

This brief is based on the paper by Byerlee, D., Maredia, M., Shankar, B., Kelley, T. and Stevenson, J. (2011). Foreword. In: CGIAR Independent Science and Partnership Council. *Measuring the Environmental Impact of Agricultural Research: Theory and Applications to CGIAR Research*. Independent Science and Partnership Council Secretariat: Rome, Italy.



# INDEPENDENT SCIENCE & PARTNERSHIP COUNCIL

## STANDING PANEL ON IMPACT ASSESSMENT

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*Nourishing the Future  
through Scientific  
Excellence*

## Environmental impacts of agricultural research: an overview

Agricultural research generates technologies and information that, when adopted by end users, result in economic, social and environmental impacts. The economic impacts of CGIAR-generated technologies, especially in germplasm improvement, have been widely documented but a comparable effort in documenting other types of impacts is lacking. The inclusion of environmental impacts in the evaluation of agricultural research would yield a more complete picture of the overall returns to investments in research and development.

### Key messages

- There is a thin record of accomplishment in conducting environmental impact assessment in the CGIAR.
- The integration of environmental impacts into cost-benefit analysis is both practical and possible.
- New indicators of environmental impacts need to be identified, measured and analyzed in order to monitor 'sustainability of natural resources' as one of the four new CGIAR system-level outcomes.

### Background

In 2008, the CGIAR Standing Panel on Impact Assessment (SPIA) initiated a study to increase the availability of information on the environmental impacts of CGIAR research. The study had three objectives:

1. Adapt, apply and evaluate emerging approaches to assessing *ex-post* environmental impacts of agricultural research relevant to the CGIAR's mandate.
2. Advance SPIA's guidelines for conducting *ex-post* impact assessment, with particular emphasis on environmental impacts.
3. Provide results of environmental impacts from a range of case studies, reflecting different types of research within the CGIAR.

## Main findings

Mitch Renkow's review of the documented environmental impacts of CGIAR research reveals a thin record of accomplishment (Renkow, 2011 and SPIA Brief 38). Only in a small number of cases was even a partial analysis of environmental impacts carried out (for example, CIFOR's study of the impacts of timber harvesting policies on deforestation and IRRI's study of the effect of pesticide reduction policies on human health). There are no comprehensive studies of CGIAR research outputs that can be regarded as a 'template' for guiding future *ex-post* environmental impact assessments. Renkow proposed a typology of environmental impacts that differentiates between the scales over which impacts are felt and the kind of agricultural system – intensive or extensive – in which they occur.

In a second strand of the study, SPIA selected six case studies focusing on the environmental assessment component of specific agricultural technologies or policies from CGIAR Centers. Jeff Bennett's paper (Bennett, 2011 and SPIA Brief 39) provides an overview of methods for non-market valuation of costs and benefits and summarizes the results from four of the case studies. Bennett emphasizes the positive aspects of the case studies and demonstrates that the integration of environmental impacts into cost-benefit analysis is both practical and capable of application. He also recognizes that case study leaders were limited by data constraints and a lack of experience in environmental economics.

The third strand of the study was a review by SPIA of the literature on the relationship between agricultural technologies and land-use change. New modeling analysis of this relationship was commissioned by SPIA (Stevenson et al., 2011 and SPIA Brief 40). Without the productivity gains from crop improvement achieved in the main cereal crops since 1965, the global agricultural area in 2004 would have been an estimated 18 to 27 million hectares larger than actually observed.

## Implications for the CGIAR

The studies covered by Bennett (2011) provide qualified but useful results for the CGIAR, but can best be described as an initial step towards assessing environmental impacts. Bennett concludes that the CGIAR has underinvested in the models and datasets needed to support more integrated *ex-post* impact assessment. This is the result of a lack of incentives at the system level, combined with the high cost of constructing complex biophysical models and collecting data on changes in environmental quality.

Since its inception, the objective of the CGIAR has been to stimulate the production of mandated commodities. Over the past three years, there have been significant changes in the CGIAR system and the sustainable management of natural resources has become one of its four system-level outcomes. To support this, environmental impact assessment will clearly become an important element of future CGIAR research. Greater and more coordinated investment is needed to identify appropriate indicators of environmental impacts, and collect and analyze those data. Renkow's typology provides a good starting point for this task.

## References

- Bennett, J. 2011. Advancing *ex-post* impact assessment of environmental impacts of CGIAR research: conceptual issues, applications and the way forward. In: CGIAR ISPC (2011). *Measuring the Environmental Impacts of Agricultural Research: Theory and Applications to CGIAR Research*. ISPC Secretariat: Rome, Italy.
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