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Strategic Guidance for *Ex Post* Impact Assessment of Agricultural Research

The Science Council's Standing Panel on Impact Assessment (SPIA) has for some time been aware of the need for a document that provides strategic guidance to impact assessment practitioners and research managers for planning, conducting and managing *ex post* impact assessment (epIA). EpIA is a specialized area of evaluation designed to identify and measure the consequences of past research investments. Recently, SPIA engaged a number of practitioners to distill from their own and others' experiences an authoritative statement that provides guidelines to good practices for epIA; SPIA has substantially endorsed this statement.

The context: Guidance for practitioners

The strategic guidelines are written by impact practitioners, primarily for practitioners who conduct epIAs on interventions generated by national and international public-sector agricultural research systems in developing countries. They are drafted from a pragmatic point of view and respect the fact that both financial resources and human capital for such assessments are usually scarce. These guidelines do not attempt to identify best practices, but rather to outline the options and discuss their pros and cons as a prelude to offering 'good practice' advice. This is in recognition of the context-specific nature of good practice. In the same spirit, these guidelines present information on many state-of-the-art applications that lie within the realm of the practical and the desirable.

The guidelines are grounded in the experience of recent meta-analyses and syntheses, which points to what could be improved when conducting epIAs, as well as in demands from donors for the enhanced documentation of impacts that are more closely related to the Millennium Development Goals (MDGs). The most acute need is to improve the quantity and

quality of epIAs for research on natural resource management, livestock, post-harvest operations, policy, and capacity building, where only a few epIAs have been carried out but where a substantial share of research funding has been allocated. For the epIAs that have been conducted and reviewed, much of the resulting knowledge in some key areas is especially fragile. The environmental consequences of a technology or other research product are often not reliably reported in epIAs of natural resource management and genetic improvement research, and the link between research output and decision-making outcomes tends to be weak in policy-oriented epIAs.

The guidelines are also grounded in empirical reality, which differentiates impact assessment in scientific research from that of development programs in health, education, and other sectors. For example, the impact of agricultural research hinges on the adoption of its outputs. Success of a given research initiative is not normally distributed in a statistical sense, as relatively few research interventions are adopted by potential users. Documenting key success stories is essential to arrive at an initial understanding of the productivity of any agricultural research program. Therefore, these guidelines advocate an approach that aggregates the results of documented economic rate-of-return assessments, in what is called 'impact accounting with success stories'. When the total costs of all research undertaken by a program, institute, or system are taken into account, this approach results in conservative estimates of the economic productivity of research.

The lack of epIA studies that document success stories can be used to flag underperforming research areas and help set priorities for research aimed at determining why actual impact does not match expectations in certain areas.

These guidelines are also based on the understanding of where epIA fits into the overall landscape of evaluations. In the CGIAR, external program and management reviews of centers, as well as internally commissioned external reviews of programs within centers, are important mechanisms for evaluating programs and projects in mid-stream or just after completion. If such mechanisms did not already exist, these guidelines would have placed more emphasis on external evaluations. The defining characteristic of epIA is its timing, as it takes place after a program or project has generated the intervention being evaluated. An epIA should only be conducted if sufficient time has elapsed and enough experience has been accumulated to assess the intervention's longer-term economic, social, or environmental impact. Sometimes the pressure for documented impact to justify research investments in the short term clashes with this need.

Unifying themes

Four themes weave their way through the guidelines and underscore the need to take a sequential approach to epIA. First, the two main types of epIA discussed are *Economic rate-of-return assessments* and *Multi-dimensional impact assessments*. The former focus on what are called Stage I outcomes and impacts (those that are closely linked to adoption, such as farmers' incomes), while the latter relate to Stage II impacts (those that are evident further along the impact pathway, such as poverty reduction and food security). In general, Stage I epIAs should be rigorously carried out before other consequences along the impact pathway are evaluated, as Stage II epIAs are usually more costly and specialized. In the same vein, multi-dimensional impact assessments that embrace a diverse set of factors – such as the effects of technological change on economic growth, labor markets and migration, regional producer welfare, and poverty – are a priority for research areas that have already undergone many economic rate-of-return assessments. In research areas where sufficient success has yet to be recorded, economic rate-of-return assessments remain a priority.

A second theme that resonates throughout these guidelines is the need to enhance the depth of epIAs by going further along the 'input–output–outcome–impact' pathway. This does not imply that a comprehensive quantification of all possible impacts is required in every case. In terms of the MDGs, epIAs of agricultural research should be held to the same standard as epIAs in other sectors. Successful epIAs are those that focus on one or more specific and clearly defined impact pathways, from research outputs to major intermediate outcomes to intended and unintended impacts. Indicators of impacts, whether close to or distant from ultimate impacts, should be clearly identified. As much as possible, when ultimate impacts are not measured, the indicators chosen in the epIAs should have well-established empirical linkages to the MDGs, as characterized in the literature.

A third recurring theme is the need for better preparations for conducting epIAs. Careful elaboration of the input–output–-outcome–impact linkages using impact pathway analysis is one way to focus on priority outcomes and impacts for evaluation. Three schematic impact pathway maps are presented in the guidelines. As a precursor to epIA, methods such as outcome mapping and participatory impact pathway analysis show promise for monitoring, evaluating, and documenting progress along impact pathways so as to provide a solid foundation for high-quality and plausible epIAs, especially for research projects with short-term payoffs. These methods complement – but are not a substitute for – an epIA. Applied field research that elucidates specific environmental, nutritional, health, and social consequences should be recognized as an important supporting component of forthcoming epIAs. The guidelines describe a participatory process that allows all scientists in a research institution to choose the interventions for epIA. Finally, data from national surveys on household income and expenditure are often an underused resource that could contribute to more informative and rigorous epIAs. Practitioners should become more familiar with such datasets in the regions influenced by the research they are assessing.

The last recurring theme centers on the issue of quality in terms of the conduct of epIAs. The hallmarks of good-practice epIA are transparency and analytical rigor. For example, all epIAs of agricultural research should explicitly identify a counterfactual scenario to help explain how the selected outcomes (impact indicators) would have been different if the research had not been done. Desirable traits for good-practice economic rate-of-return assessments also include: 1. sufficiency of information for meta-analyses to aggregate over several studies, 2. reasoned hypotheses on expected but undocumented consequences, 3. readability, and 4. peer review. Examples of good-practice epIAs are provided throughout the document.

Surprises in the guidelines

For impact practitioners, research managers, donors, and other readers, these guidelines not only confirm conventional wisdom about epIA but also provide several surprises. EpIA should be viewed as an integral part of research evaluation, as it is a dual-purpose activity that contributes to both accountability and

List of the components of transparency and analytical rigor for epIA

Transparency

- Clearly derived key assumptions:
    1. Their explicitness
    2. Their substantiation.
- Comprehensive attribution of data sources by citing
    1. Adoption data
    2. Productivity data
    3. Price data
    4. Adoption-related cost data.
- Full explanation of data treatment by explaining
    1. Adoption data treatment
    2. Productivity data treatment
    3. Counterfactual derivation
    4. Economic valuation
    5. Institutional attribution.

Analytical rigor

- Representative dataset utilized:
    1. Its reliability
    2. Its comprehensiveness.
- Appropriate data treatment:
    1. Appropriateness of data extrapolation
    2. Adequacy of analysis of mitigating factors
    3. Adequacy of disaggregation by production environment
    4. Adequacy of assessment of adoption-related costs.
- Plausible counterfactual scenario developed:
    1. Plausibility of assumptions about substitutable innovations
    2. Plausibility of changes due to exogenous causes.
- Adequate consideration of mission relevance of benefits:
    1. Adequacy of analysis of mission relevance of economic benefits.
- Plausible institutional attribution:
    1. Plausibility of institutional attribution.

Source: Raitzer and Linder (2005)[3] pp 25 and 27 as cited in Gordon and Davis (2007)[4]

strategic learning. The linkages between epIA and research priority setting in general, and between epIA and *ex ante* impact assessment in particular, are priority areas for strengthening. Placing epIA activities within the research domain of research centers also helps to engender an impact culture; this is because scientists see epIA as a scientific exercise, rather than as a subjective undertaking used to marshal information for press releases or as a component of compliance auditing. Perhaps more surprising is the importance attached to specific, hitherto underused components of epIA, such as the use of agricultural experimental data in estimating benefits, the need to generate reliable estimates of adoption, and the view that, unlike multi-dimensional impact assessments, good-practice economic rate-of-return assessments can now be conducted without before-and-after comparisons.

Poverty alleviation

Poverty alleviation is the ultimate goal in a hierarchy of desired impacts presented in these guidelines; it is also the consequence that appears to be of greatest interest to donors. The question of how to make epIAs more convincing in terms of documenting specific impacts on the many facets of poverty commands considerable attention. Ways of enhancing the poverty assessment content of economic rate-of-return assessments include:

- Estimating an intervention's net benefits for poor households
- Eliciting human interest stories – qualitative rather than quantitative assessment
- Assessing aspects that qualify the impact of a research intervention (e.g., loss of system diversity or changes in diet as a result of large-scale adoption of a higher-yielding crop cultivar).

Directions for research

The guidelines identify several areas that need further research if the conduct of epIAs is to be improved. They range from multi-disciplinary studies on how to better document the nexus between research outputs/uptakes/influences and outcomes in policy decision-making, to institutional assessments of the incentives for investing in epIA.

Finally, it is important to point out that, while these guidelines dispense advice on epIA, they are not the last word. The Science Council regards this as a living document that will benefit from further experiences on the part of those involved in impact assessment, and encourages feedback to improve and extend it. However, the timeliness of this publication should be noted, as the years 2007 and 2008 were marked by two watershed events for agricultural research and development, with the World Bank and other donors re-engaging in agriculture and world food prices reaching historic highs. It is hoped that these events will mobilize more investment in agricultural research, reversing the slowing trend in real funding over the past 20 years. The use of these guidelines should help instill confidence in the value of such investment, as we have a long history of developing credible approaches to assessing this, as well as hundreds of case studies that attest to its high payoffs.

Examples of good practices highlighted in the strategic guidance document

General methodological issues

Good practice 2.5. Assigning conservative values to important assumptions is recommended when conducting both economic rate-of-return and multi-dimensional impact assessments.

Good practice 2.7. EpIA practitioners engaged in economic rate-of-return assessment should complement their quantitative cost–benefit analysis with qualitative methods capable of shedding light on the institutional attribution, uptake, and influence of the research output under analysis.

Estimating adoption of the technology or policy for epIA

Good practice 3.7. Information on the adoption component for a good-practice epIA includes:

1) describing the size and heterogeneity of the re-specified recommendation domain
2) a point estimate of component adoption when the fieldwork was conducted
3) the values of parameters used to estimate or project the level of adoption
4) any distinguishing characteristics of adopters and non-adopters – especially their poverty status
5) perceived strengths and weaknesses of the technology
6) the threats that could lead to early disadoption.

Arriving at a persuasive counterfactual

Good practice 3.12. The challenge of specifying an appropriate counterfactual depends mostly on the type of research intervention and the context in which it is adopted. Sensitivity analysis is a desirable element of counterfactual analysis.

Estimating benefits and costs

Good practice 3.13. Experimental data on the treatment effects of adopted technology are preferred to survey data for estimating benefits in economic rate-of-return assessments. With-and-without comparisons are preferred to before-and-after comparisons when survey data are the basis for estimation, but the ideal is to have both sources of data available so that a double difference can be estimated. In good-practice epIAs, both experimental and survey information should be used to increase the reliability of benefit estimation.

Attributing net benefits

Good practice 3.19. Benefits are considered to be a joint output of all relevant participating institutions, and the project-related costs of each participating research and extension institution should be charged to the selected technology or policy. The attribution of benefits to each institution is not essential in good-practice epIA, but is often sought by investors.

Addressing other benefit-related concerns

Good practice 3.21. Documenting sizable non-monetary benefits is a priority for all thematic epIAs, not just for those focused on natural resource management research. At a minimum, such effects should be described in physical terms if they cannot be valued.

Assessing poverty impacts

Good practice 3.29. Food security as an indicator of poverty warrants more attention in both Stage I and Stage II epIAs. How much of research intervention's estimated net present value accrues to the poor is a relevant question in both economic rate-of-return and multi-dimensional impact assessments.

Accountability, learning, and where epIA fits into research evaluations

Good practice 4.2. Although accountability is the main objective of epIA, impact practitioners are encouraged to view epIA as a dual-purpose activity that can also contribute to strategic learning, particularly with respect to the value of the research in economic, social, and environmental terms. EpIAs should inform about the implications of the results for kindred technologies and policies in the same research area.

Gestation lags, new initiative, and epIA

Good practice 4.4. A reasonable expectation on the desirability of carrying out an epIA in a truly new research area should be about 10 years after the start of the program in a research institution that focuses on applied research. Other monitoring and evaluation tools are more appropriate than epIA during the 'gestation' phase of a new initiative.

Building epIAs into project design

Good practice 4.9. The time lags in the realization of benefits and donors' short funding cycles mean that it is often a challenging task to build epIA into project design in agricultural research. Funding for epIA that is not tied to project budgets needs to be reserved and targeted at the level of the research institute and not at the level of the institute's programs.

Who conducts epIAs?

Good practice 4.11. The carrying out of both internal and external evaluations is important although, in general, epIA that is conducted by practitioners located inside centers but outside the program has been a particularly viable model at some research institutions.

Good practice 4.12. The external peer review of both internally and externally conducted epIA is essential to ensure credibility.

Communication and dissemination

Good practice 4.15. Packaging the findings of epIAs in research briefs will make the findings more widely accessible and available. Emphasizing the diverse aspects of technologies, from the processes of science and innovation to estimating the impact on users and the effects on livelihoods, will help to make a persuasive case for the importance of research and development activities.

Notes

1 The full version of the study on which this brief is based is: Walker, T., Maredia, M., Kelley, T., La Rovere, R., Templeton, D., Thiele, G., and Douthwaite, B. 2008. *Strategic Guidance for* Ex Post *Impact Assessment of Agricultural Research. Report prepared for the Standing Panel on Impact Assessment, CGIAR Science Council.* Science Council Secretariat: Rome, Italy.
2 Although this document represents the authors' views, SPIA was involved in crafting the terms of reference on which it was based, interacted with the authors throughout, and has reviewed all the major drafts. Indeed one of the authors is an SPIA member and another is Secretary. Hence, SPIA should be regarded as a 'handmaiden' and 'midwife' to these guidelines.
3 Raitzer, D. and Linder, R. 2005. *Review of the Returns to ACIAR's Bilateral R&D Investments.* Australian Centre for International Agricultural Research (ACIAR): Canberra, Australia.
4 Gordon, J. and Davis, J. 2007. *ACIAR Impact Assessment: Guidelines for Practitioners.* Australian Centre for International Agricultural Research (ACIAR): Canberra, Australia.

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