

# Enhancing *ex post* impact assessment of agricultural research: the CGIAR experience

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Impact assessment of individual research activities have existed in the 15 international research centres of the Consultative Group on International Agricultural Research (CGIAR) for many years. In 1995, however, the members of the CGIAR decided to give much stronger emphasis to impact assessment at the system level and established what is now called the Standing Panel on Impact Assessment (SPIA). This paper reviews the panel's efforts to bring *ex post* impact assessment more to the forefront of the CGIAR, and the lessons learned from this effort are discussed together with some of the remaining methodological issues that need to be addressed. The paper ends with a discussion of the desirable direction for impact assessment in the CGIAR, including broadening the work in terms of purpose and goals, the types of research assessed and the types of impact indicators used.

**A**S WITH OTHER PUBLIC sector organizations and institutions, agricultural research organizations face increasing pressure to show that their resources are being used effectively to achieve their mission-level goals. This broader global trend for increasing accountability has created a growing demand for impact evaluations — evidence that quantifies as rigorously as possible the benefits that flow from investments in various program activities.

A report by the Centre for Global Development, entitled 'When will we ever learn? Improving lives through impact evaluation', argues that despite billions of dollars being spent on programs to improve health, education and other social sector

outcomes in the developing world, rigorous impact evaluations of social development programs are relatively rare (Svedoff *et al*, 2006). The absence of evidence as to which programs actually make a difference, and how big that difference is, means that vital knowledge is not available for policy-making and program design. If this void in information results in fewer resources being invested, then it denies poor people the crucial support needed to improve their lives. The report highlights the need for urgent action in systematically building a strong body of evidence about what works in social development through rigorous impact evaluations. The report recommends dedicating resources to impact evaluation, ensuring collaboration among policy-makers, project managers and impact experts, and improving standards for evidence. It recognizes that better coordination of impact evaluations across countries and institutions would make it possible to cluster studies around common thematic areas and improve the ability to generalize findings. The creation of the Network of Networks on Impact Evaluation (NONIE) is partly in response to this emerging challenge. The report also recommends that this effort should be led by some entity, for example, a committee, a council, or some standards-based network, as a focal point for leading such an initiative.

The Consultative Group on International Agricultural Research (CGIAR) embarked on such a strategy of focus and coordination in 1996 when it established

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The authors wish to put on record the many contributions of current and past SPIA members and other individuals in the conceptualization and evolution of ideas that have guided SPIA and the IAEG throughout their brief history in particular, Mywish Maredia, Flavio Avila, Hermann Waibel, Ruben Echeverria, David Raitzer and James Stevenson, and particular thanks to the 15 centre IA focal points.

the independent Impact Assessment and Evaluation Group, later renamed the Standing Panel on Impact Assessment (SPIA), with a mission to provide CGIAR members with credible information about the impact of past CGIAR research centre investments and to enhance and systematize more the quality of ongoing CGIAR centre *ex post* impact assessment efforts. It was felt that rigorous impact assessments (IAs) were essential in providing convincing evidence as to whether and to what extent agricultural research is an effective instrument for achieving poverty alleviation and other development goals.

This paper, written some 10 years after SPIA was constituted, provides a self-examination of how this model of having an independent body charged with enhancing the *ex post* IA portfolio and improving standards has worked. After providing some background on *ex post* impact assessment and outlining the challenge faced by the CGIAR, four basic questions are addressed:

1. What have been the results of SPIA's work on IA?
2. What lessons have been learned with regard to the best methodologies and approaches to use in generating credible and relevant IA results?
3. Has the SPIA model been an effective instrument in helping the CGIAR generate a larger and more credible body of evidence to satisfy the accountability imperative of investors? and
4. What insights have been gained and what avenues of new activity should SPIA pursue to ensure greater success in future?

**Impact assessment: context and initial challenges for the CGIAR**

The mandate of the SPIA is specifically to concentrate on *ex post* IA.<sup>1</sup> As used by the Development

Assistance Community of the Organization for Economic Cooperation and Development (OECD), impact relates to 'positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended' (DAC, 2002). NONIE has adopted this definition for its own use (World Bank, 2007) while other agencies have adopted more general and less comprehensive definitions.<sup>2</sup>

*Ex post IA in the context of a broader array of evaluation tools*

The various types of assessment and evaluation tools available have a range of functions and should be used at different times by diverse actors.<sup>3</sup> *Ex post* IA is only one component of a comprehensive evaluation package, which also includes *ex ante* IA, impact pathway analysis, program peer reviews, performance monitoring and evaluation and process evaluations, among others. In the case of agricultural research, process evaluations can be further composed of several forms of early-acceptance and adoption studies of resulting technology options, which seek to provide feedback to the research process as it proceeds.

This paper focuses almost exclusively on *ex post* IA, as opposed to other forms of evaluation. The other forms of research evaluation are the primary responsibility of the CGIAR Science Council's other standing panels, the CGIAR centres themselves and the CGIAR Secretariat, for example, related to *ex ante* IA, priority assessment, performance reviews and monitoring and evaluation. IA is, therefore, not synonymous with research evaluation. The latter is broader and encompasses far more. To avoid confusion and to clarify functions and responsibilities, SPIA emphasizes the distinct and separate components of research evaluation within the CGIAR as depicted in Figure 1. These are:

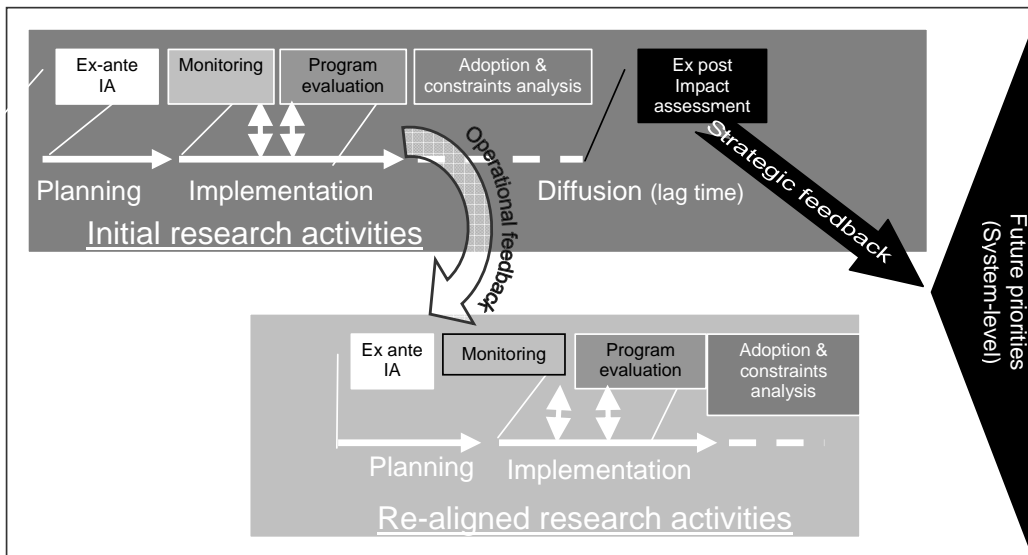


Figure 1. Evaluation process and timeline for research

- Ex ante IA focuses on assessment of likely future impacts of alternative research portfolios as an input into priority-setting and generating hypotheses about projected impacts for use in monitoring and evaluation and subsequent verification in *ex post* IA.
- *Monitoring* involves reporting on outputs and achievements in the context of plans and expectations, for example, centres' medium-term plans which include logframes and the annual performance measurement system.
- *Program/project evaluation* focuses on peer evaluation of research quality (design, planning and process) and achievements of project milestones or deliverable scientific outputs, expected outcomes and objectives (e.g. centre-commissioned external reviews, external program and management reviews, and investor project reviews).
- *Adoption/constraints analysis* focuses on uptake and utilization of research results by partners and factors affecting this, for example, early adoption/acceptability studies,<sup>4</sup> 'follow the technology' analysis, and impact monitoring;<sup>5</sup> the aim here is to understand what technology options are working and why, as a guide to future priorities and strategies and to identify constraints to increased adoption.
- Ex post IA focuses on changes in selected *indicators* of achievement of mission-level goals (e.g. income changes or sustainable poverty alleviation) that can be *attributed* to specific R&D interventions compared to what the indicators would have been in the absence of the interventions, that is, the *counterfactual* situation or 'control'; also defined as 'evaluating the scope and sustainability of overall benefits of larger programs ... often measured in terms of highly aggregated figures which can then be used for setting new priorities' (Balzer and Nagel, 2001).

*Ex post* IA primarily emphasizes the accountability and strategic validation functions. Indeed, learning and operational feedback are most effectively generated and utilized via other forms of research evaluation, for example, project evaluation and adoption constraints analysis. Often *ex post* IA can be effectively conducted only many years after the completion of the research being assessed, which makes it less appropriate for 'real-time' feedback and mid-course corrections in research strategies and processes. Hence initiatives such as those associated with 'institutional learning and change' (see Watts *et al.*, 2008) should be viewed as complements rather than substitutes for *ex post* IA.

*Ex post* IAs in the CGIAR are conducted by IA specialists at the research centres, often in collaboration with national and international experts from partner institutions. Each centre has an IA focal point staff member, often positioned within the Office of Director-General or within the

economics/social science unit. IA is supported at the system level by the Science Council's SPIA, which also commissions system-wide *ex post* IAs.

### *The initial challenges for the CGIAR*

Despite the many *ex post* IA studies carried out in the CGIAR to date (see Pingali, 2001, for an earlier summary), documenting in a convincing manner the effects of agricultural research is neither simple nor straightforward. The CGIAR mission is to:

achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment.

These system-level goals of sustainable food security and poverty alleviation can be pursued by many instruments other than agricultural research and related activities, and *ex post* IA is an essential element in satisfying investors that the latter are cost-effective ones. There usually are significant time-lags between research outputs and impact, with potential for dilution and leakage at each step along an impact pathway due to lack of favourable policy environments and ancillary investments by development agencies. In addition, there are multiple impact pathways through which agricultural research can produce impacts in terms of system goals. Research outputs and outcomes may have a conceptual link to a number of possible intermediate impact indicators relevant to the target beneficiaries, that is, the poor. These indicators include crop/livestock yields, farm income, food prices, rural wage rates, food and nutrient consumption or household vulnerability to shocks. However, tracing these links in impact pathway analysis in a credible manner is a serious challenge. When *ex post* IAs are carried out in environments where there is a scarcity of primary and secondary baseline data, these challenges are compounded further, as it is difficult to establish appropriate counterfactuals to enable empirical assessment of the contribution of research. Some of these issues have been addressed by Bamberger (2006).

In spite of this formidable challenge, the CGIAR system has a responsibility to make its activities accountable to investors in meeting their own development objectives, as most of the funding for the CGIAR derives from public sources. *Ex post* IA has a particular role to play in demonstrating the cost-effectiveness of agricultural research in comparison with alternative investments. It serves a primary function in providing empirical evidence of the effectiveness of past investment for generating outcomes of interest and validating the relevance and efficiency of overall strategies pursued. The importance of this rationale was recently verified in a survey of investors in the CGIAR (Raitzer and Winkel, 2005). An arguably second key function is

drawing generalized conclusions about what does and does not work, at the sector or program level, based on a strong cumulative body of evidence. These are the two most commonly cited uses of ex post IA of agricultural research (Alston *et al*, 1996; Özgediz, 1995; Maredia *et al*, 2000).

In the process of carrying out its mandate, SPIA and the CGIAR initially faced a number of challenges and problems. One was the highly variable quality of centre impact evaluations. While some centres, particularly the older ones with more success and more experience in documenting success, were capable of producing highly credible ex post IAs, others were producing lower-quality, less credible, even anecdotal reports as found by Cooksy (1997a,b). It was deemed important to raise the standard for this latter group.

A second challenge related to expanding the coverage of IA beyond crop germplasm improvement, where the vast majority of IA effort had thus far been made. Yet this was only one of the major areas of research investment by the CGIAR; others included natural resource management, policy, training and biodiversity.

The third challenge was that, at a time when development assistance was shifting away from agricultural R&D, knowledge about rates of return on overall investment in agricultural research, and the CGIAR in particular, was deemed critical in sustaining that investment. However, credible, documented evidence was lacking.

Finally, there was a need to develop quality checks on the IA work done in the system and to systematize and better expose the IA work that had been done, and in a form relevant to the main audience — the investors in the CGIAR. In the next sections we look at the SPIA and centre responses to these challenges more closely.

### Impact assessment achievements in the CGIAR

It is widely perceived that the CGIAR has had, over its lifetime, a significant and sustainable impact on poor people by helping to develop technology options and agricultural management tools that have permitted increased food security and dramatic lowering of the cost of producing the major food staple crops of the world. This, in turn, has benefited both poor producers and consumers. CGIAR system-level assessments by Anderson (1985), Nelson and Maredia (2000), Evenson and Gollin (2003), Maredia and Raitzer (2006), Raitzer and Kelley (2008) and others that have validated these perceptions would not have been possible without the basic analyses done by CGIAR centres themselves.

Indeed, CGIAR economists working at individual research centres made significant contributions in advancing the theory and methods of IA and documenting centre impact, as highlighted by Pingali

(2001) in his synthesis of IA research in the CGIAR from 1977 to 1999. His study charts the progression from assessments of the impact of adoption of crop genetic improvements and crop management technologies from research in the 1970s and 1980s, to formal rate of return and benefit distribution studies in the 1980s, research on spillovers and intersectoral impacts in the 1980s and 1990s, and gender, and environmental IA research as the 1990s progressed into the 21st century. Most of the cited studies were done on a centre-specific basis. Morris *et al* (2003) provide a critical review of past and current practice in assessing the impact of international agricultural research, particularly within the context of the CGIAR.

While the scope of IA research at the centres indeed expanded over time, major areas of research remained under-assessed with respect to impacts, for example, natural resource management, social science and policy, and biodiversity research. Partly this was due to methodological challenges and constraints. Furthermore, there still remained a critical need to assess system-level achievements in terms of poverty alleviation impacts. SPIA initially focused its efforts on synthesizing the available evidence of impact at the system level and on filling gaps in IA coverage. Accordingly, SPIA commissioned a range of studies to:

- Synthesize and review centre IA studies (Cooksy, 1997a,b);
- Investigate factors affecting the adoption of CGIAR innovations through case studies at eight centres (Seechrest *et al*, 1999);
- Undertake a comprehensive analysis of the impacts of crop genetic improvement research to date (Evenson and Rosegrant, 2003 [see Box 1]);
- Support a literature review and seven case studies of the poverty impacts of CGIAR research (Kerr and Kolavalli, 1999; Adato and Meinzen-Dick, 2007);
- Synthesize the evidence about the environmental impacts of CGIAR technologies (Nelson and Maredia, 2000; Maredia and Pingali, 2001);
- Evaluate the system's integrated pest management research (Waibel, 2000);
- Review the milestones in the CGIAR IA over time (Pingali, 2001);
- Conduct a cumulative benefit–cost meta-analysis of the entire CGIAR investment (Raitzer, 2003 [see Box 1]) and one for CGIAR and partners' research investments in sub-Saharan Africa (Maredia and Raitzer, 2006).

A SPIA-commissioned study to better understand donor views about the major uses of and demand for ex post IA work, carried out by the CGIAR (Raitzer and Winkel, 2005), addressed three major questions:

1. To what degree does ex post IA actually inform perceptions of past and future research impacts?

### Box 1. Documenting impact in the CGIAR: two key initiatives

Two examples serve to illustrate the documentation of large-scale impacts of the CGIAR in the recent past.

Working with SPIA and eight commodity improvement CGIAR centres to comprehensively document the poverty-related impacts of arguably the most successful area of CGIAR research, that is, crop germplasm improvement, Evenson and Rosegrant (2003) developed counterfactual scenarios to show what would have happened to world food production and prices without CGIAR centre contributions. They estimated that:

- World food production would have been 4–5% lower and developing countries would have produced 7–8% less food — exacerbating hunger, malnutrition, and poverty;
- World food and feed grain prices would have been 18–21% higher — adversely affecting poor consumers;
- Area planted to crops would have been significantly higher for all food crops, as cultivated area in developing countries would have expanded by 11–13 million hectares (and 5–6 million in industrialized countries), at the expense of primary forests and fragile lands with high biodiversity;
- In developing countries, *per capita* food consumption would have declined by 5% on average, and up to 7% in the poorest regions — causing food, income, and nutrition insecurity; and
- Some 13–15 million more children would have been malnourished, predominantly in South Asia, where incidence of hunger is highest.

While none of these results were unexpected or surprising, it was the first attempt made to systematically quantify in a rigorous fashion the range of benefits derived from crop improvement investments in the CGIAR.

A second example concerns a SPIA-commissioned benefit–cost meta-analysis by Raitzer (2003) — a first attempt to scale up quantified economic impacts to the system level and thereby address the issue of the overall efficacy of agricultural research as development assistance. This study examined whether the entire investment in the CGIAR over time could be justified on the basis of the benefits derived from its proven (and agreed-upon) major successes. Prior impact analyses had been unable to address this issue directly, because such had focused on the costs and benefits only of research successes, while ignoring the costs of associated efforts that have not resulted in quantifiable impacts. In looking across all activities of the CGIAR since its inception, Raitzer was able to report an overall benefit–cost ratio of 9.0 for the US\$7.12 billion (1990 US dollars) invested, when conservative assumptions were used. This ratio rose to 17.3 when extrapolated through 2011 under the assumption that research benefits would continue to be realized at present rates. Thus, for every dollar invested in the CGIAR, at least US\$9 worth of additional value was produced in the developing world, catalysing substantial additional ‘multiplier effects’ for poor producers and consumers in the process. This study was flagged by a number of donors to the system as the type of assessment required in order to justify continued investments by them into the CGIAR.

2. What influence does *ex post* IA have in donor investment decisions? and
3. What kinds of *ex post* IA results and which impact indicators do investors find most useful?

This study was deemed critical in understanding demand for impact information in the context of what is possible, given existing resources and methods of conducting IA. As CGIAR investors have very limited time to read professional peer-reviewed journals or documents reporting on impact, brief, easy-to-read summaries of IAs in the form of ‘impact briefs’ were called for — a clear message emerging from the survey of users. SPIA produces short, two- to four-page synopses of key IA findings for all its completed studies. It also established a CGIAR Impact website <[www.impacts.cgiar.org](http://www.impacts.cgiar.org)> as a means to disseminate IA studies, promote ‘best practices’ and foster dialogue among IA practitioners, both within the CGIAR and throughout the larger research, development and evaluation communities. Ongoing dialogue between decision-makers and impact assessors is of course always needed to ensure impact-related information is relevant and meets the evolving needs of investors.

With respect to filling important gaps in impact assessment coverage for some research areas, SPIA has given increased attention recently to developing and refining IA methods for harder-to-measure research themes. Some of these initiatives are ongoing

but some of the recently completed ones include an assessment of the impacts of selected natural resources management research activities within the CGIAR (Science Council, 2006a; Waibel and Zilberman, 2007), a system-level strategic evaluation of investment in training in the CGIAR (Science Council, 2006b) and a scoping study on documented impacts from CGIAR policy-oriented research (Science Council, 2006c; Raitzer and Ryan, 2008). Yet many gaps remain and these will be discussed in the subsequent section.

### Current and emerging impact assessment needs of the system

The need which inspired the creation of a centralized impact assessment group (SPIA) more than 10 years ago remains today. The IA priorities, however, have evolved as numerous centre- and system-level IAs have been completed and new challenges have emerged. These are particularly urgent in light of the broad cuts that have taken place in funding for international agricultural research, despite the recent rapid rise in many food prices (Bradsher and Martin, 2008). These new challenges fall into five major areas related to:

1. Primary objectives of *ex post* IA;
2. Developing and applying new IA methods,

- particularly in more difficult areas such as natural resources management, policy and biodiversity research and training/capacity building;
3. Broadening the scope of IA beyond economic measures and advancing further down the impact pathway toward indicators that reflect more closely impacts in terms of CGIAR goals of sustainable poverty alleviation, enhanced food and nutrition security, and enhanced natural resources;
  4. Making *ex post* IA more utilization-focused (providing strategic feedback); and
  5. Helping centres enhance the coverage and rigour (and thus credibility) of their impact assessment efforts.

#### *The learning function of ex post IA*

With many *ex post* IA studies of CGIAR research investment completed, and with the status of CGIAR funding more secure than it was in the mid-1990s,<sup>6</sup> the original accountability role of impact assessment has been de-emphasized by some, who call for broadening the purpose for *ex post* IA to emphasize it as a tool for ‘learning’ at the operational level to make the research process more effective (Chambers, 2003; Horton and Mackay, 2003). Increasingly, the purpose of *ex post* IA is often confused with the purposes for which other forms of evaluation are undertaken. Indeed, the tendency is to replace the accountability function with one focused more on ‘failures’, feedback, and self-critical learning in order to improve the focus, conduct and cost-effectiveness of future research efforts (Matlon, 2003).

There are conceptual issues in the use of *ex post* IA for ‘learning’ that require further thought and clarification. It is recognized, for example, that different types of evaluation are more relevant to operational decision making than to strategic decision-making within a given organization (MacKay and Horton, 2003). In this context, the types of decisions that *ex post* IA can inform are largely determined by the fact that pathways from CGIAR research-derived innovations to development goals are complex, involve many complementary inputs by other development actors, and are characterized by long and uncertain lag times (Ekboir, 2003).

Many years may pass between the initiation of a research project, the production of a research-derived innovation and its ultimate diffusion into farmers’ fields and beyond. Hence, the research agenda may have evolved considerably in that time. This creates significant discontinuities between the current agenda and the earlier research endeavours subject to *ex post* IA, which strongly affects the relevance of any ‘lessons’, particularly in terms of mid-course corrections and forward planning. How *ex post* IA can most effectively contribute to ‘learning’ in this context remains uncertain. In fact, the more impact analysis involves assessment of the contribution to development goals, the less likely is

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## **Many years may pass between the initiation of a research project, the production of a research-derived innovation and its ultimate diffusion into farmers’ fields and beyond**

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it that it will have real-time relevance to current research settings because complementary factors become confounding, and long lead and lag times in a dynamic environment make extrapolation of lessons difficult (Raitzer, 2003). As a summative form of evaluation, *ex post* IA appears to be more appropriate to strategic, longer-term information needs, but it still remains a significant challenge to identify the means by which feedback most effectively can be provided to those strategic decision processes for which insights regarding impact are most appropriate.<sup>7</sup> To complement this strategic feedback, a broader array of evaluation approaches is needed. Most of these fall outside of the purview of *ex post* IA.

SPIA and the CGIAR members (Raitzer and Kelley, 2008) have emphasized the critical importance of the accountability function, which they believe should be preserved as a primary objective for SPIA. At the same time opportunities for adding value through learning from these studies are being considered (see below). The challenge is to preserve accountability while enhancing feedback and operational learning to improve the design and conduct of future research efforts.

#### *Developing and applying new IA methods*

*Ex post* IA coverage is still primarily restricted to select classes of research, and particularly that related to crop germplasm improvement and production losses avoided in the case of agriculture. For example, the meta-analysis of large-scale CGIAR economic *ex post* IAs found that more than 90% of the benefits in the moderately inclusive scenario were generated by just three research areas — cassava mealybug biocontrol and breeding of modern varieties of spring bread wheat and rice (Raitzer and Kelley, 2008). Thus, more *ex post* IA attention is still required for those areas of research for which there is less documented evidence of impact. Despite SPIA and centres’ recent activity in some of the neglected areas of natural resource management research, policy-oriented research, and training (Waibel and Zilberman, 2007; Raitzer and Ryan, 2008; Science Council, 2006c), more needs to be done in documenting adoption (with careful attention to both costs and nature of adoption, e.g. in the

case of policy research), influence and impact (with careful attention to establishing the appropriate counterfactual and addressing attribution issues).<sup>8</sup> This is required to justify, at least in economic terms, previous investments in those areas.

Given that lack of well-established methodologies are major constraints for these 'harder to document' areas (Morris *et al.*, 2003; Kelley and Gregersen, 2005; Science Council, 2006b,c), a dedicated effort is required. SPIA intends to work with CGIAR centre IA focal points and a range of outside IA experts in the future to develop appropriate methods for *ex post* IA for these research areas. The current policy research IA initiative is such an example, where experts in the fields of agricultural economics, political science, education and sociology will mentor CGIAR scientists within the context of specific centre case studies of policy-oriented research to document adoption/influence and impact.

It should be emphasized here that even in areas where there has been a strong history of IA, such as crop germplasm improvement, conceptual issues and opportunities for improving methods still remain, for example, related to establishing causality, attributing credit, and developing credible counterfactuals. Many of the methodological problems in the case of counterfactual analysis can be traced back directly to lack of advance preparation in research project planning stages, such as insufficient attention paid to the establishment of baseline data sets that allow before-and-after and with-and-without experimental approaches.

#### *Moving beyond economic measures to indicators more representative of CGIAR goals*

A major criticism of the *ex post* IA work within the CGIAR to date has been its characteristically strong economic/monetary focus with over-reliance on internal rates of return and benefit-to-cost ratios as the standard measures used (Watson, 2003; Adato and Meinzen-Dick, 2007) This criticism needs to be put in the context of four important points, namely, that:

1. The field and methods of impact assessment have mainly been developed by economists using changes in economic surplus as the main tool;
2. Conducting rigorous and credible *ex post* IA using non-economic indicators is not a trivial exercise and carries significant challenges related to concepts and methods;
3. Data frequently are not easily or cost-effectively generated even for economic indicators, much less some of the harder-to-get-at social or environmental measures; and
4. Assessing impacts on the poor can be done only after estimating the size and distribution of the economic benefits and costs generated by the innovations, and these dimensions are complements to, not substitutes for, non-monetary measures of impact.

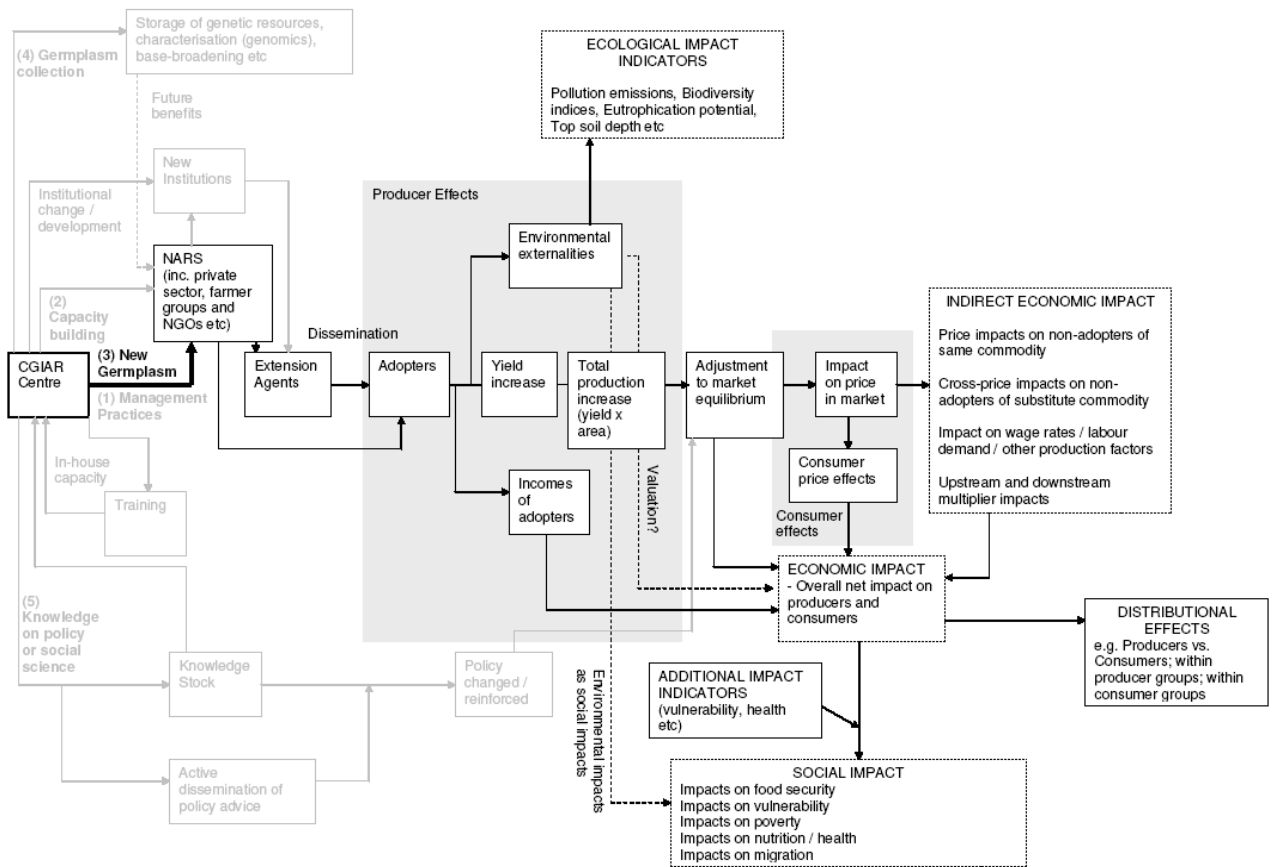
It is clear that most impact studies have not been extended to address the non-economic dimensions and this is a deficiency in current IA work in the CGIAR. Other dimensions of impact do exist that cannot, at least easily, be valued or monetized, but must still be quantified. This relates especially to food and nutrition security effects (monetized or otherwise) and environmental benefits/losses, which must also be captured. However, it should be recognized that some non-economic indicators derive from the economic benefits generated and would not occur without them. Hence one needs to be cognizant of the potential for double counting.

Moving further down the impact pathway in IA remains a critically important task. Clearly, a more rigorous treatment in demonstrating causality between agricultural research and alleviating hunger and poverty, ensuring food security, and sustaining the environment is required. Tracing the links between outputs, outcomes, intermediate impacts and ultimate CGIAR-goal-related impacts through the various direct and indirect pathways is a complex and demanding task. Figure 2 shows a hypothetical impact pathway for a yield-increasing crop germplasm improvement activity. To date, few CGIAR *ex post* IAs have attempted such a comprehensive assessment that encompasses the full range of ecological or social effects, direct and indirect effects, distributional effects, etc. Most are partial assessments. While it is not necessary, nor even advisable, that every *ex post* IA cover every potential impact, serious efforts should be made to ensure that the major impacts, including possible negative ones, have been assessed, and that the assumptions on which this implicit or explicit judgement is made, are clearly enunciated.

In an attempt to go beyond partial assessments, and particularly aggregate economic assessments, SPIA has recently commissioned a study to comprehensively assess the overall impacts of CGIAR activities in South Asia, a region of the world where agricultural research is known to have had highly successful productivity effects but where poverty, hunger and malnutrition persist to a degree uncharacteristic of any other region that benefited so much from the Green Revolution (Hazell, forthcoming). A major objective of this study is to better understand the direct and indirect pathways of past impacts of CGIAR and partner research on different producer and consumer groups (rural vs. urban, irrigated vs. rainfed, poor vs. less poor, etc.) resulting from productivity improvements in different commodities, including identifying cross-commodity effects. Initiation of this study recognizes that while much has been done to document productivity and economic efficiency impacts, documenting distributional impacts, both direct and particularly indirect, has received much less attention. There is still significant scope for improving understanding of the implications of the CGIAR's activities for target beneficiaries and the broader external environment.



Impact pathway for a yield-increasing germplasm improvement – Example for consultation at the Impact Assessment Focal Point Meeting, Nairobi 5-7<sup>th</sup> October 2006.



**Figure 2. Impact pathway framework**

Source: Science Council (2007)

Key: Crop genetic improvement pathway in bold and other programs in grey

*Improving use of ex post IA for strategic feedback*

The relatively small and selective sample of CGIAR *ex post* IAs thus far generated clearly limits the extent to which reliable lessons and generalizations can be made. Hence, as the set of *ex post* IAs grows, a greater body of evidence will exist on which strategic lessons can be drawn for the system. These lessons relate to:

- What type of research is most effective from an impact perspective (where and under what type of conditions and for whom)? (Raitzer and Kelley, 2008)
- How close have *ex post* IAs been in terms of results to the earlier projections from *ex ante* IAs? In this manner one would have a better basis on which to undertake future *ex ante* IAs by modifying, for example, assumptions about key parameters such as research and adoption lags, probabilities of success, and extent of adoption and spillovers based on actual experience.
- How can impact pathway analyses of the type arrayed in Figure 2 offer a further way of linking *ex post* and *ex ante* IA?
- How to maximize spillovers so that the returns to R&D investments are enhanced. This is especially relevant for the CGIAR, as it pursues the

production of international public goods with wide applicability rather than location-specific ones where others have a comparative advantage.

Raitzer and Winkel (2005) attempted to identify how investors utilize *ex post* IA information to help inform their decisions. There is now a need for a study to characterize the current use of information from existing *ex post* IAs in centre research management, and to identify what types of information managers would like future *ex post* IAs to produce. It is expected that the results should lead to identification of a set of ‘best bet’ evaluation and IA approaches that generate relevant feedback for input into centre research planning and management. There also is a need for a study that explores the actual and potential complementarities and linkages between *ex ante* and *ex post* IAs.

In a more strategic learning sense, it is hoped that through various ongoing and future SPIA initiatives — such as the South Asia impact study alluded to above — the key impediments to and opportunities for achieving CGIAR goals through agricultural research and technology enhancement will be more clearly understood. Ultimately, the *ex post* impact pathway analysis of the South Asia region should provide a much better understanding of the economic and health, nutrition and environmental impacts



that have occurred and the distribution of those among various poor and non-poor groups in both urban and rural settings — which in turn will have major implications for future priority assessment.

*Enhancing the rigour, credibility and consistency of centre impact assessments*

Notwithstanding the improvements in methods and coverage of *ex post* IA conducted within the CGIAR, there is still substantial variation in the prevalence and quality of *ex post* IAs among centres. Many, including investors and centre scientists and managers, recognize the need to improve the consistency of IA coverage across the system. Indeed, the need for a common framework in relation to *ex post* IA has been documented at conferences and workshops on the themes of IA in the CGIAR (TAC Secretariat, 2001; Watson, 2003; SC and CGIAR Secretariat, 2007). SPIA currently is involved in several activities to help facilitate improvements in the quality and hence credibility of *ex post* IAs.

First, working with the centres' IA focal points, it is finalizing a set of principles and strategic guidelines for *ex post* IA of international agricultural research such as conducted by the CGIAR (Walker *et al*, forthcoming). The intention is not to supply a detailed step-wise 'how to' manual for carrying out *ex post* IAs, but rather to elaborate on the key conceptual and methodological issues associated with carrying out *ex post* IA on different kinds of R&D projects, for example, related to attribution and counterfactual analysis, data protocols and quality controls, etc. These guidelines should enable more effective system-level integration, synthesis and comparison of centre-level assessments and hopefully lead to agreement on 'good practices'. It is intended that the guidelines would be useful beyond the CGIAR; for IA practitioners in CGIAR partner organizations and other organizations involved in international agricultural research or indeed in any research that is focused on development impacts, such as those pursued by the CGIAR.

In preparing these strategic guidelines, it is recognized that *ex post* IA methodologies need to be adaptable to different contexts — varying agendas, data situations, actors and knowledge requirements of different types of research applications. For example, there are several questions that research managers need to answer prior to the conduct of *ex post* IA:

- Should the unit of analysis be at the project, program or institutional level?
- Should the focus be on impacts at the local, regional, national or international level?
- What is the best systematic approach to setting up criteria for choice of projects to subject to *ex post* IA?
- To what extent does the Raitzer (2003) meta-analysis approach have potential at different scales for different types of entities, for example,

in assessing an individual centre's cumulative individual program and overall impact efficacy?

- What share of research resources should be devoted to IA? Should this vary by research type or other characteristic? How should IA budgets be decided?
- Should reliance be placed on in-house IA capacity or independent evaluators, or some combination? The former approach may better suit learning objectives and the second the accountability imperative.

The strategic guidelines will address these and other IA-related issues.<sup>9</sup>

A second activity relates to SPIA's evaluation of the quality of centres' *ex post* IAs and the extent to which centres are developing an IA 'culture' using pre-established and agreed-upon criteria and indicators. This is part of the CGIAR's annual performance measurement exercise, which began in 2005 as a component of strengthened monitoring and evaluation of centres. The instructions, criteria, and indicators used in this annual exercise can be found in SC and CGIAR Secretariat (2007). SPIA is also using the strategic IA guidelines (Walker *et al*, forthcoming) to refine the performance measurement indicators related to the quality and extent of IA at the centres and their commitment to building an IA culture.

The relationship between SPIA and the centres has been evolving over the years. Originally, it consisted of centres providing support to SPIA initiatives through data collection and provision of case studies that fit within a broader system-wide IA initiative, for example, the Evenson and Gollin (2003) study. Over recent years, there has been a growing SPIA partnership with the CGIAR centres, keeping in mind the need for SPIA to maintain its objectivity in producing its various outputs in an independent and credible manner. This new role for SPIA, working with the centres in improving methods and the scope of *ex post* IA and exchanging information and insights for institutional learning and change, is likely to take on more importance in the future. However, maintaining such a peer relationship when SPIA is now required by investors to evaluate centres' IA performance represents a major challenge. It is pleasing that at the most recent meeting of centre IA focal points and SPIA, both groups recognized the potential difficulties but agreed to further strengthen their relationships.

## Conclusions

*Ex post* IA has become an essential ingredient in ensuring the continued support by investors to the CGIAR. If anything this is more so now, some 40 years after the advent of the Green Revolution, its primary *raison d'être*, than at any other time in its history. The importance of continuously building up, synthesizing and summarizing a credible body of

evidence of the wisdom of past investments for investors cannot be overemphasized. It is now integral to the monitoring and evaluation processes of the CGIAR system.

Some key lessons have been learned over the past decade from the experience of system-level IA activity within the CGIAR. The first is that *ex post* IA in the CGIAR has its comparative advantage in addressing the accountability imperative for a publicly funded institution like the CGIAR. It is not as appropriate for institutional learning, nor has its full potential as an input into *ex ante* IA and priority assessment been realized.

The second is that the scope of *ex post* IA should be broadened beyond the narrow economic indicators such as internal rates of return and benefit–cost ratios. While these are necessary elements in satisfying the accountability imperative, they are no longer sufficient. With increasing concerns about poverty, food and nutrition security and sustaining the environment, investors are seeking assurance that these goals are being effectively met by international agricultural R&D. This is going to mean that disciplines other than economics will need to play more significant roles in *ex post* IA the future. This will include identifying indicators of impact not amenable to monetary valuation such as biodiversity, social gains, environmental protection, strengthened institutions, etc. Economists also will need to place more emphasis on documenting impacts in those terms to complement their extensive literature on economic indicators of impact.

Third, continued methodological advances in IA are needed to address issues such as attribution and counterfactuals, not only in the more challenging areas of IA (natural resources management and policy research, training, biodiversity), but also for the traditional areas where IA has been applied, such as germplasm improvement and crop loss avoidance technologies. There is scope to embrace experimental evaluation methods and some of the approaches used by evaluation professionals. Additional needs are for testing and validating more qualitative methods derived from the sociological and anthropological traditions in development studies, as complements to economics-based IA approaches that could form part of a multi-dimensional comprehensive approach to the study of impact.

Fourth, SPIA's role has broadened beyond the original mandate of helping to ensure adequate quantity, quality, integrity and use of IA in the system to include a compliance function in the context of the new annual performance measurement system. This can compromise its peer relationship with the centres. However, as SPIA evaluates centre IA work in the performance measurement system based on a pre-defined, agreed-upon set of detailed and rigorous criteria that are derived from good practices in the centres, the chances of this happening are perhaps low. In addition, SPIA typically relies on outside IA experts to evaluate particular components of

the performance measurement exercise which reduces the potential for conflict of interest.

Fifth, at the centre level there remains a question as to the appropriate institutional arrangements for the conduct of IA. A case can be made for the creation of an independent IA unit responsible to the director-general or the director of research of the centre. This has an advantage of raising the profile of IA in the centre, which can enhance the prospects of developing and institutionalizing an 'impact culture'. A disadvantage is that such a unit can be viewed as an audit or compliance unit by the other professional staff, which could inhibit the cooperation needed to undertake effective IA. Also, having a unit so close to senior management can create a perception that IA is primarily a public relations function. One alternative to this would be to have the IA unit responsible to the board of the centre, but to our knowledge there has been no example of this type of arrangement. Another alternative arrangement is to house the IA responsibility in the social science or economics units, where the chances that those conducting the IA studies can develop a peer relationship with the professional staff are higher. Also, if IA is regarded as a component of the staffs' agreed research portfolio, then the likelihood of peer-reviewed publications emerging is enhanced, which is good for the credibility of the IA work. Perhaps the ideal is to have IA as part of everyone's responsibility. One disadvantage in having a single designated individual as the IA focal point in the centres, as now, is that regardless of location, that person can be viewed as the repository of all information and work on IA to the detriment of institutionalizing IA in the centre and developing an 'impact culture' among the professionals. After all, the basic goals of the CGIAR are impact-focused. On the other hand, there are advantages to having a focal point in terms of specialization and the facilitation of interactions with SPIA and external groups.

Lastly, while the credibility and integrity of *ex post* IA is imperative, experience to date indicates that the information embedded in it must be packaged in brief, user-friendly flyers that busy investors can use to influence their own institution and others that allocate funding for development assistance. Indeed, the existence of SPIA helps satisfy investors about the credibility and integrity of the assessments

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**The lesson here is that resources need to be provided to ensure the studies are packaged in a form that enhances communications beyond the scientific community**

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conducted. They are much more interested in the bottom lines. The lesson here is that resources need to be provided to ensure the studies are packaged in a form that enhances communications beyond the scientific community.

SPIA and the CGIAR Science Council, in close communication with the CGIAR investors, will no doubt continue to contemplate the implications of these and other lessons learnt over the last decade as a basis for looking ahead and effectively responding to future demands for impact-related information at the system level. Judging from the very positive reactions of investors and other stakeholders within and outside the CGIAR community, the SPIA model itself, as embodied in an independent system-wide IA unit, appears to have been an effective instrument in helping the CGIAR generate a larger and more credible body of evidence to satisfy the accountability imperative of investors. The accountability imperative must be preserved at all costs, but at the same time such a system-level unit must look for ways and means of discovering new insights about what avenues of research might offer the most promising prospects for success in future, ideally through compiling and occasionally synthesizing a larger body of evidence of impacts on the poor and the environment emanating from diverse types of CGIAR research.

## Notes

1. The mandate of the Science Council's SPIA is threefold: (1) to provide CGIAR members with timely, objective and credible information on the impacts at the system level of past CGIAR investments and outputs in terms of the CGIAR goals of enhanced food security, poverty alleviation and sustained natural resources; (2) to provide support to and complement the centres in their *ex post* IA activities; and (3) to provide feedback to CGIAR priority-setting, and create synergies by developing links to *ex ante* assessment and overall planning, monitoring and evaluation functions in the CGIAR.
2. The ADB guidelines, for example, state: 'project impact evaluation establishes whether the intervention had a welfare effect on individuals, households, and communities, and whether this effect can be attributed to the concerned intervention' and IFAD's impact evaluation guidelines define impact as the 'the attainment of development goals of the project or program, or rather the contributions to their attainment'. Current thinking embraces a more comprehensive definition.
3. The Joint Committee on Standards for Educational Evaluation (1994) defines evaluation as 'the systematic investigation of the worth or merit of an object'. The primary focus of evaluation is to determine the effectiveness of a program against pre-established priorities and goals. Evaluation helps document whether a program is accomplishing its goals, identifying program weaknesses and strengths and the areas of the program that need revision. The term assessment refers to the systematic gathering of information about component parts of the program or entity to be evaluated. The evaluation process, therefore, is broader than assessment and involves examining information about many components of the thing being evaluated and making judgements about its worth or effectiveness.
4. In 2004 the Australian Centre for International Agricultural Research began to systematically monitor and assess the effectiveness of large projects three years after their completion by undertaking studies assessing the uptake of results. These studies examine those factors that affect uptake, and why and whether the project has made any difference to the social, economic and environmental wellbeing of local communities.

Early uptake studies are synthesized to draw lessons and a report published annually by ACIAR (McWaters and Davis, 2006).

5. A relatively new initiative, institutional learning and change (ILAC), has been exploring new approaches to this component. This initiative is an evolving community of practice committed to increasing the contributions of agricultural research to sustainable poverty reduction. The group uses innovation systems thinking and tools to understand agricultural change processes within R&D institutions and guide interventions to stimulate pro-poor innovation. See the ILAC website <[www.cgiar-ilac.org/index.php?section=1](http://www.cgiar-ilac.org/index.php?section=1)>, last accessed 15 May 2008 for further details.
6. The 2006 budget of the CGIAR is estimated at US\$506 million (nominal terms), compared to US\$270 million (nominal terms) in 1995 (and US\$304 million in 1996) (CGIAR Secretariat Financial Reports, 1996, 2006).
7. A good example of this strategic learning dimension emerged from the Evenson and Gollin (2003) study, which highlighted a major remaining challenge for the CGIAR and NARS in targeting crop germplasm improvement investments to farmers in poor, marginal environments where modern varieties have not been widely adopted.
8. Credible counterfactuals are a necessary component of assessing both influence and impact. It is often very difficult to attribute specific influence or impact to individual POR projects or institutions. However, this should be attempted. Attributing POR influence may be sufficient if it is possible to measure the ultimate impacts of the policy changes that resulted, even if it is not possible to apportion them among all the actors involved.
9. The strategic guidelines are a cooperative venture between centres and SPIA. Also, in keeping with the spirit of the exercise, production of the guidelines is an open-ended exercise, recognizing that as new experience, new methods and approaches and new data protocols come to light the guidelines and 'good practices' will need to be modified. Among other things, the guidelines also will provide a purpose for periodic meetings of the centre IA focal points, SPIA members and outside experts to meet and exchange information on new information and ideas that need to be incorporated into this 'living' document.

## References

- Adato, M and R Meinzen-Dick eds. 2007 *Impacts of Agricultural Research on Poverty Reduction: Findings of an Integrated Economic and Social Analysis*. Johns Hopkins Press.
- Alston, J M, G W Norton and P G Pardey 1996 *Science under Scarcity: Principles and Practice for Agricultural Research Evaluation and Priority Setting*. Cornell University Press.
- Anderson, J R 1985 *International Agricultural Research Centers: Achievements and Potential: Volumes I and II*. Washington, DC: CGIAR Secretariat.
- Balzer, G and U Nagel 2001 Logframe based impact monitoring within the CGIAR system. In *The Future of Impact Assessment in the CGIAR: Needs Constraints and Options*. Proceedings of a workshop organized by the SPIA/TAC, 3–5 May 2000. Rome, Italy: FAO.
- Bamberger, M 2006 *Conducting Quality Impact Evaluations under Budget, Time and Data Constraints*. Independent Evaluation Group. Washington DC: World Bank.
- Bradsher, K and A Martin 2008 World's poor pay price as crop research is cut. *New York Times*, 15 May 2008.
- CGIAR Secretariat 1996 *CGIAR 1995 Financial Report*. Washington, DC: World Bank.
- CGIAR Secretariat 2006 *CGIAR 2006 Financial Report*. Washington, DC: World Bank.
- Chambers, R 2003 Preface. *Agricultural Systems*, **78**(2), 119–121.
- Cooksy, L 1997a CGIAR Methodological Review and Synthesis of Existing Ex Post Impact Assessments. Report #1: A Review of Documents Reporting Effects of International Agricultural Research Centres. CGIAR IAEG publication.
- Cooksy, L 1997b CGIAR Methodological Review and Synthesis of Existing Ex Post Impact Assessments. Report #2: Analysis of Comprehensive Ex Post Studies of Impact of International Agricultural Research Centres. CGIAR IAEG publication.

- DAC, Development Assistance Community 2002 Glossary of key terms in evaluation and results based management. July. OECD.
- Ekboir, J 2003 Why impact analysis should not be used for research evaluation and what the alternatives are. *Agricultural Systems*, **78**(2), 166–184.
- Evenson, R and D Gollin eds. 2003 *Crop Variety Improvement and its Effect on Productivity: the Impact of International Agricultural Research*. Oxon, UK: CABI.
- Evenson, R and M Rosegrant 2003 The economic consequences of crop genetic improvement. In *Crop Variety Improvement and its Effect on Productivity: the Impact of International Agricultural Research*, eds. R Evenson and D Gollin, pp. 473–497. Oxon, UK: CABI.
- Hazell, P forthcoming *An Assessment of the Impact of Agricultural Research in South Asia since the Green Revolution*. A study commissioned by the SC Standing Panel of Impact Assessment. CGIAR Science Council Secretariat. Rome, Italy: FAO.
- Horton, D and R Mackay 2003 Using evaluation to enhance institutional learning and change: recent experiences with agricultural research and development. *Agricultural Systems*, **78**(2), 127–142.
- Joint Committee on Standards for Educational Evaluation 1994 *The Program Evaluation Standards*, 2nd edn.
- Kelley, T G and H Gregersen 2005 Lessons from CGIAR impact assessment research. In *Natural Resource Management in Agriculture: Methods for Assessing Economic and Environmental Impacts*, eds. B Shiferaw, H A Freeman and S Swinton, pp. 341–360. CABI.
- Kerr, J and S Kolavalli 1999 Impact of Agricultural Research on Poverty Alleviation: Conceptual Framework with Illustrations from the Literature. EPTD Discussion Paper No. 51. Washington DC: International Food Policy Research Institute.
- MacKay, R and D Horton 2003 Expanding the use of impact assessment and evaluation in agricultural research and development. *Agricultural Systems*, **78**(2), 143–165.
- Maredia, M and P Pingali 2001 Environmental Impacts of Productivity-Enhancing Crop Research: A Critical Review. TAC Secretariat. Rome, Italy: FAO.
- Maredia, M and D Raitzer 2006 *CGIAR and NARS partner research in sub-Saharan Africa: Evidence of impact to date*. Report commissioned by the Science Council's Standing Panel on Impact Assessment. Rome, Italy: Science Council Secretariat.
- Maredia, M, D Byerlee and J R Anderson 2000 Ex post evaluation of economic impacts of agricultural research programs: a tour of good practice. In *The Future of Impact Assessment in the CGIAR: Needs, Constraints and Options*. Rome, Italy: CGIAR Technical Advisory Committee Secretariat, FAO.
- Matlon, P 2003 Preface. *Agricultural Systems*, **78**(2), 119–121.
- McWaters, V and J Davis eds. 2006 *Adoption of ACIAR Project Outputs: Studies of Projects Completed in 2001-2002*. Canberra: ACIAR.
- Morris, M, P Pingali, H Gregersen and T Kelley 2003 Assessing the impact of agricultural research: an overview. *Quarterly Journal of International Agricultural*, **42**(2), 127–148.
- Nelson, M and M Maredia 2000 Environmental Impacts of the CGIAR: an Initial Assessment. TAC Secretariat. Rome, Italy: FAO.
- Özgediz, S 1995 Strengthening evaluation in the CGIAR: needs and options. 10 March 1995. Draft.
- Pingali, P L 2001 *Milestones in Impact Assessment Research in the CGIAR, 1970-1999. With an Annotated Bibliography of Impact Assessment Studies Conducted in the CGIAR, 1970-1999, prepared by Matthew P. Feldmann*. Mexico, DF: SPIA, CGIAR Technical Advisory Committee.
- Raitzer, D 2003 Benefit Cost Meta-Analysis of Investment in the International Agricultural Research Centres of the CGIAR. SC Secretariat. Rome, Italy: FAO.
- Raitzer D and T Kelley 2008 Benefit-cost meta-analysis of investment in the International Agricultural Research Centers of the CGIAR. *Agricultural Systems*, **96**, 108–123.
- Raitzer D and J Ryan 2008 State of the art in impact assessment of policy-oriented international agricultural research. *Evidence and Policy*, **4**(1), 5–30.
- Raitzer, D and K Winkel 2005 Donor demands and uses for evidence of research impact – the case of the Consultative Group on Agricultural Research (CGIAR). Rome: Science Council Secretariat, FAO.
- Savedoff, W D, R Levine and N Birdsall 2006 When will we ever learn? Improving lives through impact. Evaluation Report of the Evaluation Gap Working Group. Washington, DC: Center for Global Development.
- Science Council 2006a *Natural Resources Management Research Impacts: Evidence from the CGIAR*. Rome, Italy: Science Council Secretariat.
- Science Council 2006b *Evaluation and Impact of Training in the CGIAR*. Report commissioned by the CGIAR Science Council.
- Science Council 2006c *Impact Assessment of Policy-Oriented Research in the CGIAR: a Scoping Study Report*. Rome, Italy: Science Council Secretariat.
- Science Council 2007 *Advancing Impact Assessment of International Agricultural Research: Synthesis Report*. Report of a Meeting of CGIAR Centre Impact Assessment Focal Points and the Standing Panel on Impact Assessment of the CGIAR Science Council held at World Agroforestry Centre (WAC), Nairobi, Kenya, 5–7 October 2006.
- Science Council and CGIAR Secretariat 2007 Guidelines for the Reporting of Performance Indicators for CGIAR Centers – 2006 data.
- Seechrest, L, M Steward and T Stickle 1999 A Synthesis of Findings concerning CGIAR Case Studies on the Adoption of Technological Innovations. Rome, Italy: IAEG Secretariat, FAO.
- TAC Secretariat 2001. *The Future of Impact Assessment in the CGIAR: Needs Constraints and Options*. Proceedings of a workshop organized by the Standing Panel on Impact Assessment of the TAC, 3–5 May 2000. Rome, Italy: FAO.
- Waibel, H 2000 *Evaluation of the Impact of Integrated Pest Management Research at the International Agricultural Research Centres*. TAC Secretariat. Rome, Italy: FAO.
- Waibel, H and D Zilberman 2007 *The Impact of Natural Resource Management Research: Studies from the CGIAR*. Wallingford, UK: CAB International.
- Walker, T, M Maredia, T Kelley, R La Rovere, D Templeton, G Thiele and B Douthwaite, forthcoming. *Strategic Guidance for Ex Post Impact Assessment of Agricultural Research*. A study commissioned by the SC Standing Panel of Impact Assessment. CGIAR Science Council Secretariat. Rome, Italy: FAO.
- Watson, D J 2003 *Impacts of Agricultural Research and Development: Why Has Impact Assessment Research Not Made More of a Difference*. Proceedings of a conference organized by the SPIA and CIMMYT, held 4–7 February 2002 in San Jose, Costa Rica. Mexico: CIMMYT.
- Watts, J, D Horton, B Douthwaite, R LaRovere, G Thiele, S Prasad and C Staver 2008 Transforming impact assessment: beginning the quiet revolution of institutional learning and change. *Experimental Agriculture*, **44**(1), 21–35.
- World Bank 2007 NONIE: Impact Evaluation Guidance. Mimeo. <<http://www.worldbank.org/ieg/nonie/docs/NONIEGuidanceIntroduction.doc>>, last accessed 15 May 2008.