phase has been described in these terms and has less than 18 months to run, we do not consider this a useful investment of time and effort.	None	N/A	N/A	
Recommendation 5: Governance processes are re-assessed and the structure altered to ensure that the Grain Legumes Director has the authority and budget control to drive	Accepted in full: The discussion of and recommendations concerning governance and management are clear and constructive and we anticipate	The authority of the CRP management, with respect to its responsibilities, needs to be recognised	Lead and participating Centres	As soon as practicable	The fiduciary and legal responsibility of the CRP rests with the Board of the lead centre. To effectively allowing the CRP to operate as an

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the execution of strategy and that the IAC is truly independent and is given the power to influence strategic decisions before they become final. We also recommend that PLCs are provided with the authority to manage the direction and finances of their PL; and that ring-fenced funds are provided for the promotion of collaboration, coordination and staff training.	working towards these recommendations in the remainder of the extension phase and to have these processes fully and transparently implemented in phase 2				'independent entity' that reports to a Steering and Advisory Committee and takes instruction from it is risky. Note that the SAC has no responsibility and cannot be held accountable legally. I am sure a Board would not accept what appears to be a ceding of responsibility to a non-legal entity in the SAC.
Recommendation 6: Increase in the efficiency of use of resources by Grain Legumes must be through an effective Monitoring and Evaluation Facility	Accepted in full Monitoring and Evaluation system for CRP GL is in the process of being adapted from Dryland Systems and as	Adoption of web based M&E system	Project Management Unit	March 2016	

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	substantial parts of Dryland Systems, Dryland Cereals and Grain Legumes will likely be merged in the phase 2I Dryland Cereals and Legume Agri-food Systems CRP (DCLAS), it would seem sensible to adopt this system to facilitate the convergence that will be needed in 2017. Preliminary discussions with ICARDA have taken place.				
Recommendation 7: The reporting activity must be streamlined to a single (brief) format that can be used to report to Grain	Accepted in full	Standardisation of reporting	RMC and Centres	March 2016	The development of a web based reporting system is necessary for this efficiency. However,

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Legumes, Centres and to donors for special project activities.					the format of reports has been dictated in large part by the CO.
Science Quality					
Recommendation 8: The website must be given a complete overhaul and improvement and then regular maintenance must be provided to keep it current.	Accepted in full	Project Management Unit and Research Management Committee	RMC and Centres	March 2016	The PMU can deal only with the structures, the content needs to be directed there by the RMC

<p>Recommendation 9: A cost: benefit analysis and subsequent strategic planning must be undertaken to justify further investment in the genomics and phenotyping facilities at ICRISAT especially as such technologies advance rapidly.</p> <p>Strategic planning and coordination must also be implemented for capitalising the investment in crop simulation modelling.</p> <p>More importance must be placed on the quality of publications and initiatives developed to encourage co-authorship across PLs, institutes within CGIAR and external organisations. A scheme to give special recognition of high quality collaborative papers is recommended, thereby</p>	<p>Accepted in principle:</p> <p>The injection of W3 funding in this area suggests that some evaluation has been made, but we agree that the use of W1W2 funds in this area must be guided by the breeders' objectives.</p> <p>Co-authorship, open data sharing and collaborative action is a secondary consequence of good science and should not require 'incentivisation'.</p>	<p>Report and recommendation on priorities to be produced for consideration by the RMC.</p> <p>RMC members to explore ways to encourage this coordination</p>	<p>Relevant PLCs and FPCs</p> <p>RMC</p>	<p>Before the completion of the 2016 POWB</p> <p>Ongoing</p>	<p>A report to the RMC for submission to the IAC is needed. We consider that the investment in the development of these facilities needs rather to be matched by investment in their use.</p> <p>Coordination is on-going among scientists involved in modelling. Additional coordination is needed with the breeders. There is encouraging debate at the moment, but agree that needs a push</p> <p>We anticipate the appearance of a number of publications that will use a common model framework in different legume species. These are co-authored by crop-specific scientists and will not (superficially)</p>
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encouraging increased quality of the research programmes and widening the penetration of research impacts.					<p>look like “collaborative” papers, but these authors are working closely together in a common model framework. So, we think the criteria used to assess collaborative work across centers or PLs does not pay justice to such collaboration.</p> <p>A report to the RMC for submission to the IAC is needed before the end of the extension phase.</p>

<p>Recommendation 10: It is essential to institute a change from gradualism in research output and outcomes to an expectation of concrete achievements that can be attributed clearly to people, centres and core facilities.</p>	<p>Partially accepted: The report comments on “gradualism” and continuity of activities within Grain Legumes with those that were in place before the CRP came into existence. This is couched as a criticism, and this would be valid if it was leading nowhere, and that “that gradualism is more prevalent than innovation” but we are of the opinion that such criticism is valid only if the program is failing to deliver on outputs and outcomes. We accept that these were difficult for the CCEE team to quantify because of deficiencies in baseline data, the absence of a comprehensive M&E System and the short time available for the review. So this criticism is accepted in so far as it suggests that gradualism should not be accepted as inertia, but neither</p>	<p>Step-changes that are attributable to Grain Legumes need to be identified and documented</p>	<p>RMC</p>	<p>For inclusion in the final report</p>	<p>Indeed, while most or all of the PLs were predicated on previous work, in fact each one was conceptualized as an area of potential growth and impact – not as a totally new area of research per se but as new area of priority for research, building on preliminary work over previous years. Work on herbicide tolerance, machine harvestability and BNF and heat tolerance were either newly integrated or were in the preliminary phase of research and needed to be carried forward in CRP.</p>
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	should it be rejected on principle. The re-casting of the work of Grain Legumes within a systems approach and in a broad group of agro ecologies allows this issue to be reassessed critically in the phase 2 of CRPs				
Effectiveness					

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<p>Recommendation 11: Consideration of grain legumes as if they were vegetable crops in terms of the strategy for intensification of production, both from the management perspective and for seed systems, will be a useful development objective into the future</p>	<p>Accepted for consideration This proposal implies considerable input investment that may not always be affordable even if the outcome would be improved productivity</p>	<p>A potential impact assessment should be proposed within FP6</p>	<p>RMC</p>	<p>by end 2016</p>	<p>The low seed multiplication rate of legumes may cause some difficulty, nonetheless, there are vegetable options of grain legumes that can be explored, e.g., pods and leaves of common bean, faba bean and cowpea; immature grain of several legumes.</p>

Impact					
<p>Recommendation 12: To quantify real impact, the Grain- Legumes must have access to reliable baseline data on production and consumption, and this is missing. There needs to be a concerted effort to undertake baseline studies and to implement a robust M&E activity Staff training must be provided at all levels to embed the philosophy of impact within Grain Legumes,</p>	<p>Accepted in full: We accept the need to quantify (from a baseline) production and consumption including the health and nutritional benefits and the environmental gains from grain legumes, but recognise that this is a major challenge as legumes are not the dominant feature of diet or farm systems. An effort to calibrate this against crop area or production/ consumption would seem a good strategy.</p>	<p>Baseline data especially on demand in relation to productivity is needed</p>	<p>PMC</p>	<p>By mid-2016</p>	<p>This has been initiated within FP6. It would be good to publish conclusions as part of the International Year of Pulses in 2016. Other data on a geographically limited basis are available from TL-II.</p>

Gender					
<p>Recommendation 13: Strategic and measurable gender indicators need to be embedded in research design, for instance, through specific IDOs for each of the flagships projects</p>	<p>Accepted: The review comments on the integration of gender within the program, and notes that the gender strategy (and its implementation) is younger than the program as a whole. We take heart that “notable gender initiatives were identified during field visits” reflecting the reality of this implementation and the comment that there is a “sound sensitivity base on which to build”. This is not perfect but reflects the real efforts of researchers within Grain Legumes to embrace this component of the research portfolio.</p>	<p>These gender indicators need to be more explicit in Annexes 1 and 2 of the Annual Reports</p>	<p>RMC</p>	<p>For the 2015 Annual Report</p>	

Capacity building					
<p>Recommendation 14: Training activities should follow a coordinated programme managed by Grain Legumes.</p>	<p>Partially accepted: This is noted as “rather centre-specific” and much capacity building is undertaken by the centres, nevertheless a considerable effort was made to create a coordinated approach to post graduate training as a collaboration between Grain Legumes as a whole and the USAID funded Feed the Future Labs. This is a limited achievement but is a concerted effort that is explicitly not centre specific.</p>	<p>The capacity building plans for 2016 should be explicit in the POWB and agreed by the RMC in so far as this involves W1W2 funding</p>	<p>RMC</p>	<p>for the 2016 POWB</p>	<p>It would be helpful if the W1W2 component of capacity building was under the direction of the RMC rather than at Centre level. Training at the technician level could well include a greater cross-center, cross-crop component.</p>

Partnerships					
<p>Recommendation 15: The Grain Legumes holds a meeting with a range of external partners to develop a more coherent strategic programme designed to eliminate overlap and promote synergy between national and international programmes with common aims. Grain Legumes searches energetically for partnerships with private industry</p>	<p>See response to recommendation 3</p>				
<p>Recommendation 16: The legume components should fit in with the major crops that determine production systems.</p>	<p>Accepted in full</p>	<p>The role of legumes in Agrifood systems should be made explicit</p>	<p>RMC</p>	<p>for the CRP phase 2 portfolio</p>	

Recommendations not included in the matrix

Science Quality: More importance must be placed on the quality of publications and initiatives developed to encourage co-authorship across PLs, institutes within CGIAR and external organisations. A scheme to give special recognition of high quality collaborative papers is recommended, thereby encouraging increased quality of the research programmes and widening the penetration of research impacts.

Comment: We note that the proposed financial plan for 2016 from the Consortium Office proposes to tie funding to this measure - in itself this is an incentive'.

Effectiveness:

- A more holistic approach is required that coordinates an understanding of the disease pathology and epidemiology, and of new chemicals before they become commercially available, together with agronomic practice such that recommendations can be made for growers.
 - In the past research teams enjoyed the support of full time pathologists. Given the breeding focus of most programs, and the accumulated knowledge on most major diseases, pathology staffing has been reduced, making investment in epidemiology unlikely. On the other hand, interaction with private companies can readily respond to the suggestion of gaining an understanding of new chemicals, since these same companies are often anxious to have support in registering their products for new uses.
- Work should be continued to establish whether agronomic factors hold true in different environments and to assess GxE effects within breeding programmes. Such rigorous trial practices should be used to inform the evaluation of breeding lines and to provide phenotype data to associate with markers for traits such as heat, drought and herbicide tolerance.
 - GxExM interactions are being tackled by the cross-crop initiative on crop modelling and this work is also proposed to be re-emphasized part of DCLAS.
 - We are totally in agreement. This dimension of the work of the centers was weakened when most systems of international trials were reduced or abandoned in the 90's. It needs to be revived and rationalized using modern statistical analysis methods and vastly improved databases for climate and some soil traits. It is an explicit part of the Phase 2 proposal.
 - Some centers (like ICARDA) have International nursery program sharing with NRES partners of about 32 countries. This provides unique opportunity of defining Mega and specific environment characterization besides disease and race characterization. With the implantation of BMS, this will further get boost in the extension phase.
- The absence of socio-economists from research teams is evident in the general lack of an end-user focus. People with these skills must be part of the team from project inception so that appropriate frameworks are incorporated for measuring and influencing sociological and economic changes brought about by Grain Legumes research.
 - Totally in agreement. This has been a lack which was implicitly brought to our attention by the ISPC.

Impact: Responsibilities of the different actors in the whole value chain must be considered and identified when developing impact targets, and the pathway leading to them, for individual projects.

Sustainability: A consistency and unity of purpose is required to make a programme of any size operational and particularly if a large, integrated programme is envisaged. Security of adequate funding must be assured at whatever scale of programme is decided in the future.

As the Grain Legumes moves into the future, and if sustainable funding cannot be assured, decisions must be made concerning a reduction in activities, keeping some caretaker breeding maintenance, and focus (as has TL III) on fewer species and a reduced geographic focus.

This could well form part of the current process to reformulate the configuration of the Phase 2 CRPs.

Capacity building: Cohort building activities to include all staff: We agree.

While long and short term training programmes for NARS partners are in place in each center these need to be integrated, managed and highlighted at the CRP level.

APPENDIX 1: EVALUATION TEAM

Professor Jim Dunwell (<https://www.reading.ac.uk/apd/staff/j-m-dunwell.aspx>).

Professor David Midmore (<http://www.reading.ac.uk/apd/staff/d-j-midmore.aspx>).

Dr. Carol Wagstaff (<http://www.reading.ac.uk/food/about/staff/c-wagstaff.aspx>).

Dr Shirley Smith (<http://www.reading.ac.uk/apd/research/livelihoods/LRGStudentProfiles/apd-reslrg-smith.aspx>).