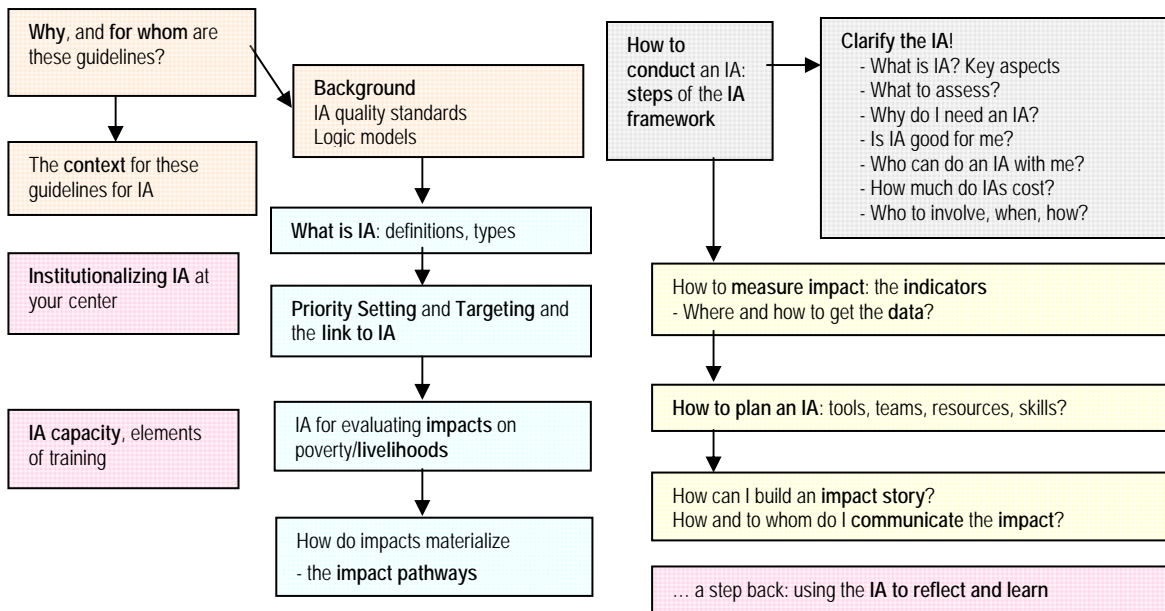# Operational guidelines for assessing the impact of agricultural research on livelihoods

Good practices from CIMMYT

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Preface

This manual responds to the need of CIMMYT scientists and field partners for guidance on impact assessment (IA) . It has been developed through a two-year process involving colleagues at CIMMYT and various stakeholders of CIMMYT work.

The guidelines naturally draw on many sources of information on IA, and condense and enhance what is known about IA for hands-on users: researchers and managers of crop improvement projects and their NARS partners interested in IA, and social scientists who are not expert in IA.

This manual will initially be published on-line so that it can be easily upgraded and linked to other sources. Users will be able to provide feedback, upgrade and enrich the content, and add details to IA case studies.

The aim of this document is to help ensure quality in IA, institutionalize good IA practices, provide a resource list of approaches, tools, and suggestions, and give examples of how CIMMYT does good IA with partners in diverse places and conditions.

The manual often refers to complementary documents, such as the "Strategic Guidelines" that are forthcoming from the Standing Panel on IA (SPIA) of the CGIAR, and draws from many sources.

Please inform us of any instances where we have neglected to cite original sources, so we can revise the manual accordingly.

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Available at http://www.cimmyt.org/english/docs/manual/ia/index.htm

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Contents

Acknowledgements

Acronyms

Acronym		Website
IA and M&E	Impact Assessment and Monitoring and Evaluation of impacts	
CGIAR IMPACT	Consultative Group on International Agricultural Research	http://**impact**.cgiar.org/
CGIAR	Consultative Group for International Agricultural Research	www.**cgiar**.org
CIAT	International Center for Tropical Agriculture	www.**ciat**.cgiar.org
CIMMYT	International Maize and Wheat Improvement Center	www.**cimmyt**.org
DAC	Development Assistance Committee (OECD)	www.**oecd**.org/dac
DFID	Department for International Development	www.**dfid**.gov.uk
DREAM	Dynamic Research EvaluAtion for Management	www.**ifpri**.org/**dream**.htm
EIARD	European Info System on Agric. Research for Development	www.**eiard**.org;http://www.infosysplus.org/
FAO	Food and Agriculture Organization	www.**fao**.org
GTZ	German society for technical cooperation	www.**gtz**.de
ICARDA	International Center for Agricultural Research in Dry Areas	www.**icarda**.cgiar.org
IDRC	International Development Research Centre (evaluation)	www.**idrc**.org/evaluation
IDS	Institute of Development Studies	www.**ids**-ps.org
IFAD	International Fund for Agricultural Development	www.**ifad**.org
IFPRI	International Food Policy Research Institute	www.**ifpri**.org
ILAC	Institutional Learning and Change	www.cgiar-**ilac**.org
IMPACT	(model, IFPRI)	www.**ifpri**.org/themes/**impact**.htm
IRRI	International Rice Research Institute	www.**irri**.org
ISNAR	International Service for National Agricultural Research (NL)	www.**isnar**.cgiar.org
MDGs	Millennium Development Goals	www.un.org/**millenniumgoals**
ODI	Overseas Development Institute (UK)	www.**odi**.org.uk
OECD	Organization for Economic Cooperation and Development	www.**oecd**.org
PSIA	Poverty and Social Impact Analysis	spa.synisys.com/resources/draft**PSIA**UserGuide.pdf
RWC	Rice-Wheat Consortium for the Indo-Gangetic Plains	www.**rwc**.org
SC	Science Council (of the CGIAR)	www.**sciencecouncil**.cgiar.org
SPIA	Standing Panel on Impact Assessment	www.sciencecouncil.cgiar.org/activities/**spia**/
WB	The World Bank	www.**worldbank**.org

1. Introduction

Impact assessment (IA) in agricultural research is the effort to measure its social, economic, environmental, and other benefits. IA is important because stakeholders expect research organizations such as CIMMYT to account for their use of resources, as well as learning from and adjusting to new challenges. These guidelines present major considerations to be addressed in designing and implementing IA. They are intended for partners in national agricultural research systems, universities, non-government organizations, or others who may have limited background in IA or economics and who are charged with conducting IA for their projects and programs. It may also be of interest and direct use to colleagues in other CGIAR centers.

The need for guidelines for assessing impacts on livelihoods

Many methods, tools, and standards are available for doing IA, yet there are two essential requirements:

1. IA must be integral part of the organization's core business and knowledge management.
2. Formulating the right questions, designing the study, communicating throughout the assessment, and taking action on recommendations are as important as the actual IA results.

Neglect of these requirements can seriously jeopardize the value of IA, resulting in studies that simply comply with pre-established rules and targets, playing it safe, or adopt a defensive stance or displace goals (Perrin 2002).

Applications of the guidelines

The guidelines essentially follow a livelihoods approach to arrive at a comprehensive, poverty-explicit IA. The document will assist in:

- Understanding what is meant by IA and why IA studies are needed and important.
- Designing IA studies that respond to external and internal demands.
- Increasing awareness of available approaches.
- Identifying good practices for quality IA and making informed choices on data and methods.
- Teaching the key elements of well designed IA studies or projects with IA elements.

Structure of the guidelines

This document contains step-by-step guidelines for IA and presents procedures, methods, and options to help users develop appropriate IA for projects or studies. The document provides:

- A selection of IA good practices, tools, and methods with examples, in the form of Boxes, often with a brief description of their main strengths and weaknesses.
- Suggestions on minimum datasets from which to select indicators of impact on livelihoods.
- Key approaches for assessing impacts of agricultural technologies on farmers' livelihoods.
- A checklist for designing an IA project or identifying projects that would benefit from an IA component.
- References from the international (Annex 5) and CIMMYT (Annex 6) literature; and web links to resources and organizations (Annex 7) from CIMMYT's experience.

Figure 1. Flowchart of contents.
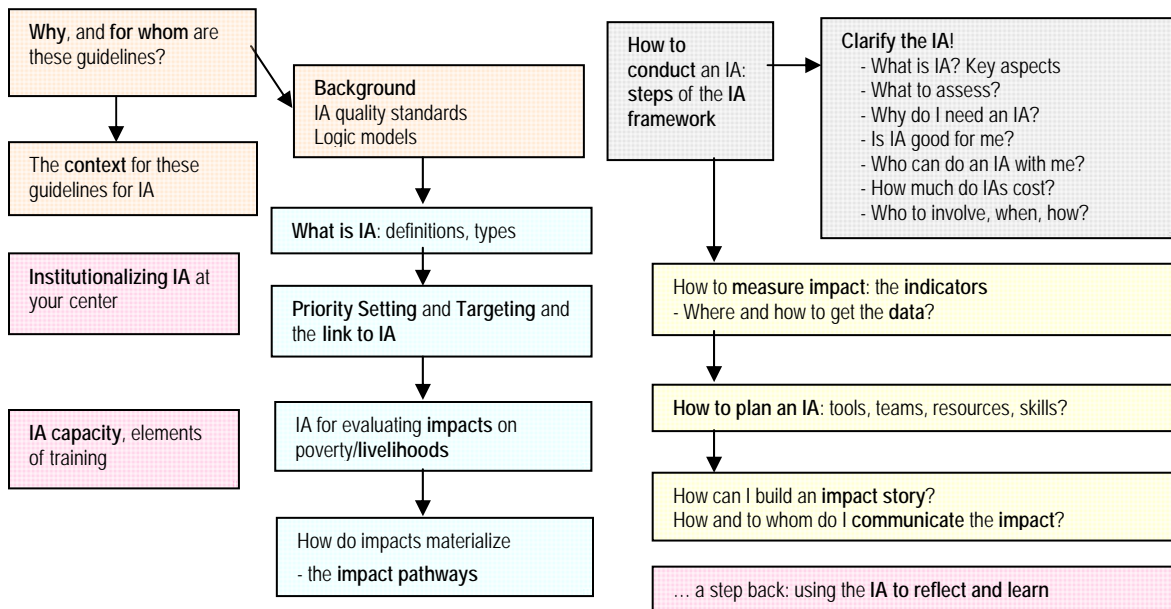
Definition of impact and impact assessment . IA involves observing, measuring, and describing how the condition being assessed (e.g., poverty) has been influenced by intentional human action. It should compare achievements with planned targets, or how things were before and after the intervention, and include a critical review of the assumed chain of causal influence. A classic understanding of impact is that of direct effects on income from increased adoption and use of technologies, as measured by numbers of farmers or area planted with an improved technology, yield increases, productivity growth, and the economic effects of adopting new technologies. Yet there is increasing recognition of the need to go beyond these forms of understanding of impact and include other and more comprehensive measures.

In this sense, having an impact means having an effect on farmers' livelihoods and well-being, contributing to policy debates, influencing processes and outputs, creating change, and providing benefits to users. The effect is the intended or unintended change due directly or indirectly to an intervention. "Process impacts" are currently not fully defined but are important: for instance, process impacts may refer to changes in institutional, developmental, and policy level impacts that directly or indirectly, and in the longer run, lead to improved livelihoods.

Impact Assessment (IA) is defined as "a process of systematic and objective identification of the short and long-term effects–positive and negative, direct or indirect intended or unintended, primary and secondary–on households, institutions and the environment caused by on-going or completed development activities such as a program or project." An IA helps researchers in development to better understand the extent to which activities affect the poor, which objectives are fulfilled, and the magnitude of their effects on people's welfare.

An IA evaluates the effects of the different stages of an innovation system or intervention, from:

Research Inputs > Research Outputs > Outcomes > Final Impacts

The IA should provide information and results that are credible and useful, enabling lessons learned to be used for decision making by all stakeholders.

Impacts are the broader, longer-term, economic, social, or environmental effects resulting from research or development interventions. Evaluation is a systematic and objective process of judging, appraising, or assessing the worth, value, or quality of interventions in terms of their relevance, efficiency, effectiveness, and sustainability, as well as impacts. Linkages exist

between the two terms and practices, and several elements and results of an IA can be used for the purposes of evaluation, but there is a clear distinction between the two.

Impact monitoring and evaluation (M&E) is a systematic, ongoing process of data collection on given indicators, to ascertain the long-term, widespread, intended/unintended consequences of an intervention and to monitor progress towards wider livelihood improvement goals. M&E seeks to provide stakeholders with an indication of the extent to which objectives are being or have been achieved. Monitoring and evaluation are complementary, but distinct processes.

Overview of key operational concepts for impact assessment

Livelihoods

Livelihoods have been defined at CIMMYT as the "*stocks and flows of assets and the ways these contribute to farmers' well-being*" (based on definition by staff, see section: Institutionalizing impact assessment). A livelihoods approach means considering the impact of technologies or of projects on farmers' livelihoods. This shifts the focus from maize or wheat crops alone, to approaches that link them to the stocks and flows of household assets and activities. These guidelines define livelihoods as *"the capabilities, assets, and activities required for a means of living. Livelihoods are sustainable when they can cope with and recover from stresses and shocks and maintain or enhance the capabilities or assets, while not undermining the natural resource base."*

The livelihoods approach focuses on people's lives, rather than resources or project outputs.

A livelihoods approach to IA means that:

- Poor people become the focus.
- A wide range of beneficiaries will be involved.
- Impacts and the links between impacts need to be understood at the local, national, and policy levels. This means looking beyond households to impacts on organizations (capability, culture) and on society at large (values, attitudes).

Impact assessment that takes a livelihood approach (Figure 2) measures changes in the factors that affect livelihoods: capital assets, institutional structures or processes, the resilience or vulnerability of households, and livelihood strategies and outcomes.

A livelihoods approach (see Sustainable Livelihoods Guidance Sheets) can be used as a checklist of important issues to be considered systematically in doing an IA, to design indicators,

and to understand how indicators link to each other. Adato and Meinzen-Dick (2007) describes applications to implement an IA and draws the attention to the core influences and processes and emphasizes the multiple interactions between the factors that in practice affect livelihoods.

Figure 2. Sustainable livelihoods framework.
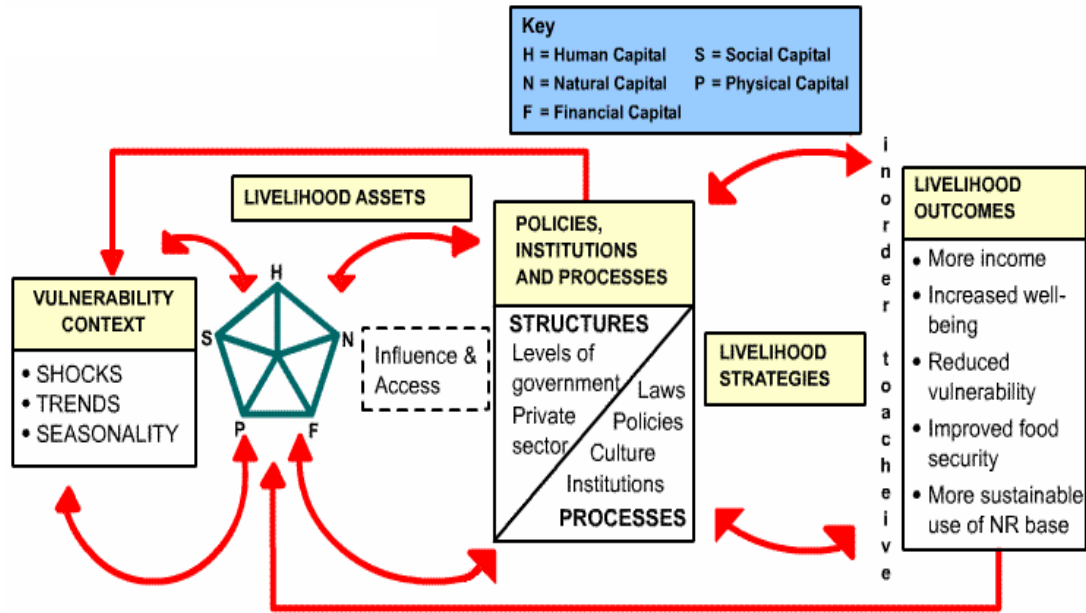
Livelihood assets can be classified into five groups.

Natural capital - natural resources from which resources and services for livelihoods are derived (e.g., vegetation, land, water).

Social capital - social organisations that facilitate or constrain cooperative enterprises, inter-household relationships, formal/informal networks.

Human capital - education, knowledge, health that enable people to solve their own problems and to pursue different livelihood strategies.

Physical capital - infrastructure, equipment, property to support livelihoods (affordable transport; shelter; water supply, sanitation; energy).

Financial capital - financial resources that people use to achieve their livelihood objectives (e.g., access to credit, loans, savings and remittances).

The interaction of livelihood assets with **policies, institutions, and processes** and with **livelihood strategies** *(*combinations of farming and non-farming activities, for example, migration, off-farm work, abandoning farming for urban employment, farming diversification or, intensification) influence people's livelihoods.

People in rural areas have complex livelihood strategies. Box 1 shows the application of livelihood concept to a typical farmer in a marginal maize- and wheat-growing area.

Box 1. Application of livelihood concepts to a typical farmer.

(CIMMYT work contributes directly or indirectly to the areas shown in **bold**)

Livelihood capitals	The farmers' context *before* research or development	The farmers' context *after* research or development
Natural	Limited land which may be degraded. No irrigation and poor rainfall. Does not use improved technologies.	Limited land which may be less degraded. No irrigation and poor rainfall. **Uses improved germplasm and conservation agriculture options.**
Social	Large family. Member of farmers' groups. Not participant in selection trials. Belongs to political association and church	Large family. Member of farmers' groups. **Participant in selection trials.** Belongs to political association and church.
Human	Limited education. HIV/AIDS in the family. Not member in participatory variety selection activities. Poorly nourished children. Labour focused on food crop production.	Limited education **but more aware of varietal and crop management options**. HIV/AIDS in the family. **Member in participatory variety selection activities. Better nourished children. Labor released for cash crops or off-farm income.**
Physical	Modest house. No post-harvest storage. Poor sewage system.	Modest house. **Post-harvest storage (metal silos).** Poor sewage system
Financial	Savings in good years only. No credit access. Receives remittances.	**Savings in some bad years also**. No credit access. Receives remittances

To implement a livelihood approach, centers like CIMMYT are adopting a broader view of productivity that includes improvements to the livelihood capitals and specifies the circumstances in which better productivity will improve livelihoods in maize and wheat systems.

The causal relationships between adoption, productivity, and livelihood improvements depends on the nature of the farming and livelihood systems. To define causal relationships as integral parts of IA approaches, Centers should partner with specialists from a variety of fields and endow their staff and partners with a wide set of skills[1] to conduct IA projects. This also entails the need to recognize that attributing impacts becomes more difficult, although several analytical tools are available for the purpose (see for instance Alston and Pardey 2001).

As agriculture is only part of rural livelihoods, IA of agricultural technologies needs an integrated, interdisciplinary approach combining conventional quantitative economic tools with systems modeling and qualitative tools. This means integrating household surveys, social analyses tools, gender, institutional, stakeholder, and markets analysis and measuring unintended as well as intended impacts (whether positive or negative).

[1] Other examples are contained in Adato and Meinzen-Dick (2007). One characteristic of the Oaxaca case used in these guidelines is that it explicitly defines and uses the counterfactual, according to the good practices described in this document.

Implicit in the livelihoods approach is the need for quantitative and qualitative baseline data that include indicators beyond those relating to maize and wheat. Each IA will need to be tailored to specific circumstances. The need for broad sets of impact indicators means that stakeholders need to agree on indicators at the design stage. Changes in measurable indicators (e.g., cash, yield) must be assessed in terms of how they contribute to livelihoods directly (e.g., to income, food) or indirectly (on assets, options, ability to cope with shocks). Changes in *how* people live may therefore become just as important as the more obvious changes in *what* people achieve. Livelihood approaches to impact assessment seek to answer questions such as:

- What are people's livelihood priorities and which of these is the project aiming to meet?
- In what ways will the project affect the livelihoods of target groups?
- How do livelihood strategies affect how different groups get involved in a project?
- How can the project enhance the livelihoods of target groups?

Livelihood approaches to impact assessment also assess the impact of technologies that:

- Maximize average production and stabilize yields.
- Are successful with high inputs under good conditions and low inputs in poor conditions.
- Reduce workloads, freeing up household labor for other uses.

They also seek to answer questions about the context in which technologies work:

- Does the technology change people's ability to cope with temporary changes and shocks, and capitalize on and adapt to positive trends and permanent changes?
- How does the technology relate to long-term trends, and does it compensate for or amplify their effects?

The livelihoods approach considers different levels, factors, and driving forces, and captures a broad picture of impacts in rural areas. This means that IA of agricultural technologies through a livelihoods lens draws upon conventional quantitative economic methods, tools for modeling systems and pathways, and qualitative tools.

To illustrate the application of livelihood approaches in IA we have drawn on the following:

- Livelihood guidance sheets (Sustainable Livelihoods Guidance Sheets).
- Methodologies for conducting a livelihoods baseline (LFP 2004).
- Methodologies for livelihood IA (WWF in East Africa), ODI.

- Tools for sustainable livelihoods M&E, IDS, 2001.
- A manual by Bellon (2001).
- Meinzen-Dick, Adato, Haddad, Hazell (2004).

Poverty

Even when agricultural research generates large gains in yield (Evenson and Gollin 2003), poor farmers may not benefit (Kerr and Kolavalli 1999). Poverty is not only about low incomes but includes food insecurity, social inferiority, exclusion, lack of assets, and vulnerability.

To assess the impact of agricultural research on poverty means using tools, such as poverty mapping and ex-ante assessment, to identify where impact can be achieved. These take into account diverse factors, technologies, and externalities, and measure the impact of research products on poor consumers, as well as on food security and policies that affect poverty. The impact of research and development (R&D) interventions on poverty can be measured in:

- <u>Monetary</u> terms, where poverty is viewed as a shortfall in income below a given level. The impact is the effect of the R&D on income. If the tools are appropriate, monetary metrics can take into account the heterogeneity of the effects of a R&D intervention across target groups.
- Terms of <u>capabilities</u>, where poverty is viewed as a failure to achieve minimal or basic capabilities. The impact is the effect of the R&D on capabilities. A capability approach sees development as the expansion of human capabilities (for instance improving the capacity of farmers to cope with risk), rather than maximizing income.
- Terms of <u>social exclusion</u>, meaning total or partial exclusion from participation in society. The impact is the extent to which R&D fosters inclusion. The social exclusion concept deals with the processes of marginalization and deprivation, usually of specific groups rather than specific individuals.
- Terms of <u>self-perception</u>. In the self-perception approach people themselves, rather than outsiders, decide on the impact of R&D.

Other key concepts in impact assessment

Other key concepts for IA are listed below and described in more detail in Annex 1.

Adoption is the process by which innovations are accepted and used by people. Adoption is influenced by factors such as perceptions, the policy environment, socioeconomic characteristics, and the technology.

Attribution is the process by which a causal link is ascribed between observed (or expected) changes and interventions. It serves to assess those who at different levels and stages were involved in a project, program or in the development and diffusion of a technology, and their roles.

A **counterfactual** is what would have happened without the intervention. See Step: II in the IA framework: Focus on the key questions and hypotheses, for details.

The **impact pathway** is the chain of events and outcomes that link outputs to goals.

Outputs are products of development interventions and result in changes that achieve outcomes. **Outcomes** are the likely or actual short-term and medium-term effects of intervention outputs.

Links between impact assessment, priority setting and targeting

IA is increasingly recognized as a set of related activities:

- Ex-ante IA to forecast impacts.
- Monitoring during projects.
- End-of-project evaluations.

These link with priority setting and targeting (Figure 3). Starting points are often a baseline study and ex-ante forecasts of future events that coincide with or precede interventions. Targeting and describing the pathways that lead to intended impacts normally precede a project or take place during early stages. Monitoring during the project tracks progress on project indicators. At the end of projects, or some time after, ex-post IA studies take place, ideally as a comparison with baseline circumstances. Lessons learned can be fed into priority setting for follow-up phases. This framework is related to that which appears at www.impact.cgiar.org.

Figure 3. Links between impact assessment, priority setting and targeting.
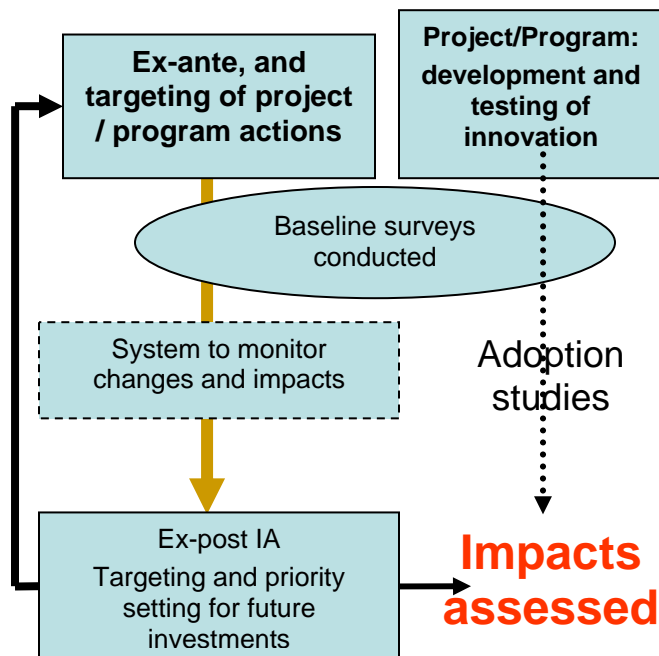
External demand for IA

There are two major trends in the external demand for IA. First, demand for externally conducted IAs is growing. Second, the demand for IA comes increasingly from larger national agricultural

research systems and research centers in developing countries—Africa, India, China, Brazil. CGIAR centers and their partners now account for only a limited fraction of international agricultural research for development.

Strong demands for evidence of the impacts resulting from work by international agricultural research Centers comes among donors (Raitzer and Winkel 2005). The impacts of agricultural research on mission-level development goals, chiefly poverty alleviation and the distribution of benefits, constitute an increasing focus. Often managers and scientists in the CGIAR want concise summaries and briefs from an IA, which they also use to inform higher-level decision makers or the public.

Whereas social scientists increasingly demand ex-ante studies, breeders and other partners tend to require ex-post studies. The external pressure to ensure credibility means as well that the "learning" aim of impact studies is of growing importance. Finally, the demand for IA studies commissioned and conducted by experts external to a Center or project is increasing.

Investor demands

Donors require evidence of the impacts of agricultural research (Raitzer and Winkel 2005), particularly how it reduces poverty and how benefits are distributed. Decisions on priorities and funding are mostly driven by ex-post rather than ex-ante IA studies.

Few investors, however, have reported a direct instrumental use of IA information to decide on funding. IA is said to influence decision making more indirectly, through an improved understanding of overall research and science issues. While most CGIAR members appreciate economic metrics, such as internal rates of return, others are concerned that economic metrics do not always inform adequately about the distribution and social implications of research benefits. According to EIARD (2003), good IA studies need to enhance the developmental impacts of research investments for poor people. Information about returns on investment is important, but analyses should go beyond easily-measured impacts, seeking to capture complex, non-linear innovation processes and effects on livelihoods. Because of the difficulty in attributing impact to specific research outputs, searching for plausibility rather than proof of impact can help to produce useful information and insight at reasonable cost.

Partner demands

National agricultural research systems, non-government organizations, and advanced research institutes have their own expectations and uses for IA, including the following:

- Guidance for rationalizing research budgeting.
- Improving the likelihood of sustained financial support.
- Comparisons across research projects and identifying areas for improvement.

Internal demand from CIMMYT

Many well-known impact assessment from CIMMYT have focused on adoption rates and rates of return to investments in crop improvement. The vision document "Seeds of Innovation" (CIMMYT 2004) emphasizes people-centered, livelihoods- and poverty-oriented, systems-based approaches to research. The CIMMYT Business Plan for 2006-10 states that IA must assess a broader range of impacts than in the past, including vulnerability, poverty, and the distribution of benefits. Direct and indirect impacts arising from linkages within farming systems and between agriculture and the non-farm economy should also be recognized. Finally, current strategies propose embracing diverse stakeholders, each with different expectations for IA. In this context, IA helps CIMMYT staff and partners to conceptualize and communicate project and program results internally or externally.

Capacity for IA

To enhance its IA capacity, CIMMYT analyzedkey strengths and weaknesses of center staff and partners in this area. The strengths of CIMMYT staff were in traditional IA—adoption studies, financial analyses, estimating the number of varietal releases, estimating the areas planted to new varieties, and biophysical analyses. CIMMYT staff were relatively weaker in assessing impacts on livelihoods, assessing impacts on policy, equity and poverty, and in training on IA. However, CIMMYT could count on a team of social scientists familiar with innovative approaches and able to appreciate farmer realities, both skills that complement livelihood approaches. CIMMYT partners generally lacked IA skills and experience, except in biophysical analyses, although capacity varied. The concluding section of this document on Training in IA summarizes the key elements of training required for a livelihoods approach to IA.

IA approaches to date: strengths and weaknesses

The CGIAR has a long history of IA that has produced a wealth of information and understanding, for example on adoption of new varieties and returns on investment in germplasm improvement. Yet, according to Matlon (2003), weaknesses also exist: "*A primary objective driving many studies was to demonstrate impact, to show donors that their investments in center research were well spent, and thereby to mobilize additional resources. Departing, often unconsciously, from the classic scientific method of hypothesis testing to move towards a demonstration mode, methodological problems became increasingly apparent: selection of successful cases for IA studies, inconsistent use of counterfactuals, overestimating benefit attribution to center activities, and restricting the dissemination of less favorable studies biased results and undermined their credibility and value. Donors and an increasing number of critics, also within the CGIAR, began to challenge the accuracy and representativeness of the exceptionally high published rates of return. As a result, both the resource mobilization and accountability goals of IA studies were often not achieved.*"

Many difficulties stem from inadequate conceptualization of the innovation process itself and from the challenges of attributing impact. Innovation is a complex process in which technology is only one factor (Kuby 1999). Because innovation is the result of social interaction, development impact is never the result of the activities of a single factor such as agricultural research. Research can work towards development goals but it cannot guarantee that the goals will be reached.

For effective IA of research it is necessary to recognize that innovation is a social process. IA research needs to abandon the idea of scientific proof and aim for plausible arguments and claims as to the causes of impacts (EIARD 2003, Alston and Pardey 2001).

Impact assessment quality standards

Quality IAs meet accepted social science and international standards for:

- Utility, Feasibility, Accuracy, Propriety, Transparency.

These standards are modified from the African Evaluation Society (Annex 4). Since implementing all the standards may be impractical, the principles of usability and feasibility are recognized as being the most critical. Standards address the ethics of IA (see also Box 12).

2. Good practices in conducting impact assessment

The key steps in designing an IA are shown in Figure 4. They address the issues of clarifying the purpose of the IA, planning to involve stakeholders, communicating the results, identifying the conceptual framework that guides the IA, and drawing up timeframes and budgets. The steps, developed at CIMMYT, build upon the framework proposed by Patton (1995) and EIARD (2003):

I. Clarify the IA: Clarify the background, context, key hypothesis, demand, purpose, intended uses and users, and (involve) key stakeholders.

II. Focus on the key IA issues: What is the innovation that needs to be assessed, its scope, timing? What is the logic model? What are counterfactual and attribution questions?

III. Plan the IA: Identify the key disciplinary expertise needed, set up the best possible team for the assessment, plan to learn from and use the IA results.

IV. Select from a variety of methods; focus on the key data and indicators for the IA.

V. Assess the roles that different agents and factors have played in achieving impact, the pathways by which impact was / was not achieved, and the expected magnitude of impacts.

VI. Acquire the agreed key data and information from primary and secondary sources.

VII. Assess and analyze impacts, interpret the findings, and develop recommendations.

VIII. Report to facilitate understanding; disseminate and communicate the findings.

IX. Evaluate the assessment; reflect and learn internally.

Figure 4. The IA framework: Key steps in designing an IA.

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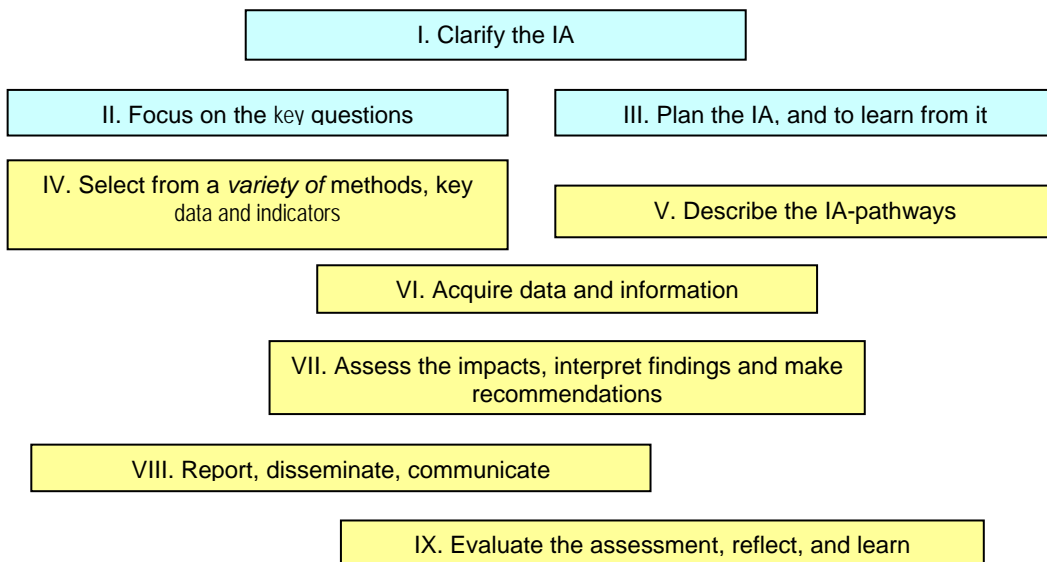
Although Figure 4 shows a linear presentation of the steps in IA, in reality these are rarely sequential but are iterative and interrelated. The framework is constructed from the assessor's point of view, but can also be used by other stakeholders starting at other entry points. It is crucial to negotiate and communicate with users during the IA process, since users need to be involved in key decisions to get their acceptance and buy-in to the results.

Examples from CIMMYT's recent experience of designing IA studies for research projects are used to illustrate the framework in practice. The examples mostly discuss the impact of activities in which downstream livelihood impacts were intended. The study on the livelihood changes and impacts of previous maize diversity projects in Oaxaca, Mexico (Box 2) is used more frequently. However, it has not been published yet and will be dealt with in more depth in next updates of these guidelines. Other CIMMYT IA case studies will be added online as soon as completed, as practical illustrations of the elements, steps, and practices discussed in these guidelines.[2]

Box 2. Assessing livelihood changes and impacts of CIMMYT projects in Oaxaca, Mexico.

CIMMYT conducted extensive participatory research in Oaxaca, Mexico, from 1996 to 2001. The project (www.cimmyt.org/Research/economics/oaxaca) aimed to study and preserve the diversity of maize landraces and increase their productivity. The approach included a baseline study of household characteristics and a household and diversity monitoring study (Smale et al. 2003). Training courses and field demonstrations were arranged for farmers, focused mainly on maize diversity, and included the promotion of maize post-harvest technology (metal silos).

In 2006, nearly a decade after the research started, CIMMYT assessed the longer-term impacts of the project and how livelihoods had changed, to learn how future projects can have more impact. The assessment used a livelihoods approach, econometrics, and partial economic budgets analysis. To run both "with/without" and "before/after" comparisons and relate changes to baseline data, 120 households were sampled semi-purposively as well as randomly. A clustering technique was used to group households into 4 typologies with homogeneous characteristics based on 13 livelihood assets--11 quantitative and 2 qualitative (binomial) (see Box 6). The 2006 assessment showed that nearly a third of farmers were using maize derived from the Project; half of those had been participants in the project, but non-participants had also adopted varieties promoted by the project. Silos had also spread among farmers, both through a process facilitated by CIMMYT and through farmer-to-farmer diffusion. Silos were successful because they substituted well for local storage practices and met farmers' needs to reduce losses of stored grain/seed and to foster economical consumption. Participants had however forgotten part of what they learned from training and demonstrations, and had applied relatively little. The average

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[2] Bellon et al. (2007) also provide examples of the application of a livelihoods framework to IA at CIMMYT. Other examples are contained in Adato and Meinzen-Dick (2007), of which the Bellon study is part. One characteristic of the Oaxaca cases used in these guidelines is that it explicitly defines and uses the counterfactual, according to the good practices described in this document.

farm size had increased in line with extensification, and there was a general decline in the area of maize. About a third of households were poor and marginalized. The less-educated older farmers were often those who grew maize as their staple. Remittances remained an important source of income. In terms of maize diversity, in 2006 most farmers still preferred to grow '*Blanco'* maize because of its better marketing, consumption, and drought-tolerance. Adoption of CIMMYT seed took place most often in the most remote and least market-connected communities, where there were more poor farmers. Other goals of the project were to increase knowledge of maize diversity and generate and test new participatory research methods for working with farmers. These were beyond the scope of this livelihood change and impact study. The livelihoods approach indicates that the impact of the project was in some respects very positive (e.g., the silos) or positive (e.g., the adoption of maize varieties) and, in other respects, variable (e.g., effects of demonstrations and training). To these, the spillovers from increased knowledge about maize diversity and the participatory research methods developed should also be added.

The next section (2.1) focuses on good practices for designing an IA (steps I to III), while the following section (2.2) focuses on implementation (steps IV to IX).

2.1 Good practices in designing an impact assessment

(I) Clarify the purpose, context, scope, and limitations of the IA

Impact assessments take time and resources, so there need to be good reasons for doing them. Formulating the questions, study design, communication, and actions on recommendations are as important as the substantive results of an IA. Neglect of these can seriously jeopardize the value of an IA. Problems can also arise when an IA is conducted in a rigid, unimaginative, and bureaucratic way. The main questions that need to be answered to justify whether or not an IA needs to be done are given below:

What is an IA?

An IA is an "evaluation to determine consequences of an intervention." Social science and economic tools can be used to systematically quantify and measure values and indicators, and capture perceptions. IA includes:

- *Ex-ante studies*, done before an intervention is initiated or an outcome is generated to ensure appropriate targeting of research, resource allocation and priority setting;
- *Monitoring and evaluation* to monitor progress and impact of research activities; and
- *Ex-post assessment* to measure the outcomes of interventions and research.

What types of impact need to be assessed?

The main types of impact that need to be assessed are: *quantitative* (measurable), *qualitative* (observable), *direct* (e.g., yield increase), and *indirect* (e.g., less need to work off-farm). Adato and Meinzen-Dick (2007) provide a comprehensive classification and a list of practical examples.

	QUANTITATIVE	QUALITATIVE
Direct	Higher productivity, income	Reduced vulnerability, increased knowledge
Indirect	Lower food prices, changes in off-farm work opportunities	Community-wide empowerment due to knowledge of better varieties

Other types of impact are (examples in parentheses):

Tangible (income change by higher yield)	**Intangible** (changes in empowerment)
Positive (effects on participants' income, or less obvious ones more knowledge)	**Negative** (less access to natural resources used by the technology, reduced soil fertility)
Intended (more yield)	**Unintended** (fewer rural jobs)
Temporary (yield increase in a year)	**Permanent** (yield risk reduction)
Short-term (food security in lean year)	**Long-term** (better farming knowledge)

Why do I need an IA? How can we use the outputs of an IA?

Demand for IAs is growing because:

- Resources are scarce and must be targeted and spent effectively.
- Organizations such as CGIAR centers need to show that they can—and do—alleviate poverty.
- Proof is required that public investments (from tax-payers' money!) to research and development organizations actually pay off in the field.

Other reasons for doing an IA are to feed information back into programs, encourage internal learning, and better target and implement ongoing and future research. Yet traditionally, and most often, IA is done to ensure accountability: to give stakeholders evidence that investments in research are effective and relevant, and that continued investments are justified. IAs also:

- Provide estimates of the scale of outcomes for different demographic groups, regions and over time. These help target research and make it more effective.
- Measure the effects of an activity and distinguish these from the influence of other factors.
- Compare the effectiveness of alternative interventions.

- Clarify whether the costs of an activity are justified. This helps to inform decisions on whether to expand, modify, or eliminate projects or programs, and how to improve future activities.

The effort and resources invested in IA are particularly justified when the research is innovative, replicable, of practical use, and with defined applications, uses, and users.

Is IA good for my work? What if the IA shows little or no impact?

For all the above reasons, an IA can be extremely useful, even if it shows little, no, or negative impact, provided that the IA has captured the reasons and factors limiting impact. This is because one of the main and increasingly important purposes of IA is that of learning. IAs are effective and practical provided that a center has institutionalized IA as a tool for learning and for project or program improvement—meaning the results of IA are used in a context conducive to learning. Essentially, the results of an IA should provide answers to central development questions, for example, whether a project or institution is making a difference and to what extent, and should demonstrate impact on the ground. The systematic analysis and rigor achieved by using the results of IAs can give managers and policy-makers added confidence in decision-making and often lead to more and more effective funding.

Who do I need to develop an IA?

Donors, the main stakeholders, and the relevant policy-makers need to be involved in an IA from the beginning, to foster their buy-in to the results and the legitimacy of the design and recommendations. The IA team needs implementers with strong skills in the design of social science research, management, analysis and reporting, as well as a balance of quantitative and qualitative research skills. The actual mix of expertise and staff needed to conduct an IA will ultimately depend on the type of IA required (see also below).

Who does IA in and outside the CGIAR?

A typical CGIAR IA team is led by a social scientist. National partners and international experts play an important role. A list of roles in IA is given on page 31 and following pages, and Annex 7 gives a list of websites of organizations both within and outside the CGIAR that are involved in IA.

How do we get rapid and cost-effective IA?

The cost and speed at which IA can be done varies, depending on the type of project, its scope, its purpose, the resources (financial, human, data, time) available, and the location. Figure 5

indicates some of the costs and timing of IA, based on the actual costs and duration of previous CIMMYT projects.

What are the risks in doing an IA?

IAs may be expensive and time-consuming. Unless they are written into projects from the start, they may not be easily funded. There are, however, quick, cheap approaches to IA. Assessments that require more time, are not designed for rapid use by stakeholders, or are more academic risk being of less use, when decision-makers need information quickly. An IA may be of little credibility or scientific value, if appropriate counterfactuals are not identified.

Obviously, some IA studies may show limited or no impact, or may be perceived by users as negative relative to their initial expectations. This may happen especially if the lessons from the IA are not used positively for learning. Strategies to avoid negative perceptions of an IA are:

- Building IAs (and any evaluative analysis) into project proposals from the very beginning.
- Fostering a culture of continuous improvement in the institution that makes it safe for people to make mistakes and even to fail. This is only realistic if the mistakes and failures happen at the early stages of the work, before significant time or money are invested.
- Promoting self-assessment and peer review. Often people are more critical than outsiders of their own work.
- Be clear on what people will be held accountable for and discourage them from playing it safe. One way to do this is to hold people accountable for their behavior—it should be responsible and professional—rather than for specific impacts that cannot be guaranteed. If, for instance, a new variety is not accepted by farmers, the scientists cannot be held responsible, whereas they can be held responsible for taking action on the causes of the rejection.

How can the outputs of an IA study be (made more) credible?

IA is more likely to be credible when:

- The recommendations in these guidelines and in other mainstream good practice literature on IA are followed.
- The IA conforms to appropriate standards.
- Proper indicators, data, methods are used.
- The right IA questions are asked from the beginning.
- The right people are involved at the right time.

Given the complexity and cost of doing an IA, the costs and benefits must be assessed realistically at the outset, and appropriate alternatives considered (e.g., M&E instead of an ex-post[3] assessment). Alternatives should be seen as complementary rather than as substitutes for IA. The objectives of the IA need to be determined for the benefit of both the assessors and those assessed, and a common ground for assessment developed.

The first step is to **describe the background**. This means describing the political, social, cultural, and ecological aspects of the project or program in detail:

- History and current status of what is to be assessed.
- Names and types of organizations involved.
- Goals, scope, and size of the project or program.
- Sources of existing information (e.g., previous reports, performance monitoring).
- Who—people or institutions—requested the IA, and the reasons why it was requested.
- How and for what the information will be used.
- The intended audience for the findings and recommendations.

Clarifying the purpose of an IA means answering questions such as:

- What exactly is to be assessed? What is being analyzed?
    - (*Impact of what?*)
- What are the welfare (distributional), social, ecological impacts being assessed?
    - The distribution of costs and benefits among groups (e.g., rich and poor, men and women) is an important consideration when judging developmental impact.
    - Whose welfare is being analyzed? What is the impact being analyzed?
        - (*Impact on who?*)
- How, and by whom impacts are channeled?
    - (*What are the expected impact pathways?*)
- Who commissioned the IA?
    - Who has/should have a stake in it and should/may (want to) influence it?
- What are the risks of an unexpected outcome?
- Who should be involved in developing the IA?
    - (*What expertise is needed? Who should author the IA?*)

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[3] An example is a project commissioned by CIMMYT to assess the impacts of SG2000 interventions in Africa. This project, initially commissioned as an ex-post study, was reformulated during inception meetings with key stakeholders, the donor, and CIMMYT as an M&E project.

- Who will use the results?
    - o Users may include for example, project staff, beneficiaries, policy makers, donor.
- Which conceptual framework or perspective will be used and will guide the IA?
- How much time and money are available and needed for the assessment?
- What is the impact of (and on) governments, NGOs, the private sector and others?
    - o How do institutions affect the outcomes of the project?
        - ▪ Does the innovation affect the external forces (organizations, institutions, policies, markets, and social norms) that influence local livelihoods?
        - ▪ Does the innovation change the policies or behavior of others towards local residents, people's access to institutions, and their influence over them?
    - o How do stakeholders benefit or lose from the project?
    - o How do stakeholders affect the nature and scale of impacts on local people?
    - o How does the policy, institutional, and political environment influence the project and its impacts and the sustainability of project impacts?

Other questions address the strategic, spatial, and temporal dimensions of the IA:

- What are the system boundaries? What should/will be included and what should/will be excluded from the assessment?
- When are the impacts expected to materialize?
- At which level(s) should the IA be conducted? This questions calls for differentiating between the geographic and intervention levels, as discussed further below.

The answers to these questions should help both the assessors and the users of an IA study to identify the key factors affecting the impact, the distribution of impacts between stakeholders, and the wider development impacts of a project or program.

(II) Focus on the key questions and hypotheses

This section presents the key considerations and trade-offs in the design of an IA. The key aspects are:
- Identifying realistic counterfactuals.
- Accounting for lag times.
- The timing of the assessment.
- Defining the spatial dimensions.
- Attributing effects and impacts in the context of often complex, multi-player partnerships.

- Defining the logic model (Annex 2) to conceptualize the IA.

The counterfactual. Every ex-post IA starts with this, since the impact is the difference between the observed events and the counterfactual. If counterfactuals are not realistic, the results of an IA will have little credibility. Constructing a realistic counterfactual of projects or programs allows before/after and with/without scenarios to be generated (Baker, 2000) and attributes causal pathways to specific influences of a particular element relative to other drivers. Because of the complexity and typical dynamics of the agricultural context, "before" scenarios cannot always be assumed to be accurate counterfactuals to "after" scenarios. The before/after scenarios are not sufficient as counterfactuals; with/without scenarios are also needed. With/without counterfactuals are normally made of participants (in innovations or programs) versus non-participants, or of adopters (beneficiaries, for instance of a new variety) versus non-adopters (non-beneficiaries).

Building counterfactuals in agriculture is complex because of the dynamics, externalities, policy influences, conflicts, and social, ecological and technological changes, which are the product of the interaction of different innovations. It is not easy to isolate the role of single innovations, as these are the result of collaborative efforts of scientists and institutions. It is thus challenging to determine what the course of events would have been if single contributions were removed. Counterfactuals must take into account the dynamic nature of innovations and capture valid technological alternatives for farmers, including innovations that would be produced by other institutions in the absence of the assessed research. In the case of international-public-good research outputs, a true control sample for comparison with a treatment group can hardly be isolated since public good information is freely available. As a result, experimental controls, as described later in the methods, are rarely possible and quasi-experimental controls must be used. Adato and Meinzen-Dick (2007) give a definition of the ideal counterfactual that comprises a quasi-experimental design (page 47) with randomly chosen adopters and non-adopters, supported by baseline and panel data collected over time.

Attribution means ascribing a causal link between observed (or expected) changes and specific interventions. It serves to assess who—institutions, stakeholders, researchers, or farmers involved at different levels—had a role in the development and diffusion of an innovation and, therefore, an impact. At the project or program level, establishing a counterfactual relative to a specific program is equivalent to attributing the causal pathway of specific actions to a particular institution, relative to other drivers of change. Attribution refers to what is credited for observed changes or results achieved. It represents the extent to which observed effects can be attributed to a specific intervention or to the performance of one or more partners taking account of other interventions, anticipated or unanticipated confounding factors, or external shocks.

Attribution can be difficult because of:

- Spatial differences: for example, local interventions, or the wider spillovers.
- Stakeholder diversity: for example, researchers, farmers, institutions, investors.
- Temporal differences: for example when given players entered (or exited) the process that ultimately led to given impacts.
- Different outputs: technologies, capacity building, knowledge, empowerment; this gets more complex when natural resource management technologies are included.
- The lack of a counterfactual or a wrongly-defined counterfactual.

Yet attribution is needed because of:

- Different interests and pressures, and the need to anticipate stakeholders' claims.
- Bias (for example, bias towards wining projects), neglecting costs, or overestimating benefits, or neglecting certain stakeholders, partners or previous projects or investments.

It is not always feasible or desirable to attribute results to the actions of partners in collaborative research efforts, since often the actions of one partner alone would have not produced adoptable outputs without the contributions of others. Attempts to attribute credit may offend the partners involved. In such cases a viable solution is to consider and attribute collaborative efforts jointly.

Identifying the application of agricultural and related research outputs may often be complex, especially in the case of research programs that do not directly produce finished tools or improved physical inputs. Good examples are the intermediate genetic research outputs of CIMMYT that are used by others but do not directly impact on livelihoods; or documents, recommendations, and policies that draw on agricultural research results but do not produce direct impacts. The impact of these can only be attributed by gathering evidence (through interviews and case studies) on the contribution they made from those involved.

Lag times and timing are other critical issues to be considered in doing an IA. It is important to consider lag times, because research is typically a cumulative and evolutionary process in which new findings are partially a product of past findings. Problems arise in attributing impacts from previous projects, the sunk costs of previous investments, the direct costs (evaluations, travel, field work, building data systems, analysis, overheads), and the opportunity costs (scientists' time, participatory research or ex-ante studies performed at the beginning of the process). Each new finding or technology that leads to successful innovations takes time to be applied broadly. It

is thus important to be careful in the temporal attribution of research efforts, as current achievements may stem from previous research.

Research investments are often regarded as sunk costs, so internal rates of return are calculated for the marginal investment of new research and can vary significantly, depending on assumed lag times. This may be reasonable, if the counterfactual assumption of no alternate provision of the output is valid. Lag times also present challenges for the timing of ex-post IA, as it may be several years before research products are widely adopted and produce benefits (for example, the impact of conservation agriculture on soil health in farmers' fields may not be evident in less than 5 years). IA studies often attempt to project benefits into the future, but time lags may complicate quantification. Ideally, ex-post IA should take place at the program or institutional level every 5-10 years.

The **dimension** or **level** of the assessment depends on the geographic or institutional mandate of the study, and can be interlinked with and differentiated between geographic and intervention levels. Recognizing the presence of different levels and factoring this into the design and analysis of impacts is critical to capture the effects and interpret the explanatory factors leading to impact.

The geographic levels comprise the following:
- International (e.g., global impacts of drought-tolerant maize research).
- National (e.g., impacts of maize breeding in Mexico).
- Regional (e.g., impacts of various CIMMYT and partner projects in Oaxaca, Mexico).
- Community (e.g., impacts of a CIMMYT project in Huitzo village, in the Oaxaca project).
- Household (type) (e.g., impacts of maize varieties on poor households in Oaxaca).
- Field (e.g., impacts of improved maize varieties on clay soils).

The intervention levels comprise the following:
- Global or regional (e.g., global or Africa-wide impacts of maize improvement).
- System-wide (e.g., impacts of wheat breeding by the CGIAR).
- Institution (e.g., impacts on the internal dynamics of implementing organizations, their policies, service delivery mechanisms, management practices, and links among these).
- Program (e.g., impacts of the wheat improvement program in Turkey), in general of a development program involving multiple activities that cut across sectors, themes and/or geographic areas, grouped to attain specific development objectives.
- Project (e.g., impacts of the Nepal hill maize project on Nepalese maize farmers), in general of a development intervention designed to achieve specific objectives with given resources and implementation schedule, often within the framework of a program.

- Study (e.g., impact of a study on maize diversity in Oaxaca in terms of learning and targeting).

(III) Towards implementation: Ensuring partners' involvement, and planning for learning and communicating the results

This section gives good practices for planning IA to:

- Ensure stakeholder involvement and buy-in.
- Learn from and use the outputs.
- Enhance the credibility, use, and dissemination of the results.

An IA needs relevant, action-oriented findings and, to encourage action and reflection, the **involvement of clients and users** from the beginning. Stakeholders involved in or affected by an IA (including the beneficiaries) should be identified and included, so that their needs can be addressed and they can use the findings. An IA should thus include key users and anticipate and gain the cooperation of interest groups, to avoid any attempts to influence the findings. The main *stakeholder groups* should be identified, and grouped into those with common interests: direct participants (e.g., owners, workers, customers), affected non-participants (e.g., local residents), or those who may want to influence the project. Stakeholder groups may be sub-divided further depending on factors such as scale and benefits.

Once the groups of stakeholders have been identified, **consultation and negotiation** are needed to get agreement on indicators, how to measure impact, baseline data, and the standards to be applied throughout the IA process. The IA should be planned, conducted, and reported in a way that encourages follow up by stakeholders and increases the chances of the findings being used. An IA should be presented as an asset and opportunity for those being assessed, since it requires their time and resources, and their input should, therefore, not be taken for granted. Staff may be concerned about participating in the assessment of a project or program that evaluates their own work. It is thus important to examine honestly and openly what has/hasn't worked, to include both successes and failures and identify positive lessons.

Obligations should be formalized in writing, so that participants have a common understanding of the IA and of options for renegotiating the agreement. Informal and implicit expectations by all parties should be considered. Conflicts of interest, if any, should be dealt with openly, so as not to compromise the reliability and credibility of the process and results.

The CIMMYT experience of institutionalizing IA flagged the need to establish control mechanisms to ensure that IA and M&E achieve and maintain high quality. This can be done by establishing an IA focal point for quality control. The focal point can be supported by scientists representing each program who perform peer evaluation, give guidance, harmonize, synthesize and support the IA process.

Responsibilities and roles

A multidisciplinary IA **team** is crucial for the success and credibility of an IA. Depending on the objectives, team members may contribute at different stages and participate to different degrees. If the IA involves collecting field data, the staff should be a mix of people from the area or region and external specialists. The *responsibilities* of the IA team (Baker, 2000) are to:

- Develop objectives, the timetable, logistics, budget, team composition and roles.
- Design and organize the IA system.
- Collaborate with partners and hosts.
- Train staff and other individuals involved.
- Organize collection of primary data collection and gather secondary data.
- Coordinate data analysis.
- Present and feed back information.

The key *roles* (see also Adato and Meinzen-Dick, 2007, p. 47) are:

- **Leader or manager**
  - Establishes the IA design and methods, data needs, indicators (with the stakeholders), identifies the IA team, and drafts the Terms of Reference (ToR).
- **Policy or other assessment experts**
  - For example, economist, anthropologist.
- **Sampling expert**
  - Guides the choice of who, where, and how many participants and non-participants in an innovation should be sampled.
- **Survey expert**
  - Designs data collection instruments and codebooks; pilot tests the survey.
- **Data processors**
  - Map household, crop, plot, and other data. May be analysts based in the institution or unit that commissioned the IA, and often include a GIS technician.

- **Field work supervisor or manager**
  - o Directs field operations, may collect some data but mainly gathers it from enumerators, harmonizes data types, checks for consistency and quality of data.
- **Field enumerators**
  - o Collect the data in the field, often enter it, and report it to the supervisor.

Box 3. Roles in a typical IA study.

The following are roles in a typical IA project. The list is drawn from the Oaxaca study, Mexico.

Senior scientific/managerial staff:

- Impacts Specialist (Agricultural Economist): overall design and coordination of the study, definition of research questions, supervision of analysis, reporting and reviewing.

- Senior Manager: internal review of the report, communication with reviewers.

- GIS Specialist: data management, mapping and analysing spatial results, internal review.

- Communications Specialists: editing the report.

Supporting technical staff:

- One person to design the questionnaire and focal groups, collect survey data, lead focus groups.

- One person to analyse quantitative data.

- One person to design, program and automate surveys, manage data.

- One person to manage GIS data.

- One administrator to provide administrative and budget management support.

- Expert from the study region: to design the questionnaire, collect data, and lead focus groups.

- Expert from the study region: to design the questionnaire, collect data and household GIS coordinates, collect secondary and expert knowledge data.

- Independent reviewers: to provide an external independent review of the project and IA study.

The terms of reference of impact assessment studies should summarize the following:

- Purpose and scope.
- Needs for and types of training.
- Methods and data to be used.
- Standards against which performance will be assessed.
- Resources and time allocated.
- Reporting requirements and outputs.
- Deadlines and deliverables.
- Overall cost of the IA.

Baker (2000, pp. 169–187, pp. 188-197) provides good examples of standard terms of reference for an IA study. An example based on the terms of reference for the Oaxaca project is presented in Box 4.

Box 4. Key elements of the terms of reference for an IA study.

Purpose of the study: To assess the impact of X project on organization(s) Y in years Z.

Needs for and types of training: Training on livelihoods assessment through household surveys. Computer training on automated tools for data collection. Training in SPSS for data analysis.

Methods and data: Quantitative and qualitative data; the former in the form of descriptive statistics, cluster analysis, multiple regression analysis and logistic regression; the latter in the form of focus group analysis and additional secondary information to complement the surveys.

Standards: The "Operational guidelines for assessing the impact of agricultural research on livelihoods: Good practices from CIMMYT" particularly Annex 4.

Resources and timeframe: For these, refer to the section on Writing IA into projects, and developing a budget and to Figure 5.

Reporting requirements: A main report in English with a summary in Spanish, a report to the donor, a journal paper, a general summary for rapid and wider communication to stakeholders including policy makers, and a seminar to solicit feedback from stakeholders.

Deadlines and deliverables

(Based on the Oaxaca Study)

The primary functions of M&E and IA have been to provide accountability to donors and assess the achievement of projects or programs, but they also build capacity for ongoing learning beyond the life of the project, and produce information that can be used for planning, making policies, or resource allocation. To establish a learning process that uses the outcomes of IA, the capacity of individuals must be strengthened and a culture of reflection, learning, and communicating knowledge must be institutionalized. These issues need to be considered in the early planning stages of an IA. Their application within the context of CIMMYT is described in more detail in the section on Institutionalizing impact assessment.

2.2 Good practices in implementing an impact assessment

(IV) Select/develop the analytical instruments

The choice of the approach and methods for an IA of agricultural research projects or programs can be challenging. One difficulty is that the causal chain from research to improved well being for the intended beneficiaries of projects is often long and complex, with significant lags between research operations and impact on the ground. Moreover, research is in most cases not the only influencing force; there are many other causal and confounding factors, such as changes in prices, policies, various externalities and shocks, the institutional environment, etc.

This section presents analytical methods and tools that can be used to capture the complexity of the anticipated impacts. The objective is to give an overview of proven methods, with short descriptions of their main characteristics and how they can be used.

Livelihood IA indicators

Livelihood IA indicators are designed to measure the changes in household access to assets, institutional structures and relationships, or changes in livelihood strategies. Livelihood IA indicators should be Simple, Measurable, Achievable, Realistic, Time-bound (SMART) and:

- *Outcome focused* (indicators that assess outcomes of the intervention, such as changes in yields, reduced input use and cost, soil fertility improvements, etc.). Outcome-focused indicators address changes in peoples' livelihoods by recognizing that outcomes are diverse and go beyond simple quantitative changes in the variables measured.
- *Process based* (indicators that show whether innovations are being used and are being used as intended).
- *Negotiable and open-ended* (indicators that show negative and positive trends, and recognize the context).

Livelihood IA indicators should capture the dynamics of livelihoods by looking at vulnerability and how vulnerability changes over time in relation to the context, rather than just the livelihood status, due to a technological innovation or intervention by a project or program. The list that follows gives commonly-used indicators.

Livelihood capitals

- **Human, social**:
    o Household demographics (e.g., labor assets, family composition, ethnicity).
    o Social organisation (e.g., inter-household relations, participation in community).
    o Knowledge, levels of literacy/illiteracy, school drop out rates.
    o Sanitation and hygiene awareness, health status.
    o Nutritional indicators (e.g., linked to consumption of nutritionally-enhanced crops).
    o Number of meals consumed in the lean season; number of months food-insecure.
    o Ability to borrow money from other households for consumption.

- **Physical and natural**:
    o Natural resources from which inputs, resources, and services for livelihoods are derived (e.g., natural vegetation, land, water).
    o Physical productive assets (e.g., soil types, equipment, animals, labor), and the changes in their levels under mild, medium, and severe stress or risk conditions.
    o Farm land distribution, production, crop area, productivity (change), yields by crop and variety; for example under mild, medium, or severe drought conditions.
    o Basic infrastructure, equipment, and property to support livelihoods.
    o Affordable transport, road access (especially in rainy season), adequate shelter; access to water, to energy, sanitation.
    o Access to common property resources.
    o Level of natural vulnerability of the area of residence (e.g., flood prone).

- **Economic and financial** resources people use to achieve livelihood objectives:
    o Farm-level seed demand.
    o Prices; for example, of seeds, grains, feeds.
    o Household financial assets, asset stability and change, expenditures.
    o Crop consumption, sales, and marketable surplus.
    o Investment by farmers in farm inputs.
    o Access to credit, use and amounts (includes formal and informal loans).
    o Grain and livestock products.
    o Institutional investment in research and development.
    o Inventory of germplasm by source.
    o Household savings (including ownership of livestock).
    o Remittances from household members working outside the area.
    o Subsidies (assess their presence to see if technologies would be viable in their absence).

Indicators of **crop productivity, production, and adoption** capture impacts of germplasm diffusion:

- Preferred crop traits, varieties planted, crop management and input use (fertilizers, chemicals), yields, seed systems, management practices.
- Crop post-harvest and marketing: grain consumption and sale, amount of marketable surplus, amounts stored by the household for later sale.

The IA indicators should also allow capture of the following factors:

- Seasonality (e.g., duration of labor-scarce agricultural periods).
- Shocks (e.g., frequency of drought years, price collapses).
- Stresses (e.g., chronic lack of water for irrigation).
- Trends in assets and resource availability and use (e.g., increasing fertilizer use).
- Policies (e.g., subsidized inputs, prices, credit), institutions (e.g., providing microfinance for agricultural investments), availability of services (e.g., mobile phone networks).
- Livelihoods status (e.g., nutrition, health, social).

These indicators are linked to household livelihood strategies (e.g., intensification of use of inputs, migration, diversification, exiting from agriculture, specialization, intensification). Changes in these indicators contribute to **livelihood outcomes**. These are location-specific and can vary across households. It is important to assess how the technology or project contributes to improved outcomes. Outcome indicators include:

- Better well-being (health, education, etc.), more (cash) income, less vulnerability, more food security), improved asset base (land, labor, livestock), better food security, more physical security, lower farming or climate risk, personal or community empowerment, natural resources preservation, more job opportunities, etc.
- Economic effects (income, returns to investment, etc.), by source, including from improved maize and wheat.
- Improved market access (roads, markets, access to types of information and extension).
- Environmental effects (sustainability, natural resources use).
- Policy changes that affect livelihoods and determine type and degree of impact.
- Capacity building (e.g., of farmers, of NARS), public awareness, empowerment.

The indicators need to be established in the planning stage of an IA, preferably with the participation of the key stakeholders and users. Indicators should ideally also be geo-referenced.

Box 5. Nutritional and health indicators: Disability-Adjusted Life Years (DALYs).

Nutritional and health indicators are increasingly used to capture the human impacts of research and development, including agricultural technologies. De Groote and Meng, in a paper by Meenakshi et al. (2007) for the CGIAR's HarvestPlus Challenge Program, describe an adjusted Disability-Adjusted Life Years (DALYs) methodology applied to biofortification. Biofortification, a tool to combat micronutrient malnutrition, can make a significant, cost-effective impact on micronutrient deficiencies in the developing world. DALYs are increasingly used to quantify the magnitude of ill health, morbidity, and mortality outcomes, by combining temporary illness with more permanent conditions in a single measure. Despite being relatively underutilized in the economic literature as a welfare metric, DALYs obviate the need for monetization of health benefits. Benefits are quantified directly using DALYs saved, while costs per DALY saved offer a consistent way to rank alternative interventions. DALYs lost—the sum of years of life lost (YLL) and years lived with disability (YLD)—enable the addition of morbidity and mortality outcomes, and are an *annual* measure of disease burden. YLL is the number of years lost because of the preventable death of an individual, and the YLD represent the years spent in ill-health because of a preventable disease or condition: hence *DALYs lost = YLL + YLD.*

A public health intervention is expected to reduce the number of DALYs lost; the extent of such reductions is a measure of the benefit of the intervention. DALYs saved are a direct metric to analyze the benefits of an intervention, and do not necessarily have to be monetized to ensure comparability across interventions. Unlike most agricultural technologies, biofortification doesn't lead to shifts in the supply function. Hence, changes in economic surplus are not relevant. Instead, it is the supply of dietary sources–say, of iron–that is increased, and the impact of this shift on public health that is captured here. Cost-effectiveness measures expressed in terms of DALYs saved are increasingly being used in priority ranking exercises by agencies such as the World Bank and WHO. Since some outcomes affect only some target groups (children, pregnant women), gender and age-specific disaggregation of target groups will be needed to upgrade the approach.

Baker (2000, pp. 178-180), the Sustainable Livelihoods Guidance Sheets and materials posted on www.livelihoods.org, and the web-based literature on the Millennium Development Goals list additional livelihood indicators in different contexts, as well as examples and case studies.

Box 6. Typical livelihood indicators.

The Oaxaca study identified 13 types of livelihood assets to define household typologies. Eleven of these were quantitative and two were qualitative (binomial: yes/no). The assets are given below, grouped by type of capital:

-*Natural capital*:

- Land endowment (in hectares).
- Quality of land for farming.
- Availability of water* (through various types of irrigation or water access).

-*Physical capital*:

- Number of different types of inputs used.
- Number of pieces of equipment owned and used.
- Distance of main parcels of land from the closest market used.

-*Human capital*:

- Number of family members.
- Average age of household head and second most important member.
- Average years of education of household head and second most important member.

-*Social capital*:

- Knowledge and involvement with a main Mexican research institute working in rural areas.
- Earnings (as a form of cash support) from government rural programs (these are also intended as a form of social capital, as peopleneed to be part of networks to access government programs).

-*Financial capital*:

- Numbers of chickens sold (indicator of a marketable asset), earnings from remittances, etc.

Adoption. Adoption is a dynamic process determined by factors such as farmers' perceptions of the advantages and disadvantages of technologies, efforts made by extension services to disseminate the technologies, the policy environment, the characteristics of farmers, the characteristics of the farming systems, and of the technologies themselves (see Adato and Meinzen-Dick, 2007, p.333 for a list of factors drawn from a variety of case studies). Adoption studies aim to derive an overall understanding of the farming systems in which innovations and technologies are diffused by identifying the technical, socioeconomic, and policy constraints. The

objectives of adoption studies are to improve the adoption of the technology and its diffusion among farmers, and provide information that for impact studies. Assessment of adoption should distinguish between early and complete adoption. Adoption can be quantified by considering:

- The effect of diffusion of germplasm, technology, or management option on productivity.
- Farm-level productivity gains.
- Sustainability of gains.
- Area planted (primary and secondary estimation methods).
- Adoption intensity.
- Substitution effects.
- Asset requirements.
- Cultural and culinary preferences.
- Inter- and intra-household effects.
- Identification of adoption constraints.
- The economic surplus generated.

Costs for technology development are mainly incurred through research and extension. The ratio between benefits and costs decreases, as the duration of research and extension increases and as the benefits derived from the technology decrease. Innovations that are quickly adopted are more profitable than those that are adopted more slowly, because the benefits arrive more quickly and the ceiling of adoption is reached earlier, all the rest being equal. The higher the level of adoption achieved at a given time, the higher the benefits. The likely extent of future adoption of research results strongly influences the efficiency of research. Research activities are beneficial if their results are transferred to farmers—the faster the adoption and the more farmers who adopt, the greater the benefits.

The speed and ceiling of adoption for each technology/innovation are a function of the relationship between the characteristics of the new and the traditional technologies. However the decision to adopt does not easily fit into conventional econometric models (Adato and Meinzen-Dick 2007), hence the need to complement adoption studies with a livelihoods assessment. The assessment of adoption is comprehensively dealt with in the following sources:

- CIMMYT manuals on good practices for economic assessment of technology adoption, of the adoption of technology, and of productivity (CIMMYT 1993, 1998).
- Parts of the Bellon (2001) manual on participatory research on the rapid assessment of adoption, through participatory and qualitative approaches for varietal selection.

Box 7. Integrating indicators to assess impacts of natural resource management research.

Laxmi et al. (2007) present a comprehensive approach to capturing the impact of zero-till (ZT) in the Indo-Gangetic Plains (IGPs). Their ex-ante assessment of supply-shift gains from adoption of ZT show that the investment in ZT research and development (R&D) by the Rice-Wheat Consortium (RWC) and CIMMYT was highly beneficial, with a benefit-cost ratio of 39, a net present value of US$ 94 million and an internal rate of return of 57%. In the IGPs, ZT wheat after rice generates benefits at the farm level, both in terms of yield gains (6-10%, due to more timely planting of wheat) and cost savings (5-10%, particularly tillage savings). Adoption of ZT was widespread and rapid.

The study integrates three components: a review, qualitative focus-group discussions, and quantitative economic modeling. The latter simulates the economic impact of ZT wheat R&D in the IGPs. The aggregate impact of ZT on welfare was estimated using the economic surplus approach in a closed economy framework, with linear supply and demand functions and a parallel research induced supply shift. These welfare impacts were used to estimate the ex-ante rate of return on investment in ZT wheat R&D. The economic impact of R&D was calculated by "with" scenarios to test for sensitivity of the findings. Data limitations precluded the inclusion and valuation of environmental and social impacts of ZT (e.g., externalities, intangibles, long-term effects and distributional effects), but the authors do assess these qualitatively. The economic impact estimates can be seen as conservative estimates that under-estimate the true social value of the technology and the social rate of return. The study valued impact based on private gains alone, with environmental and social gains as added non-valued benefits. Private gains correspond more closely to farmer and private sector interests and therefore with potential and rapid adoption. The authors show that the challenge for natural resources management research is to generate technologies that are privately attractive, with environmental gains as added benefits. ZT in fact was shown to have positive environmental impacts (fossil fuel savings, lower greenhouse gas emissions, water savings) that enhance the social returns to the R&D investment. The water savings in wheat crops are good, in view of excessive groundwater exploitation in intensive rice-wheat growing areas. Time and resources saved through ZT are variously used by the adopting farm households, and contribute to their livelihoods. The study suggests that ZT has high potential economic, environmental, and social or livelihoods gains in the Indian IGPs, though so far it appears to have spread more widely in better endowed areas.

Good practice for choosing an assessment method

There is no one best method for IA; the method chosen depends on, for example, the availability of data, the economic environment and the type of results required. Methods to evaluate the impact of crop breeding research are relatively well established, but there is no consensus yet on how to measure the impact of other research, such as natural resource management or farming-system projects.

Conventional methods include, for example, econometrics, use of production functions to determine, test and compare the influence of alternative drivers, economic surplus, and use of Net Present Values or Rates of Return or Benefit/Cost ratios of research investment. Mathematical models are appropriate for some tasks. However, to assess impacts on poverty, livelihood approaches have become more widespread. This section focuses on the specifics of livelihood approaches.

Because projects, data, cost, time constraints, and country circumstances vary, IA studies require a combination of appropriate methods (Adato and Meinzen-Dick 2007, p. 43). Quantitative experimental design is often a good option and matched comparisons a second-best alternative. But these methods are not mutually exclusive. Estimating a counterfactual can be done by

- Using random assignments to create a control group (experimental design).
- Appropriately using other methods to create comparisons (quasi-experimental).

The best approach combines with/without and before/after counterfactuals and baseline data. Baseline data are crucial to reconstruct why certain events took place and to control for them. When more rapid assessments are required, social and poverty assessments are appropriate. When more complete assessments are required, household surveys, econometrics or modeling are needed. Incorporating cost-benefit or cost-effectiveness analysis (Box 8) is recommended, to compare alternative interventions, especially where funds and other resources are limited.

Box 8. Classification of methods for IA (adapted from the World Bank).
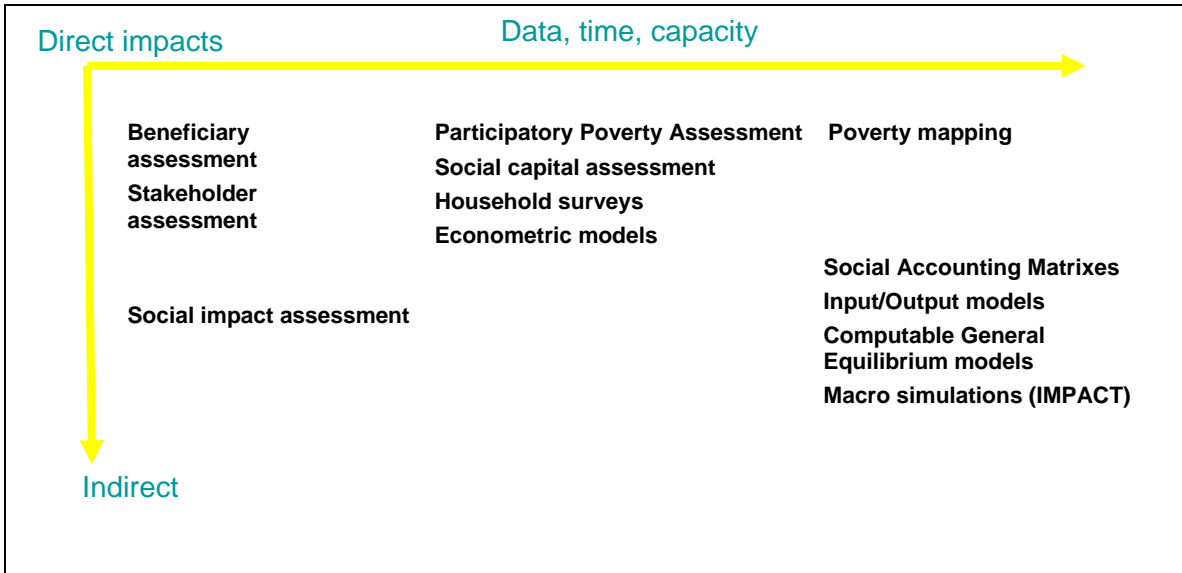
For a more comprehensive treatment of IA methods and guidance on which method to use, refer to Baker (2000) or Masters (1998), for surplus analysis approaches. The World Bank website hosts a comprehensive list of methods for doing Poverty and Social Impact Analysis (PSIA), describing the key elements that characterize the different tools required for methodological decisions.

A: Qualitative methods.

Qualitative techniques are used to determine impact without depending on the counterfactual to make a causal inference. The focus is on processes, behaviors, and conditions as perceived by individuals or groups; for example, how a community perceives a project and how they are affected by it. Open-ended methods are used during design, data collection, and analysis. Qualitative data can also be quantified. Approaches used in qualitative IAs include rapid rural IA or participatory IAs in which the stakeholders—involved at all stages—determine the objectives of the study, select the key indicators, and participate in data collection and analysis.

Qualitative assessments are flexible, can be tailored to the needs of the IA, can be carried out using rapid techniques, and can enhance the findings of IA by providing a better understanding of stakeholders' perceptions on the factors that may affect the impact. Various types of cause-effect diagrams can be used to capture farmer and stakeholder perceptions; for instance, on livelihood threats, opportunities, priorities, and preferences (www.livelihoods.org/info/tools/Diagrams.html).

Drawbacks in qualitative assessments are the subjectivity involved in data collection, the lack of a comparison group (without which it is impossible to determine causality), lack of statistical robustness given the small sample sizes, all of which make it difficult to generalize the results. The reliability of qualitative data is dependent on the skills, sensitivity, and training of the assessors because data collected may be misinterpreted.

Participatory methods are approaches in which representatives of stakeholder groups and beneficiaries work together to design, carry out and interpret an IA. This actively involves those with a stake in a project or program in decision-making and, by involving the key players, can generate a sense of ownership in the results.

Participatory methods can be used to learn about local conditions, perspectives, priorities, to design more responsive and sustainable interventions, identify and sort out problems during implementation, identify changes resulting from the project, identify who benefited and who did not benefit, identify the project's strengths and weaknesses, and empower the those involved. Participatory methods can be effective in identifying intangible outcomes and unforeseen impacts, and in harnessing the opinions of those who are less involved by providing opportunities for discussion. They can also strengthen the capacity of individuals and organizations to participate in the development process. Information from specific groups can be compared with the opinions of key informants and information from secondary sources by triangulating findings. Participatory methods are however often regarded as less objective—less quantitative and thus supposedly less rigorous—and were often not part of conventional economic practice and economist-led assessments. It can be time-consuming to involve stakeholders in a meaningful way and the process may be hijacked by some stakeholders for their own interests. Resources on participatory research at CIMMYT and elsewhere are: Hellin et al., 2006; and 2008; Bellon et al., 2001; Lilja and Dixon, 2008, Lilja and Bellon, 2006; Lilja et al., 2006.

Types of qualitative methods

Key informant interview—a series of open-ended questions posed to individuals known for their knowledge and experience in the matter of interest. Interviews are qualitative, in-depth, and semi-structured. They rely on interview checklists of topics or questions.

Focus group discussion—a facilitated discussion in small groups of carefully selected participants from similar backgrounds and a common interest in the topic discussed. The facilitator uses a checklist of topics for discussion, and note-takers record comments.

Community group discussion—questions and facilitated discussion in a meeting open to all community members. The interviewer follows a checklist of questions.

Direct observation—recording of observations of facts seen and heard at a program site.

Stakeholder analysis is a prerequisite for understanding poverty and social impact and is the starting point of most participatory work. It is used to understand the relationships, influence and interests of those involved in given activities and determine who should participate in a project or in its components. It identifies the interest and influence of those who should be involved in an IA.

Beneficiary assessment is a systematic consultation with project beneficiaries to identify and design development initiatives, constraints to participation, and to provide feedback. It comprises participatory assessment and monitoring that incorporates a process of direct consultation of those affected by and influencing an intervention or policy. It is primarily qualitative, though with relatively lower emphasis on the use of visual techniques and of community-level research.

Participatory poverty assessment (PPA) approaches include the poor directly in discussions and debates on policies and priorities. They mainly use qualitative, visual, participatory rural appraisal. Data collection techniques are similar to those in beneficiary assessments, though with a greater focus on consultation with the poor, and on a broader set of policy issues.

Participatory rural appraisal **(PRA)** focuses on sharing learning with local people. It enables researchers and local people to assess interventions collaboratively, often using visual techniques so that illiterate people can participate. Group discussions between scientists and farmers include different members of the household. Formal surveys of households in the baseline may use participatory, rapid, or visual techniques to evaluate new technologies (Bellon, 2001), or include specific questions on the indicators identified earlier during the project to reassess the new technology.

Scenario analysis is a tool to help decision-makers and stakeholders think through how a given intervention may perform in different situations (scenarios). Each scenario focuses on a discontinuity (e.g., price changes), takes into account significant but predictable factors (e.g., demographic trends) and explores how successful the intervention or policy would be in this new scenario. It pre-tests changes under a variety of circumstances. The qualitative scenario exercises can be the basis of quantitative scenarios using modeling tools.

Box 9. An example of a participatory IA process at CIMMYT. (draws on Bellon 2001)

Participatory IA assesses the changes that farmers perceive have occurred as a result of their participation in projects to develop and promote adoption of new technology. The focus is on the assessment of perceived changes, and on the use of participatory and visual techniques for capturing such perceptions. It is important to establish what changes are brought about by a new technology and the extent to which these have changed the well-being of the household.

1. Establish a set of impact indicators.
Impact indicators are a set of variables and conditions that farmers and scientists expect to change with the adoption of a new technology. Farmers and scientists may have different indicators. Indicators must be identified or discussed with key informants or groups in the diagnostic phase to identify which conditions signal that they are doing well (e.g., no need to buy food, or have more time for new activities or leisure).

2. Identify indicators of changes that may result from using a new technology.
Scientists and farmers should answer the following question to identify changes in indicators:
If you adopt this technology, what do you expect to be different?

3. Relate the two sets of indicators.
Not all indicators of well-being may be relevant to the technology being adopted. There should be one list of indicators for farmers and another for researchers, which may or may not coincide.

4. Establish a baseline.
It is essential to generate a baseline with which changes can be compared. The baseline describes the impact indicators, and any associated relevant conditions, before a new technology is adopted. Baseline data should come from a random, representative sample of households so that generalizations can be made (see randomization and other alternative techniques).

5. Establish a monitoring system.
Information on the impact indicators should be collected from a sample of baseline households in follow-up surveys. To identify unintended impacts, the follow-up visit should include an open-ended discussion of people's views of the adopted technology. Time has to pass between the introduction of a new technology and the follow-ups. The length of time depends on the indicators and data required, for example although income may only change significantly after a year, nutrition may improve as soon as a new crop becomes part of the diet.

6. Carry out a final assessment.
After a new technology has been introduced and adopted, an ex-post IA should be done even though impact will probably continue after the project ends and only produce tangible outcomes in later years. The ex-post IA should include the same (or some) impact indicators as the baseline, and a set of participatory and rapid assessments. It should involve scientists and farmers who did and did not adopt the new technology to determine their perceptions of changes in impact indicators resulting from adopting the technology. Discussions should be open and may be guided by questions about whether the expected changes occurred, whether they were positive or negative, and whether any unexpected changes occurred with the adoption of this technology.

B: Quantitative methods

Quantitative methods for IAs include, for example randomization, quasi-experimental designs, statistical control, and modeling (Baker, 2000 for details, and Scott, 1985 for sample sizes and the trade-offs between sample size, analytical rigor, and resources).

Experimental Designs / Randomization is a method of creating treatment and control groups statistically equivalent to one another. Treatment and control groups should be sufficiently large to establish statistical inferences with minimal attrition. Randomly generated control groups are the counterfactual. Subjects are randomly assigned to treatment or control groups. The impact is the means of samples of treatment groups minus the means of samples of control groups. Randomized methods of IA involving collection of data on project and control groups at different times are the most rigorous. Questionnaires or other instruments are applied to both groups before and after a project. In practice it is rarely possible to use randomized designs because of the cost, time, and ethical or other constraints. Thus, most methods of IA are less rigorous and less expensive. The most frequent problems with randomization designs are that:

1. They may be unethical because eligible members of the population are denied benefits or services for the purposes of the study (e.g., denial of medical treatment).
2. It can be politically difficult to provide an intervention to one group and not another.
3. The scope of the program may mean that there are no non-treatment groups.
4. The identifying characteristics of certain individuals in control groups may change during the experiment and may invalidate or contaminate the results (e.g., people move in and out).
5. It may be difficult to ensure that assignment is truly random and is not being modified.

Quasi-experimental (non-random) methods that compare project and control populations before and after interventions are an alternative to randomization. A non-equivalent control group is selected to match the characteristics of the project population as closely as possible. Comparison groups can be used to determine, test, and compare the influence of different drivers of change. Treatment and comparison groups are selected non-randomly *after* an intervention. Statistics are used to discriminate among groups, and matching techniques to build comparison groups with similar characteristics to treatment groups. Quasi-experimental methods draw on existing data, are quick, cheap, and can be done after a program has been implemented. Their disadvantage is that the results may be less reliable because the methods are less robust in statistical terms, they can be complex, and there can be selection bias[4].

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[4] Observable bias (see Baker, 2001) may include the selection criteria by which individuals are targeted (e.g., location); the unobservable variables may include individual ability, willingness to work, family

- *Matching methods or constructed controls* are a second-best to randomization. They pick an ideal control group to match the treatment group from a larger survey.

- *Propensity score matching* matches control groups to treatment groups on the basis of observed characteristics or by a propensity (to participate) score; the closer this score, the better the match. A good control group is from the same economic environment and is asked the same questions by similar interviewers as the treatment group. This technique is valuable when lots of time and baseline data are available, since it over-samples beneficiaries and then matches them.

- *Double difference* compares a treatment and control group (first difference) before and after a program (second difference). This can be an effective approach if the interaction between the adopter/beneficiary group and the non-adopter/non-beneficiary control group is small, and the groups are under reasonably similar conditions. This compares relative changes in metrics over time between two groups to establish how trends are influenced by interventions.

- *Reflexive comparisons* compare data from baseline data of participants before the intervention and data from a follow-up survey after the intervention. The baseline provides the control group; the impact is measured by the change in outcome indicators before and after the intervention.

Ex-post comparisons of project and non-equivalent control groups use data collected from beneficiaries and a non-equivalent control group after a project has ended. Multivariate analysis is used to statistically control for differences in attributes of the two groups.

IAs can range from large-scale sample surveys that compare project populations and control groups before, after, and possibly at several points during the intervention, to small-scale rapid assessment and participatory appraisals where estimates of impact are obtained combining group interviews, key informants, case studies and secondary data.

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connections, and subjective selections of individuals for a program. Both can give inaccurate results: under-/over-estimates of actual impacts, negative impacts when actual impacts are positive, statistically insignificant impacts when actual impacts are significant. It is possible to control for bias but difficult to remove it. Because the statistical methods are complex the design, analysis, and interpretation of IA results requires considerable expertise.

Formal household surveys are a method of collecting standard data from a sample of people or households in particular target groups for the quantitative approaches outlined above. The findings of such surveys can be up-scaled to the wider target group or population and quantified estimates made on size and distribution of impacts. Formal household surveys can provide:

- Baseline data to assess the performance of a project or program
- Key input to a formal IA of a program or project.

They can be designed to compare:

- Different groups at a given point in time
- Changes over time in the same group
- Actual conditions with the targets established in a program or project design.

Some types of information are difficult to obtain from formal surveys. Also, formal surveys often:

- Deliver results only after lengthy periods
- Are expensive and time-consuming, and
- Require sound technical and analytical skills to design, analyze and process the data.

Good practice suggests that questionnaires for IA surveys should be kept short and should focus on the main questions. So that answers are reliable and consistent across locations, enumerators and field data collectors should be instructed in the actual and intended meaning of the questions at the outset (see also models of Training Courses for IA on livelihoods in the section on Training on IA). Surveys should be adapted to local realities and cultural sensitivities. It is also advisable to complement household interviews with objective measurement, for example of yields, areas, to increase the accuracy, reduce subjectivity, and triangulate the findings.

Box 10. Cost-Benefit Analysis.

Cost-Benefit Analysis (CBA) is a conventional method of assessing whether the costs of a project can be justified by its outcomes and impacts (see also SPIA's Strategic Guidelines for IA). CBA measures inputs and outputs in monetary terms. ***Cost-effectiveness analysis*** estimates inputs in monetary terms and outcomes in non-monetary quantitative terms. CBA is one of the main tools for IA of projects with measurable benefits. When benefits cannot be quantified, cost-effectiveness analysis is more suitable. Both methods can be used to:

- Make decisions on efficient allocation of resources
- Identify projects that offer the highest rate of return on investment
- Estimate the efficiency of programs and projects
- Convince policy-makers and donors that the benefits justify the activity.

However these methods are fairly technical, require data that often does not coincide with that required for livelihoods IA and hence may not be available. In addition, the results often depend largely on the assumptions made and need to be interpreted with care—the benefits are difficult to quantify and cannot easily or explicitly focus on livelihoods or quantify livelihoods IA indicators.

C: Integrating quantitative and qualitative methods

Combining quantitative and qualitative methods both quantifies impacts of projects *and* explains given outcomes. Adato and Meizen-Dick (2007) outline the advantages and disadvantages of this combination and give examples from case studies. While quantitative data from samples that are statistically representative provide better assessments of causality by means of econometrics, qualitative methods are better for studying selected issues or events, provide critical insights into beneficiaries' perspectives and illuminate quantitative analyses.

Additional benefits from integrating quantitative and qualitative methods include:

- Consistency checks can be built in by triangulations that independently estimate key variables (e.g., income, opinions about projects, reasons, or specific impacts).
- Different perspectives can be obtained (e.g., in terms of gender differences).
- Analysis on different levels. Surveys can give estimates of individual, household, or community level welfare; qualitative tools are more effective for analyzing social processes (e.g., conflicts) or institutions (e.g., effectiveness of services).

- More options for interpreting findings. Surveys often lead to inconsistencies that cannot be explained by the data. Qualitative methods can be used to check on outliers (responses that diverge from a general pattern) and for rapid field check of such cases.

Rapid ex-post IA is a low-cost approach that combines group interviews, case studies, key informants, and review of secondary data to gather the views of beneficiaries and other key stakeholders. This approach is useful when there is a need to respond rapidly to decision makers requests for information. Rapid ex-post IA can be used to provide a qualitative understanding of socioeconomic changes and social situations, people's values, motivations, and reactions, and can provide the context and help interpret quantitative data. The findings, however, often relate to specific communities or localities and are thus difficult to generalize. This means that quantitative economists or evaluators see the recommendations as less valid, reliable and credible than those from formal surveys. Rapid approaches require skills such as interviewing, facilitation, field observation, note-taking, and basic statistics.

Figure 5 shows how the cheaper, quicker methods sacrifice methodological rigor. Participatory methods are not always cheaper than quantitative ones as the costs of staff, and training, as well the costs of surveys and data analysis, can be significant.

Figure 5 Rigor, costs, and timeframes of methods for IA studies

Randomized assessments	**Rigor** – 'perceived' higher **Cost** – $100,000 – $1,000,000 **Time** – 1-5 years
Quasi-experimental designs	
Ex-post with different controls	**Rigor** – 'perceived' lower **Cost** – $25,000 – $150,000 **Time** – 1 month – 1 year
Rapid and participatory methods	
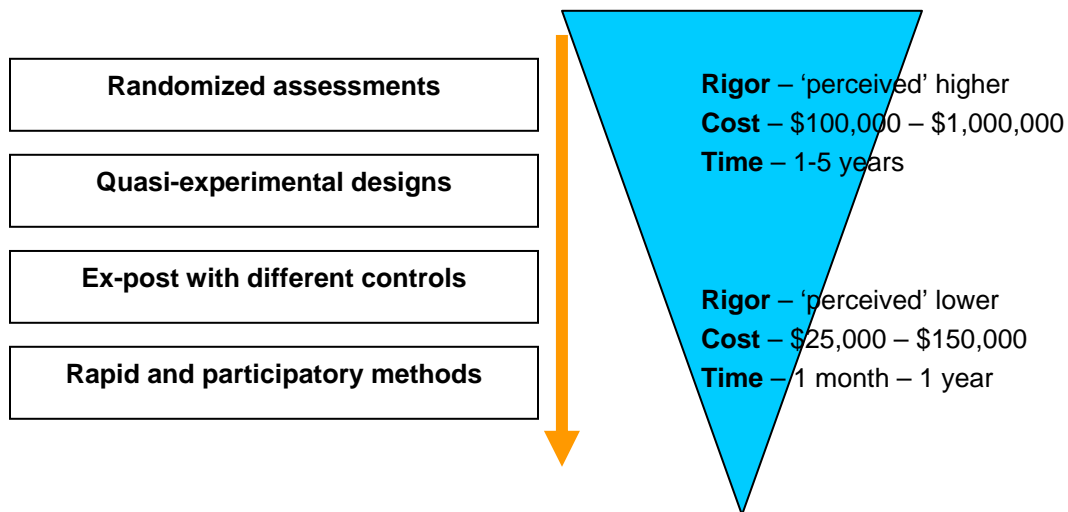
The choice of methods involves tradeoffs, mainly in terms of time, skills and resources (Figure 5 is based on international costings and need to be adjusted to local costs). This issue is also discussed in the last section of these guidelines on writing IA into projects. In general:

- Large-scale IA surveys require moderate amounts of time and skills, and significant resources. The results are widely publishable in the academic literature but their policy relevance and usefulness is limited.
- Small-scale IA surveys require moderate amounts of time, skills, and resources. Though the findings are more difficult to publish in academic outlets than the findings of large-scale surveys they are often covered in popular science publications and the media, so their policy relevance, usability and usefulness are relatively valuable.
- Informal participatory and rapid studies need less time and resources, but substantial skills and training; their policy relevance, usability and usefulness are also significant.
- Study and compilation of secondary data to derive IA conclusions are useful when time, resources and skills are limited and the results are needed urgently, but their policy use is also limited.

Methods of analysis

Econometrics applies mathematical and statistical methods to analyze data in the field of economics. In IA econometrics is used to analyze defined relationships between variables in survey data. Production and cost functions determine, test, and compare the influence of alternative drivers and estimate change in productivity due to research investment. Econometrics require good quality time series or panel data that capture variability (see Maredia et al. 2000, Bellon et al. 2007).

Economic surplus models are used to evaluate the adoption, spillover and economic impact of agricultural research. Various methods estimate economic indicators (Net Present Value, Internal Rate of Return to Investments, Benefit/Cost ratio, changes in consumer/producer surplus) deriving from changes in technology.

The economic surplus approach is based on a partial equilibrium model[5]. Initially developed for ex-ante IA, such models are now more often used for ex-post analysis. Models require data on inputs and outputs, budgets with and without the new or improved technology (or intervention in

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[5] These are multi-market models that analyze the impact of changes in price and quantity in markets on household income and expenditure. They specify demand and supply for sectors of an economy so that the impact of policies on one sector can be seen on other sectors in the economy.

general), prices, yield (increasing or stabilized) and input (reduced) change due to the technology, rates of adoption, adoption lags, costs and discount rates. For example, DREAM (*D*ynamic *R*esearch *E*valu*A*tion for *M*anagement) software runs economic surplus analyses that simulate market, technology adoption, research spillover and trade policy scenarios. The models and framework use information gathered through farm household surveys to determine adoption by households (and non-adoption or dis-adoption). The models can be integrated with GIS mapping techniques to identify and map the specific areas that could benefit from particular activities. DREAM (Alston et al., 1998) can be downloaded from the IFPRI website.

Figure 6 shows a window of the DREAM model with key input and output parameter fields. Results are often sensitive to input and output parameters and, in these cases, it is important to obtain good parameter estimates. DREAM requires robust estimates of supply elasticity.

Figure 6. Window of DREAM showing input, output, and scenario fields.

Box 11. Integrating poverty classes and economic surplus analysis: Bt maize in Kenya.

Previous, impact assessments of new agricultural technologies focused on estimating increases in yield and production, and putting a value on those increases. Economic surplus analyses estimated the effect of production increases on prices and the impact of those price rises on consumers. However, the distributional effects of new technologies were not taken into account.

There are many techniques for estimating the effects of increases in yields, production and prices and their effects on poverty alleviation. The techniques require an appropriate but workable definition of the poor, usually defined as a level of income, expenditure, or assets. Poverty levels can be estimated directly from surveys, or poverty can be mapped from secondary data.

De Groote proposes a method of integrating poverty analysis and economic surplus analysis to assess the impact of introducing Bt maize in Kenya—insect-resistant maize varieties that reduce crop losses. The analysis considers how far Bt maize can benefit the poor, how benefits are distributed between the poor and non-poor, and how benefits are distributed over different agroecological zones.

The baseline survey collected data from 1,800 farm households. The households were grouped by wealth (poor or non-poor), maize production, and agroecological zone. For example, in the low tropics the incomes of 67% of households fall beneath the poverty level. The maize production of the 67th percentile is 1.1 tons per year, so all households with maize production below that level are classified as poor. The benefits of pest-resistant varieties are calculated as crop loss abated, and reduced cost of pesticides. Ignoring pesticides, that few farmers in Kenya can afford, benefits are calculated by multiplying production by the crop loss abated. Scenarios are run for potential benefits with resistance to stemborers, with and without resistance (De Groote et al., 2004).

An economic surplus model takes into account supply elasticity—that when production rises, prices fall, so farmers have less incentive which in turn causes production to fall, The full potential of reducing crop losses is therefore not reached. However, lower prices benefit consumers, increasing the incentive to purchase, depending on demand elasticity. The combined effects can be calculated and split into producer and consumer benefits.

By superimposing the poverty map on the map of maize agroecological zones, the number of poor in each maize agroecological zone could be calculated. Most poor live in the moist transitional zone and the moist mid-altitudes. Attributing the economic surplus to poor and non-poor by agroecological zone, was a challenge. The basic economic surplus model doesn't take into account different regions, or subgroups of farmers. Therefore, the authors attributed the benefits to different groups and zones indirectly, proportional to the reduction in crop losses for producers, and the amount of maize consumed for consumers. Almost half of total benefits accrue in the moist transitional zone (40%) and the highlands (30%). All other zones (low potential) receive a small fraction of the benefits, most of which accrue to consumers. Most benefits go to poor consumers and 40% of consumer surplus is estimated to reach the poor. Producer surplus accrues to the larger producers. Small producers, however, are usually net buyers of maize and, therefore, will benefit from Bt maize through a reduction in prices. (drawn from de Groote et al., 2004)

IMPACT models

The IMPACT model series developed at IFPRI are computable general equilibrium (CGE[6]) models that analyze baseline and alternative scenarios for global food demand, supply, trade, income and population. IMPACT covers more and more countries, regions and commodities, and all cereals. IMPACT is a representation of a competitive world agricultural market for crops and livestock. In IMPACT, country and regional agricultural sub-models are linked through trade. The model uses a system of supply and demand elasticities incorporated into equations, to approximate production and demand functions. Productivity growth is estimated by its component sources, including crop management research, conventional plant breeding, biotechnology, and transgenics. Other sources of growth considered include private sector agricultural research and development, agricultural extension and education, markets, infrastructure and irrigation. IMPACT models factors that have the potential to impact future developments in the world food situation, including growth in populations and incomes, rates of growth in crop and livestock yield and production, feed ratios for livestock, agricultural research, irrigation and other investments, price policies for commodities, and elasticities of supply and demand. For any specific factor, the model generates projections for crops (area, yield, production, demand for food, feed, prices, and trade) and livestock (numbers, yield, production, demand, prices, and trade). The model includes tropical or semitropical fruits, temperate fruits, vegetables, fish commodities, distributional impacts on three income groups, and nutritional information[7]. Parameter estimates are drawn from econometric analysis, past trends, expert judgment, and literature syntheses.

Social accounting matrixes (SAMs) are related to national income accounting. They provide a conceptual basis for examining both economic growth and distributional issues within a single analytical framework. SAMs are used to organize information from the interaction of production, income, consumption and capital accumulation in a matrix.

(V) Describe the impact pathway of the program/project

Describing the pathways that interventions will take to have an impact shows how proposed research will contribute to the innovation process. If the impact pathway is appropriately formulated, claims of impact become stronger and the potential for learning is greater.

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[6] Computable General Equilibrium (CGE) models represent an economy or region, including its production activities. CGEs include models of markets (where the decisions of agents are price responsive and markets reconcile supply and demand) and of the macroeconomic components (investment, savings, payments, etc).

[7] *Endogenous* variables determined by the by country–region model are: Commodity prices and quantity; Trade quantities (imports, exports); Cropped area by commodity; Commodities consumed; Calories per capita; Agricultural incomes, Percent children malnourished. *Exogenous* variables are: Population by year; Non-agricultural income by year; Total land area by country–region; Non-price (productivity) supply growth including contributions from: schooling, extension, public- and private-sector agricultural research.

At a workshop in December 2006, the impact pathways of research projects at CIMMYT were described to assess processes by which impact is (or isn't) achieved, the magnitude of impacts, the roles that different agents play in achieving the planned impact, what is expected to lead to intended impacts, and to make sure impact pathways were explicit in planning documents.

References on impact pathways are: Patton (1995) on utilization-focused evaluation; Virtanen and Uusikyla (2004) on links between cause and effect; Baker (2000) on theory-based evaluation, the World Bank M&E guidelines; GTZ on results-based monitoring, Douthwaite et al. (2003) on evaluation by impact pathways Smutylo and Carden (IDRC) on outcome mapping, and Adato and Meinzen-Dick (2007) on impact pathways and livelihoods.

Figure 7. An institutional impact pathway.
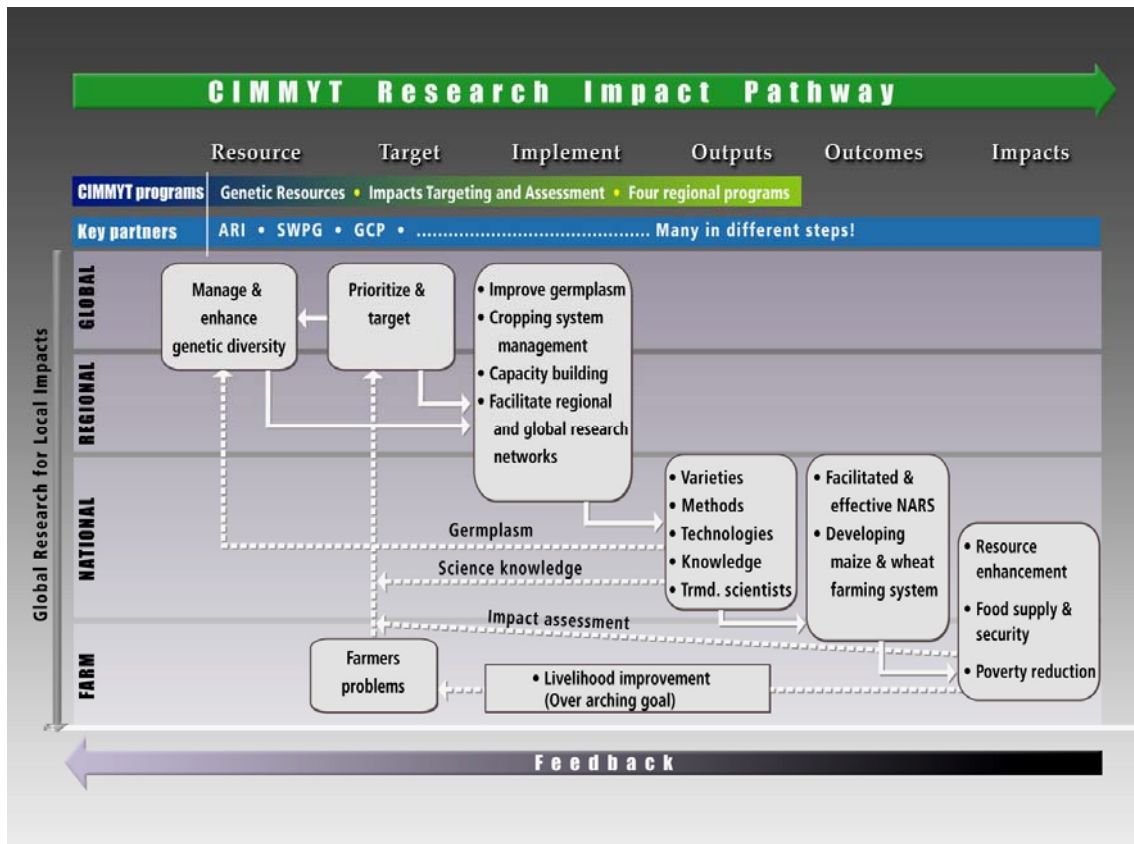
Figure 7 (from CIMMYT's 2006-8 MTP) gives an overview of CIMMYT main research impact pathways, highlighting the impact flows from germplasm to improved livelihoods and the key feedback mechanisms. (Note on the X-axis the flow from: Resource to Target, Implement, Outputs, Outcomes and Impacts and on the Y-axis the flow from the farm to global level.) The pathways suggest that real impact on livelihoods depends largely on good priority setting and targeting, on NARS that effectively finalize and release varieties in maize and wheat systems,

and on good and sustainable partnerships and collaborations. Figure 8 gives an impact pathway for the CIMMYT P10 Project "Maize and wheat cropping systems" that deals with resource conserving technology (from Pulleman, La Rovere and Dixon, 2007). It illustrates the impact pathway for resource conserving technologies that lead to improved and resilient livelihoods through a chain of interrelated mechanisms linking drivers of change, activities and outputs.

Figure 8. Impact pathway of CIMMYT maize and wheat cropping systems project.
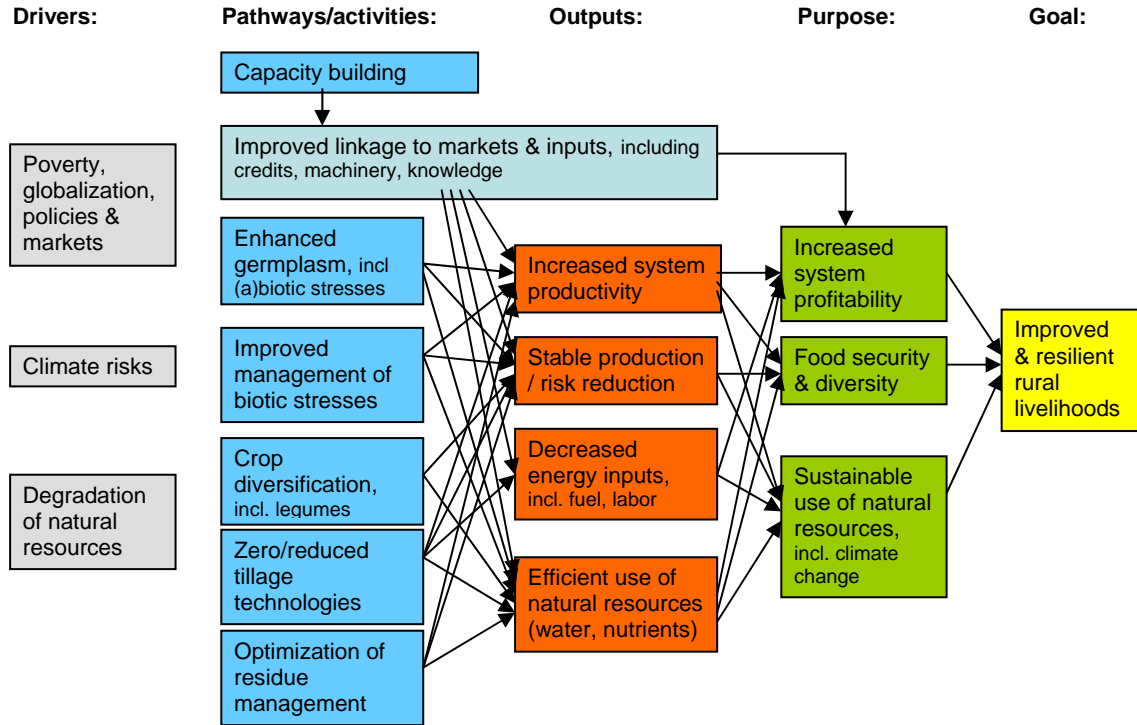
(VI) Acquire and manage the data and information

The data for an IA should respond to the needs and interests of clients and stakeholders, focus on what is actually needed, and be amenable to updating, especially if the IA is long term or of an M&E type. Good practice for acquiring and managing data and information means:

- Accurately describing and documenting the sources of information so it can be verified.
- Checking data that is likely to be biased—by using a variety of methods and sources, and triangulating data with qualitative information.
- Choosing, developing, and implementing the information gathering process to ensure that the information obtained is sufficiently reliable for the intended uses.
- Identifying the type of data required to address the evaluation issues or questions, outlining the main indicators, and giving reasons for the chosen approach.

The data collection methods for IA depend on why and how the data will be used, the level of analysis, local conditions, and the data requirements and availability. Every method has advantages and disadvantages and well-defined applications (see Baker, 2000). The main methods of data collection are:

- Case studies
- Focus groups
- Interviews
- Observations
- Questionnaires
- Review of secondary data

It is always desirable to gather multiple lines of evidence. This can be done in stages (see Baker, 2000). In the first phase explorative and qualitative instruments are useful for refining the focus of the study and deciding which instruments to use (Baker, 2000). Multiple lines of evidence make arguments and conclusions more credible. This is important as IAs are typically done in a context of uncertainty. Triangulation, tapping into different sources of information, has similar aims.

Typical steps in data collection are:

1. Sample design and selection
2. Development of the data collection instrument
3. Selecting staff and training fieldwork personnel
4. Pilot testing
5. Data collection
6. Data management and access

The World Bank (2002, 2004) and Baker (2000) provide recommendations and checklists of good practices for data collection. CIMMYT (Carrion et al., 2007) developed a manual for real time data collection, management, and sharing, based on the integration of socioeconomic surveys into Personal Digital Assistant devices. The manual is being used to guide socioeconomic household data collection for IA in various projects. The ethics of data collection for IA are also important, and surveys should be carried out with particular care and tact. Box 12 shows the CIMMYT guidelines for conduct in training field enumerators, for both household surveys and participatory community surveys. These should be used in conjunction with the propriety aspects in IA standards (see Annex 4).

Box 12 Ethical and practical issues in field research

Recommendations to enumerators for IA data collection (extracts from field guidelines):

At the start of the interview, give information and enhance comprehension by the participants:

- Develop a relationship of trust and understanding with the farmer.

- Introduce yourself properly or go with a person who can introduce you properly.

- Explain calmly, extensively, and carefully the scope, purpose, extent, and content of the survey.

- Explain who is sponsoring the study, the role of the institution that you are wor.king for, your role, the purpose of the study/project, and the number of visits that will be made

- Confirm that all information given is confidential.

- Explain how and why he/she was selected for the interviews.

- State that the information given should be accurate, complete, unbiased.

- Conduct the interviews with the informed consent of the participants and preserve the right of participants to self determination, privacy, dignity, for example. victims of famine or very old people should not be interviewed.

- Do not cause anxiety and embarrassment or affect the self esteem of those being interviewed

- Respondents must participate in the study voluntarily.

- Avoid sensitive questions, and/or use appropriate alternatives, especially those relating to gender, religion, beliefs, political opinions, and direct questions on income and wealth in general.

Baselines: The first step in M&E (see also Figure 3), and in ex-post IA, is to establish a baseline. Baseline indicators should be sufficient to describe the context in which knowledge and technologies are being applied. A livelihoods baseline is more comprehensive than conventional baselines that measure poverty in terms of income, productivity or household facilities. Livelihoods baselines establish

- The current livelihoods context of local people, their livelihoods strategies, and priorities
- The effect of policies and institutions on the lives of the rural poor (e.g., food security, vulnerability)
- The current livelihoods status of people, households, and the circumstances that make them vulnerable
- Problems, strengths, weaknesses, opportunities, and risks related to their livelihoods.

As with all baselines, livelihoods baselines should be used to identify different typologies of farmers, for example those who benefit versus those who don't benefit. Typologies are useful for defining the counterfactual (with and without the project), in selecting farmers, and designing trials, as well as to measure and show impacts.

At the program level, a livelihoods baseline can help in analyzing key areas that were overlooked, determine whether activities should be redesigned, examine whether critical issues identified by the baseline should be addressed, and develop M&E systems informed by baseline indicators. A livelihood baseline examines resources in broader ways than conventional baselines by linking resources with their use and with poor people's access to them, looks at broader livelihood relationships, is designed with the participation of stakeholders, uses quantitative and qualitative techniques in data collection and analysis, and examines the impacts beyond the project or program's outputs.

Once data has been collected, it should be appropriately managed, archived, and made accessible at appropriate levels. Institutional Property Rights should be respected at all times. The documentation consists of:

- <u>Metadata</u>: basically data about data. See also Baker 2000.
- <u>Information to interpret the data and conduct the analysis</u>, contained in a document that describes the focus and objective of the IA, the methodology, the instruments, the sample information to be collected, contacts of team members, description of field work, etc.

(VII) Analyze and validate impacts, and interpret the findings

To effectively answer IA questions both quantitative and qualitative IA data should be systematically analyzed. Relying on one type of data is likely to miss key facts and reduce the validity of the assessment. The perspectives, procedures, and rationale used to interpret the findings should be described. Conclusions should be clearly explained and justified.

Good practices for strengthening the quality and rigor of the analysis, interpreting the findings in collaborative ways, and increasing the plausibility of IA conclusions are:

- Testing alternative explanations and discussing competing impact hypotheses
- Addressing attribution of observed productivity trends to different causal factors
- Giving explicit consideration to unintended effects
- Seeking additional evidence and triangulating results
- Reviewing and adjusting the model impact pathway
- Drawing conclusions and developing recommendations.

The main sources of information on the topics mentioned in this section include:

- Baur et al., 2001, on the plausibility of IA studies and conclusions
- Miles and Huberman (1994), with discussion on standards for the quality of conclusions
- Baker (2000), Marsland et al. (2001), Adato and Meinzen-Dick (2007) on combining quantitative and qualitative methods.

Adato and Meinzen-Dick (2007) observe from the case studies they present that impacts are mixed and variable. In many cases research had a positive impact, but only on some dimensions of livelihoods, and not on others. Or, at times there was little evidence in terms of conventional impact measures such as income and consumption. Impact literature in the last few decades has mostly reported successes and high rates of return; the Adato and Meinzen-Dick studies provide examples of a more realistic assessment of the outcomes of research investments.

(VIII) Report, disseminate, communicate externally and internally

To convey and strengthen the findings of an IA, promote uptake and use of the results, and package and present the information for different audiences, it is important to plan and budget appropriately and plan for reporting, dissemination, and communication from the very beginning,. There are various ways in which IA results can be communicated effectively. Reports should clearly document the purpose of the IA so that the findings can be understood in context. Timeliness of reporting and dissemination is crucial, especially if the IA will be used to make strategic decisions. The findings and limitations of the IA should be made accessible to those affected by the IA, as well as to others who may be interested. Feedback on interim findings should be incorporated prior to producing final reports.

IA reports should generally be concise, since they are mainly aimed at executives who have little time to read lengthy documents. Supplementary information should be put in annexes or references. Impact reports should include information on projects, funding, and completion dates.

Presentation of the IA findings should be modest and realistic, recognize the limitations of the methods and the uncertainties in the results.

Means of communicating the IA results include workshops, publications, videos, meetings with policy makers and stakeholders. It is good practice to explicitly recognize the contribution of partners and all those involved.

(IX) Evaluate the assessment, reflect and learn internally

Upon completion the IA should be formatively and summatively evaluated against the principles presented in this document so that stakeholders can assess its strengths and weaknesses. Much of the relevance, effectiveness and efficiency of an IA derives from what is learned from it, from open discussion of the findings, reflection, dialogue, and action. Further guidelines on using IA for learning and reflection purposes are presented in section: Institutionalizing impact assessment. As Adato and Meinzen-Dick (2007, p. 364) conclude, *"research organizations should ask how technology development and dissemination could have been done differently, asking less often "how much poverty we reduced" and more often 'what did we miss and could have done better."*

3. Incorporating IA into projects and institutions

This section outlines the key elements of training in IA, and describes how to incorporate and budget for IA in projects. The last section describes CIMMYT's experience in institutionalizing IA.

Training in IA

Box 13 gives three examples of training courses given by CIMMYT aimed at building overall capacity in IA as well as specific IA capacity within special projects. The three courses involved:

- Mexican partners and field work consultants as part of the planning phase of the Oaxaca IA project in CIMMYT, El Batan, Mexico, November 2005.
- Ethiopian and Ugandan partners and consultants monitoring and assessing impacts of SG2000 interventions, July 2006 in Kampala, Uganda.
- Turkish national program partners assessing impacts of the Winter Wheat Program (CIMMYT–ICARDA) in Turkey, November 2006, Ankara, Turkey.

Box 13 CIMMYT IA courses: examples of IA training good practice

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A. Training workshop for assessing impacts of CIMMYT maize projects in the Central Valleys of Oaxaca', CIMMYT, El Batán, November 2005

The purpose of the workshop was to familiarize staff and consultants with livelihoods and related IA concepts, and to show them how to develop and test a survey, and use automated data collection tools

DAY 1 Introduction, objectives, research questions, Livelihoods & Poverty Overview; Impact & Poverty indicators, approach of farm interviews, survey good practices, Overview of 1998-1999 baselines

DAY 2 Livelihood assessment, Participatory poverty IA: tools, methods; survey structure, sample design, strategy, time plan, team, logistics; expert selection of communities for the survey

DAY 2-3 Development of survey components (in groups with joint reporting sessions)

DAY 4 Use of handheld devices (PDAs) and training, Field testing and practice on using PDAs

DAY 5 Planning of logistics, Evaluation of workshop and planning for next week, definition of analytical approach of survey data (SPSS, STATA) based on research questions, Closing

B. Training workshop on IA of innovations promoted by National Research Systems and SG 2000 in Ethiopia and Uganda; Kampala, Uganda, July 2006

DAY 1 *Familiarize participants with project and IA concepts and systems for panel data collection*

Opening, introduction on SG2000 activities, participants' introduction

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Introduction on impact assessment project: objectives, structure, approach, methodology options

Basics of Impact assessment and M&E: CIMMYT IA good practices

Livelihoods and Poverty, overview and indicators: operationalising livelihoods concepts for IA; participants' own definitions and examples (poverty, impacts), general definitions to be adopted

Design of survey: study area, experimental design, Participatory definition of project indicators

DAY 2 *Define together the IA metrics, case areas, and data and review approaches to understand the IA*

Purpose and approach of farm interviews, ethics of working with farmers, and common pitfalls

Qualitative (participatory) assessment of attribution of R&D benefits (e.g., beneficiary assessment)

Use of new technology for real-time data collection (PDA, GPS, mapping impacts

Start developing survey parts (start): baseline, sample design, assign group tasks

DAY 3 *Develop the survey, and all aspects involved in doing it, including data collection and analysis*

Study design: experimental design, structure sample strategy, workplan, team composition,

timing, logistics, locations, anticipate and solve practical implementation problems

DAY 4 *Test the approach, try out the new equipment, revise the survey, and propose changes*

Field work to test and apply the approach, fine tune of quantitative elements of studies, focus

group meetings, finalization of modules, practice on using PDAs, reflections on approach

DAY 5 *Review the survey, adopt a draft version, sort out all practical aspects and workplan*

Revise survey and finalization, verification of IA budgets, workplan, next steps, draft and approve

terms of reference for activities, roles, and responsibilities, Self-evaluation of workshop, Closing

C. Joint CIMMYT – ICARDA training on IA, Ankara, Turkey, November 2006

DAY 1 Introduction and overview on IA, Good practices on IA, concepts, definitions, indicators

DAY 2 Methods and framework for impact attribution (baseline, counterfactuals), case study, methods of data collection: qualitative (RRA, PRA), qualitative assessment / evaluation, quantitative methods (sampling, design), new methods for data collection: use of PDAs and GPS, ethics for IA data collection, adoption studies: definitions, indicators, methods: binomial/multinomial, case studies on adoption

DAY 3 Analytical methods for IA: economic surplus methods (theory and data, with Case study, Econometric methods (theory and data), with case study: Durum wheat in Syria

Afternoon session: presentations by the Turkey National Programs and Host Institutions, and by CIMMYT on the International Winter Wheat Improvement Program: progress and challenges

DAY 4 Approach to analyze survey data (by SPSS) including: data interpretation of results and writing an IA report, Hands-on session on data analysis and interpretation of IA results (in work groups)

DAY 5 Design and reporting an IA: implications and use of IA results: why IA is important, how it can be used; discuss a general framework to prepare an IA of crop improvement research (study structure, sample design, workplan, teams), with reflections on design of hypothetical IA of wheat in Turkey based on case study based on reality of expected national level study, Course evaluation, Closing

Writing IA into projects, and developing a budget

Securing funding to incorporate IA in projects can be a challenge. In recent years, the average project budget has decreased and IA is often one of the elements cut during project planning or negotiations with donors. So, it is crucial to match IA objectives with available resources, and acceptable levels of rigor, transparency, and reliability. We touch in here what an IA plan needs:

> - Terms of Reference, budgets, workplans, formation of teams, reporting, and internal and external communication of IA results, and so on.

The first consideration is whether an IA is required or necessary for a project or program. Not all projects merit a full IA, and some projects require only partial, rapid or light assessments. To clarify these, IA team members and managers have to link with others in the planning phases:

- At the <u>Institutional Level</u>, center management should consider the need for IA at the project proposal stage. If management identifies the need for IA, the next step is to discuss what IA is appropriate with the Center's IA unit and ensure that the project budget adequately covers the IA.

- At the <u>Program Level</u>, directors should determine whether the project budget includes proper funds and, if not, should seek more funds from local, regional or global sources as appropriate.

- At the <u>Scientist Level</u>, an IA should be viewed as a component to maximize the benefits of a project, add value, enhance impact, and disseminate and communicate the results.

It is important to determine early on who will fund the IA. If it draws on the Center's core budget it may be done inefficiently and with resentment. Donors are rarely willing to approve resources for IA in projects that they fund, since they usually conduct their own IA for projects.

Figure 9. Window of the template for project proposals with the Impact Assessment box.
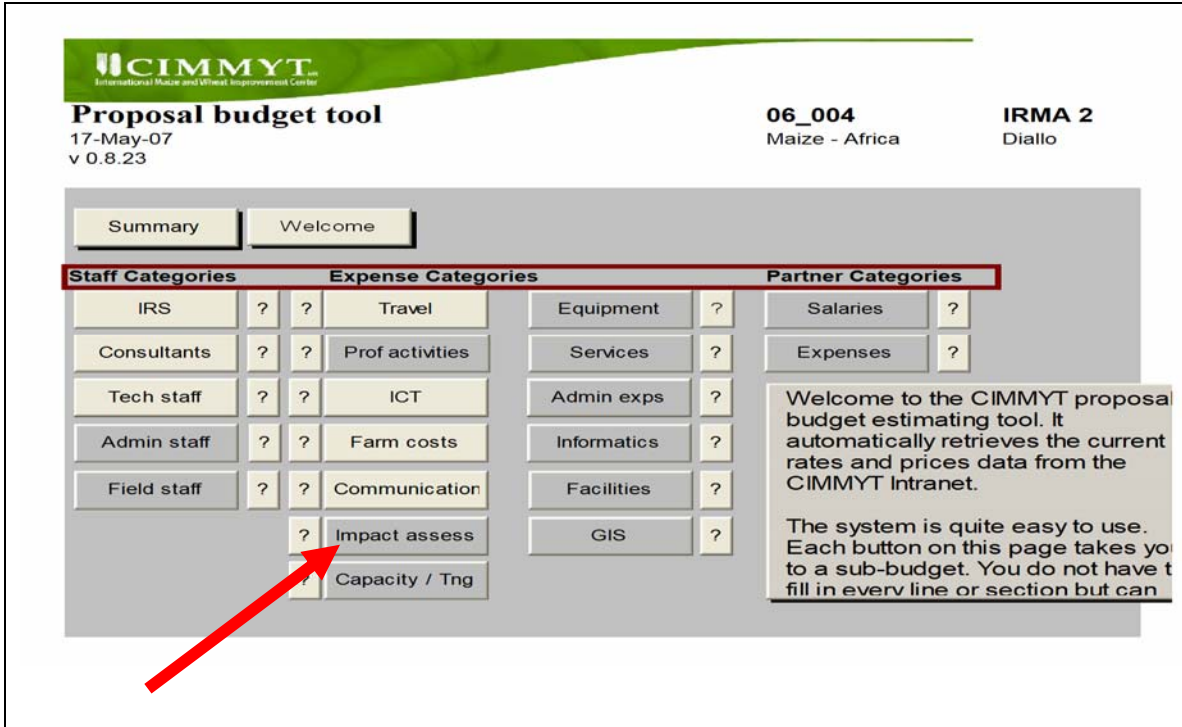
The recommended procedures for building IA into projects are:

- Define an impact pathway and define in the proposals how impact will be demonstrated.
- Design and complete the IA plan before formally starting an IA. This will provide the IA unit or team with a framework that sets out the purpose of the IA, how it will be organized, the resources required. The plan covers the questions outlined in Step I: Clarify the IA.
- Tailor the definition of IA to the project. In many cases IA may be already embedded in the proposal and the existing evidence may be sufficient.
- Define the IA at the beginning of the project. Focus on the type of impact that the project seeks. Depending on the objectives of the project, IA can be a useful tool to ensure the effectiveness of the project.
- Carry out IAs at the institutional level regularly so that IA becomes routine practice.
- Do ex-ante IA and rapid scoping studies for main projects with core funds.

Criteria that need to be considered when deciding on the design of an IA design include:

- <u>Type of project and purpose</u>: for example, accountability, attribution, learning, monitoring.
- <u>Financial</u> resources: adequate funds/scarce funds, IA costs.
- <u>Human</u> resources: various (skilled)/few (unskilled) staff.
- <u>Objectives</u>: M&E versus IA, or external independent evaluation versus internal self-assessment.
- <u>Scope</u>, <u>boundary</u>, and <u>time</u>: urgent and rapid/comprehensive or more complex study without time limits, time required to complete.
- Balance <u>between</u> internal and external <u>input: the former provides more insights and better data, while the input of external assessors will enhance credibility.</u>
- <u>Context</u>: location, data, skills, capacity, time, attitude, partners. This ranges between:
  - o Favored location, lots of data, positive attitude of participants.
  - o Marginal location, absence of data, defensive participants.

The main costs of Livelihoods M&E and IA studies and projects include:

- Design of methods and indicators.
- Real costs for each item, overheads, indirect costs, staff time (national, international).
- Cost for field data collection, local/international travel, field expenses, equipment.
- Cooperation with NARS and salaries, allowances and *per diem* for local collaborators.
- Communication, review, publication and dissemination costs (including modern media).
- Contingencies, normally 5% of total net costs.
- Collection and analysis of data. Indicative cost for conducting socioeconomic field surveys for IA, including all costs except international staff time, is often between:
  - o $25-30 to $170-200 per household, depending, for example, location
  - o RRA, PRA cost: $100-250 per community or focal group

The average duration of local IA studies is from 4 months to 2 years, but may be as much as 5 years for integrated and more complex global studies or M&E projects. IA studies with substantial field and field survey work are much more expensive.

Box 14. Resource requirements for a local IA study.

- Impact specialist and GIS specialist: 4 total months

- Support technical staff: 7 total months

- Field consultants: 8 total months

- Field expenditures and travel: US$12,000

- Publication and dissemination: US$5,000

- Institutional overheads and costs: US$7,000

(drawn from Oaxaca Study, with international scientist input)

A rule-of-thumb estimate, based on metadata from CIMMYT socioeconomic studies, suggests that 3-5% of budgets (core funds and special project resources dedicated to IA) are spent each year on IA. As CIMMYT recognizes that IA supports the Center's mission, it may be appropriate to allocate a similar percentage of budgets to IA. Obviously, the actual amount will depend on local costs, conditions, the types of IA, the locations at which the IA study is conducted, and the mandate and type of activities of the Center. The costs of conducting IA studies are often underestimated even though they represent only a small fraction of research costs. The costs of *not* obtaining impact data, improper targeting, and of missed opportunities to learning from IA, can in reality be much higher than the costs of conducting an IA.

Institutionalizing impact assessment

This section (see La Rovere et al., forthcoming) describes how CIMMYT institutionalized IA by means of a process that started in 2005, as an example for other CGIAR centers and NARS.

CIMMYT has a long tradition of IA. Until recently, IA focused on rates of adoption of improved germplasm and rates of returns on investments. Less attention was directed at measuring impact in terms of poverty reduction or livelihood security. Challenges facing the institutionalization of IA in CIMMYT involved its inherent complexity, the development of credible methods to measure broader impacts, mechanisms to ensure adequate engagement of staff and partners in learning through IA, and packaging the results to better meet the needs of users. CIMMYT's Impacts Targeting and Assessment Unit (ITAU) developed and promoted wide-ranging IA to ensure that IA contributes to staff and institutional learning and improves future work. The process included:

- Collectively assessing the understanding of impact among CIMMYT's scientists.
- Developing a people-centered framework for IA, with a focus on systems and livelihoods.
- Strengthening individual skills and capacity for high quality IA research.

In May 2005 the ITAU led a CIMMYT-wide workshop to develop and launch a learning and operational platform for IA. The workshop involved biophysical and social scientists from CIMMYT regional and global programs. The multi-stakeholder process embraced diverse stakeholders with different expectations of IA. The platform was built on existing staff competencies, and CIMMYT's economic and IA experiences, and reflected the principles in the new CIMMYT strategy. It also aimed to develop a practical framework for CIMMYT IA incorporating people-centeredness as well as a focus on systems, livelihoods, and poverty reduction, to strengthen individual skills and the capacity for high-performance teams. Box 15and Box 16 show the main elements of the process.

Box 15. Institutionalizing IA: A model of workshops and events from CIMMYT's experience.

Event	Participants	Purpose
Inception IA workshop	Social and biophysical scientists, corporate communications, managers	Initiate the IA process and platform
Special sessions on IA for breeders	Wheat breeders Maize breeders	Familiarize breeders with the key elements of IA
Workshop on priority setting and targeting	Scientists from different disciplines, and management staff	Apply IA practice to enhance targeting
Mid-term IA follow up workshop	Social scientists from the ITA program, plus key participants from SPIA, IFPRI, and IPGRI	Reflect, review progress, and share learning on IA
IA sessions on poverty and livelihoods during a science forum	All CIMMYT scientists	Familiarize CIMMYT with IA and present concrete applications
Impact pathways workshop	Social and biophysical scientists, corporate communications	Write impact pathways for main MTP Projects

At the workshop participants shared their views, expertise and expectations. Reaching consensus was not as important as learning from and understanding each other. The approach fostered buy-in from participants. The workshop included plenary and small-group sessions. The former were sometimes made of pre-identified members to ensure geographic or disciplinary diversity or homogeneity, or at other times participants were allowed to join groups based on their interest.

Box 16. Key contents of the CIMMYT IA inception workshop, May 2005.

Understanding experiences with IA Eco-regional groups discussed: What is our capacity for IA? How do we define impact? What are our strengths and best practices in IA? What are challenges/weaknesses in IA?

Increasing understanding of livelihoods, poverty and systems. Discussion in thematic groups focused on questions for participants such as: Are we working together effectively? Have we gained enough clarity on the concepts of livelihoods, poverty and systems? Have we gained clarity on the implications for IA?

Impact assessment framework. An IA framework – described in this document - was proposed and adapted. Exercises were held on IA cases including impact of stem rust (Figure 10).

Panel presentations on methods, approaches and best practices were conducted on CGIAR approaches and guidelines on IA, an application of the Sustainable Livelihoods Framework in Mexico, and on aspects of IA deriving from ILAC's approach for Learning and Change.

Implementing an IA platform, framework, and guidelines: to define best practices and an action plan to implement IA, and build IA into projects and operational modalities for global and regional programs.

An IA framework (based on Patton, 1995) was proposed, discussed extensively in the workshop, and finally adopted for use by practitioners (resulting in Figure 4). This framework covers the actions and aspects that IA leaders or project managers need to consider before and during an IA.

Using this framework, participants discussed a series of practical case studies, describing the:

- Intended users and uses of the information generated,
- Stakeholders that need to be involved,
- Topics to be assessed,
- Scope and boundaries of the study,
- Critical questions to be asked,
- Disciplinary expertise required and ways to mobilize it, and
- Ways to use the results of the IA.

The case studies included one on the potential impacts of the spread of a new strain of wheat stem rust, the UG99 (Figure 10), Hodson et al., 2005). The impact pathway shows that direct impacts on yield, grain quality, and prices could result in increased grain imports, migration to cities, changes in cropping patterns, and reduced exports, which could ultimately affect both producers' and consumers', food security and livelihoods. The impact on national economies could also affect global markets, if wheat stem rust affected large exporters or several export countries simultaneously.

Figure 10. Charting complex impact pathways: wheat stem rust.
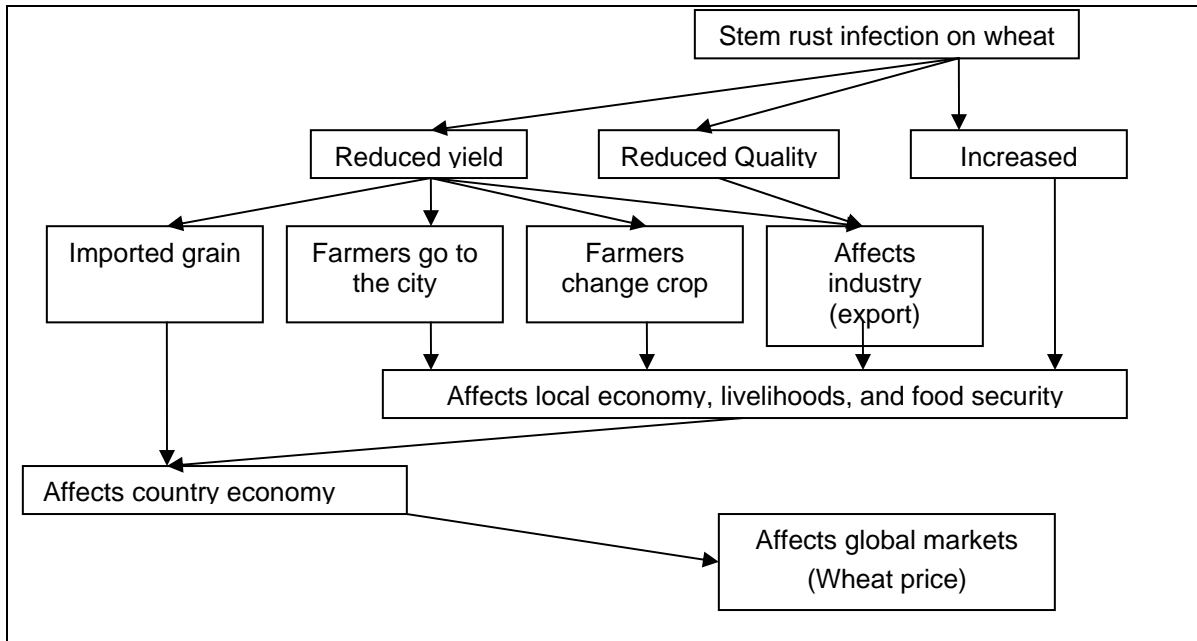
The IA workshop helped define the roles and modus operandi in IA for the participants and overcame disciplinary and knowledge barriers. It also started a process of continuous learning about how to conduct IA and integrate work among programs. As a result, the IA capacity of scientists from regional and cross-disciplinary programs was strengthened. One of the key benefits was the opportunity to reflect on IA experiences; on individual, programs, and regional capacities for IA; and on how impact is being understood and defined.

Activities since then (Box 15) include a follow-up workshop in Rome in October 2005 to foster and assess progress on the action plan agreed during the inception workshop. This workshop brought together social scientists from CIMMYT headquarters and regional programs, other CGIAR centers (Bioversity, IFPRI), and representatives from SPIA. Participants reviewed case studies and methods that integrated traditional economic and livelihood methods, and discussed the skills required to implement them effectively. An overview of ongoing CIMMYT IA activities in the areas of breeding maintenance research, ex-ante studies, monitoring and evaluation of technology use,

adoption, and ex-post impact studies was presented. As a result, more IA studies were generated that reflect the new thrusts and that integrate economic, qualitative and livelihood IA approaches.

On the recommendation of the CGIAR, a final workshop was held in late 2006 to map the impact pathways of projects in CIMMYT Medium-Term Plan.

Project-based training courses in IA started in 2006[8]. These were supplemented by discussions, and sharing of data and documents among participants, and IA focal points were identified.

Lessons learned included the realization of the benefits of building on past achievements and successes, of moving to broader livelihood, systems, and poverty IA approaches, and of integrating more closely with other disciplines than in the past, while still maintaining a strong emphasis on economics. Workshop participants felt a continued need for guidance on:

- Defining relevant datasets and the key variables to be included in an IA,.
- How to prioritize studies that need an IA.
- Budgeting for an IA when developing proposals.

The need to reduce the use of IA jargon and demystify IA terms was flagged to foster a broader understanding and use of IA at CIMMYT. This manual responds to this demand for guidelines, within the context of the new strategy, as well to the demand raised to s*trengthen capacity for IA.*

Most people gained a better understanding and appreciation of IA principles and practice. The process of assessing the learning and change that occurred through these activities is on-going.

Much learning was implicit and passive rather than explicit. Behavioral change, chiefly for project managers, was often reflected in greater attention to IA in projects and a better common understanding of IA in collegial discussions. A good example is that, in developing the Medium-Term and Business Plans staff wrote impact statements based on impact workshop outputs.

Concrete changes were the institutionalization of templates for project proposals that have budget lines for IA (Figure 9). Since then, IA and innovation systems received increased consideration by CIMMYT management. There is also a growing acceptance of the technical and institutional complexity of IA, and that it has a key role in making strategic decisions and setting priorities, as

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[8] As a modality for tracking the impact of a public good and as an indicator of use of this document, since 2006, earlier versions of this document had already been used for training purposes in 5 projects in 12 different countries, including Mexico, Turkey, and several African countries. Over 60 staff and partners were trained directly and more than 60 indirectly.

testified by the increase in demand for ex-ante IA studies. Another outcome of the process is that it did raise the profile of IA within CIMMYT and initiated an institution-wide learning process. Biophysical and social scientists are now more aware of, interested in and curious about what IA means for them. IA is being developed increasingly around issues (rather than commodities) and, while still maintaining robust economic analyses, is moving from the previous focus on crops and adoption to the broader issues of livelihoods, different impacts, and attribution.

CIMMYT's experiences (see also Annex 3) in enriching its IA practices are relevant and potentially directly useful to NARS, other partners, and other centers.

Annex 1. Glossary of key terms and concepts

The concepts and definitions used in these guidelines, as understood by CIMMYT, are presented below. The definitions integrate understanding from CIMMYT's IA learning process with the conventional definitions of organizations such as OECD and the World Bank (operational concepts that are generally limited in covering livelihoods, poverty and a balance between accountability and learning) and more recent definitions that refer to a livelihoods framework.

Impact monitoring and evaluation (M&E) is a systematic, ongoing process of data collection on given indicators, to ascertain the long-term, widespread, intended/unintended consequences of an intervention and to monitor progress towards wider livelihood improvement goals. M&E is aimed at providing assessors and stakeholders with indications of the extent to which an ongoing intervention is achieving its objectives. Monitoring and Evaluation are complementary but distinct:

- *Monitoring* focuses on tracking inputs, outputs, outcomes and impacts of interventions
- *Evaluation* assesses the efficiency and impact of interventions (after implementation).

Together, M&E allow results to be tracked over time, corrections to be made during implementation, success to be assessed, and ownership of achievements and accountability to be promoted. M&E is a tool for steering projects, and for checking that they are on track and that progress is being made towards the intended impact. When M&E takes a livelihoods approach, this is not ultimately concerned with attaching values to livelihood outcomes, but with understanding whether livelihoods are moving in the right direction. Hence, it is more relevant to focus on determining the trends and direction of change rather than to attaching values to change and differentiating impacts between groups. **Participatory M&E,** because it considers the perspectives and insights of all stakeholders (beneficiaries as well as project implementers) provides feedback on ongoing program effectiveness. Stakeholders identify issues, analyze findings, recommend, and take responsibility for action. The participatory process effectively ensures the ownership and commitment of stakeholders for any corrective action.

Ex-post IA measures the actual outcomes of an intervention at a given point after completion of a project, to determine whether or not intended impacts on individuals, households, communities and institutions were achieved as expected, whether those effects are attributable to the project, and whether or not there were other outcomes. Ex-post IA aims to identify the factors in success or failure, assess the sustainability of the impacts, and draw conclusions to inform subsequent interventions. Ex-post IA is a *summative* form of IA, concerned with the effectiveness and value of a project; it is conducted after project completion for the benefit of the implementing institutions and for external audiences, to determine the extent to which intended outcomes were achieved. Other types of IA are *formative,* that is, they are aimed at providing information during the

planning, preparation or implementation phases of projects, in order to improve performance. Ex-post IAs, however, are increasingly seen as *informative* studies for feeding back information into strategic and funding decisions to help institutions learn and improve project management. A comprehensive IA package includes, for example, ex-ante, program reviews, ex-post, performance M&E, and process evaluations. In research studies, process evaluations often take the form of early-acceptance and adoption studies that provide feedback on the research process as it proceeds. Other key IA terminology, used throughout these guidelines, is presented below:

Accountability is the demonstration that research complies with agreed rules and standards, and reports performance results fairly and accurately vis-à-vis plans. This includes the obligation of those involved in a project to act according to defined responsibilities, roles and expectations, in terms of a wise use of resources; for assessors, to provide accurate, fair and credible monitoring reports and performance assessments; and for public sector managers and policy-makers, to ensure accountability to taxpayers and citizens.

Adoption: is a dynamic process by which innovations are accepted and used by people. The process is influenced by a variety of factors:

- Farmers' perception of the relative advantages and disadvantages of technologies.
- The efforts made by extension services to disseminate these technologies.
- The policy environment.
- The socioeconomic characteristics of farmers.
- The characteristics of the farming system under consideration.
- The characteristics of the technology.

The *degree* of adoption is measured by the proportion of land under the new technology (rate), whereas the *intensity* of adoption is measured by multiplying adoption rate by degree of adoption.

Appraisal: is an overall assessment of the *potential* relevance, feasibility and sustainability of an intervention prior to a decision on funding or implementation, used by decision makers to decide whether an activity represents an appropriate use of resources. Appraisal is related to ex-ante IA.

Attribution is the process by which a causal link is ascribed between observed (or expected) changes and specific interventions. It serves to assess those who, at different levels, were involved in a project or program or in the development and diffusion, and impact, of a technology.

Baseline is an analysis describing the situation prior to an intervention, that uses benchmark reference points against which progress can be assessed or comparisons made. An appropriate baseline is often an advantage because it allows before/after counterfactuals.

Beneficiaries are individuals, groups, or organizations, whether explicitly targeted or not by the project or intervention, that are expected to benefit from a development intervention.

Counterfactual: is the situation, forecasted scenario or course of events which might prevail for individuals, organizations, or groups were there no development intervention, or that would have occurred without the intervention. The design of realistic counterfactuals is a key to successful IA.

Effect: The intended or unintended change due directly or indirectly to an intervention.

Effectiveness is the extent to which given objectives of the intervention were achieved, or are expected to be achieved, taking into account their relative importance, whereas **efficiency** is how economically the given resources and inputs (funds, skills, time, etc.) are converted into results.

Empowerment: is the expansion of the assets and capabilities of people that enable them to participate in, negotiate with, influence, control and hold accountable institutions that affect their lives. It is the expansion of freedom of choice and action, a process which places or transfers decision-making responsibility and resources into the hands of those who are intended to benefit.

Ex-ante IA can be defined as an IA process carried out before interventions or policy change take place, typically by simulating events and forecasting the impacts of these changes. It is used to set the right direction, identify the existing situation, and opportunities for impact generation before an intervention is initiated or outcomes are generated, to ensure proper targeting of research, and for priority setting. A related term to ex-ante IA is "appraisal."

Feedback is the transmission of findings generated through the evaluation process to parties for whom it is relevant and useful in order to facilitate learning. This may involve the collection and dissemination of findings, conclusions, recommendations and lessons from experience.

Impact pathway: a conceptualization of a project, program or organization's envisioned pathway towards achieving impact. It is a visual description of the causal chain of events and outcomes that link outputs to goals. It includes network maps, which show the evolving relationships necessary to achieve the goal (implementing organizations, stakeholders, beneficiaries, etc.), and shows the project rationale and logic. It can be used in both ex-ante and ex-post IA contexts.

Indicators are quantitative or qualitative factors or variables that provide simple and reliable means to measure achievement, reflect changes connected to an intervention, or help assess the performance of a development actor. Indicators are increasingly important in summarizing the progress and direction taken by development-related activities.

Livelihoods have been defined at CIMMYT as the "*stocks and flows of assets and the ways how these contribute to farmers' well-being.*" Thus the impact of technologies on farmers' livelihoods must be considered in the broad context in which people live and operate. This implies a shift in thinking from maize or wheat as central objects of research, towards an approach that more comprehensively links crops to the stocks and flows of household assets and activities.

A **meta-assessment** is used for IAs designed to aggregate findings from a series of IAs or to denote the assessment of an IA to judge its quality or assess the performance of the assessors.

Performance: is the degree to which a research or development intervention or partner operates according to specific criteria/standards/guidelines or in accordance with stated goals or plans. A **performance indicator** is a variable that allows verification of changes due to the intervention or relative to what was planned. **Performance measurement** is a means for assessing the performance of interventions against stated goals; **performance monitoring** is a process of continuous data collection and analysis to assess how well a project or program is implemented.

Outputs are products, goods and services resulting from development interventions. Outputs may also include changes resulting from interventions which are relevant to achieving outcomes.

Outcomes are the likely or achieved short-term and medium-term effects of intervention outputs.

Poverty is the failure to meet basic needs, in terms of food, health, housing, security, education, and vulnerability to climatic and economic shocks. Conventional definitions are based on having less than a given minimum disposable income, based on national averages from consumption baskets or $/day. Exclusion is another aspect of poverty linked to limited access to institutions (e.g., seed systems, credit organizations, markets, social networks).

Poverty map: is a geographic profile showing the spatial distribution of poverty within a country, used to identify where policies or interventions had or can have greatest impact on poverty. They are used to estimate geographically disaggregated welfare and inequality levels, and changes in small areas, therefore allowing geographic heterogeneity to be taken into account in IA studies.

Quality assurance: encompasses any activity concerned with assessing and improving the merit or the worth of a development intervention or its compliance with given standards. Examples of quality assurance activities include appraisal, reviews during implementation, and evaluations.

Social capital: the social capital of a society comprises the institutions, relationships, attitudes and values that govern the interactions among people. **Social capital assessment** is an approach that integrates quantitative and qualitative tools that allow investigating institutions and networks and enabling collective action. It is normally implemented together with other tools.

Social IA is a framework to identify the range of social impacts and responses to an intervention or policy by institutions or people. It is used to assess how costs and benefits of interventions are distributed among stakeholders and over time. It is based on stakeholder analysis, and is useful to disaggregate data on livelihood assets and capabilities into meaningful categories. It uses a range of qualitative data collection tools (focus groups, semi-structured key informant interviews, stakeholder workshops, etc.) to determine impact, stakeholder preferences, priorities and constraints on implementation.

SPIA: the CGIAR's Science Council comprises a [Standing Panel on IA](#) (SPIA) that contributes to the overall performance monitoring of the CGIAR centers by developing methodological inputs and by evaluating center performance in the domain of IA. SPIA provides CGIAR members and the public with information on system level impacts and a website with impact studies and methodological documents (www.sciencecouncil.cgiar.org/activities/spia/). SPIA is developing "Strategic" guidelines complementary to the present "Operational" guidelines for IA on livelihoods.

Stakeholders are agencies, organizations, groups or individuals having direct or indirect interests in a development intervention or its evaluation. They include those affected by a given intervention.

Vulnerability: denotes a condition characterized by risk and reduced ability to cope with shocks or negative impacts. It may be due to socioeconomic conditions, gender, age, disability, ethnicity or other criteria that influence people's ability to access resources and opportunities. Vulnerability is always contextual, and it must be assessed in the context of a specific situation and timeframe.

Annex 2. Logic models

Agricultural research for development is based on the hypothesis that knowledge can be used to raise poor people's level of well being by producing more food at lower cost, reducing risks and providing options for them to choose from. Research is therefore part of a means-end hierarchy that usually comprises a chain of interlinked objectives. The complete chain of objectives that links inputs to activities, activities to outputs, outputs to outcomes, and outcomes to impact is a logic model. Reviewing the logic model for a research project or program is a crucial component of planning an impact study. Logic models, or program theory in the evaluation language, are used in IA and in the evaluation of research programs and projects. A well-articulated logic model is needed for IA, thus researchers need to review, update or refine logic models in the process of IA. Some generic logic models, their main strengths and weaknesses, are described below. There are many names, definitions, and uses of logic models, for example the logical framework (Baur 1998), impact pathways (Springer-Heinze et al., 2003; Douthwaite et al., 2003) or program theory (e.g., Patton 1995). The most important aspect of logic models is that they provide a systematic articulation of what a program or project intends to achieve and how. Logic models are chains of hypotheses. The elements of the chain are connected by assumed causal links. Evaluation and IA ask whether the assumed causal link between the elements in the chain does or does not exist. A logic model may be implicit. Especially in cases where the planning function is weak or under-resourced, the assumed causal links between research outputs and outcomes may not be well articulated. The hypotheses are thus only partially known and cannot be scrutinized and improved. Logic models are essential for building hypotheses and testing causalities. They encourage impact assessors to be more precise in developing a more scientific study design. An IA, however, is usually different in its level of ambition. While science is about proof, falsification and definitive conclusions, the aim of IA at the level of peoples' livelihoods has to be more modest. Stakeholders usually expect from an IA some plausible estimates of the likelihood that particular research activities have contributed in concrete ways to improved livelihoods, which is different from definitive proof of impact. Different approaches have been suggested to address this trade-off between seeking proof and the practical need of investors for information that will help them decide what to do next.

Contribution analysis (Mayne 1999) has been suggested as a way to deal with accountability in the move towards results-based management. It usually relies on performance management data and addresses the question of what contribution a program has made to a development impact. It answers the question of how much success or failure can be attributed to a program. Contribution analysis of an agricultural research program would aim to reduce uncertainty about the contribution made, not provide proof.

Outcome Mapping (Smutylo and Carden, IDRC) is a process focusing on outcomes. Outcomes are defined as changes in the behavior and activities of people, groups, and organizations with whom a program works and allows for a realistic evaluation. Other examples of logic models for different types of research are applied models (applicable to crop breeding), adaptive models (for example participatory research, used in CIMMYT's participatory work in Oaxaca, Mexico; Smale et al., 2003; La Rovere et al., forthcoming) and livelihood frameworks.

Box 17. The results-based monitoring model of GTZ.

The results-based monitoring (GTZ 2004) approach of GTZ focuses on impacts rather than outputs. It captures the social and environmental changes required for innovation that development cooperation seeks to bring. GTZ requires project managers to monitor changes in the context of a program and identify whether such changes are linked to the project. The mere occurrence of a change is not sufficient to merit its designation as a project or program result, there must be a causal or plausible link between observed change and outputs. The difficulty of attributing change in the wider context of project interventions (the attribution gap) is recognized. Attribution is addressed in the contract and cooperation agreement by stipulating monitoring requirements for objectives up to and beyond the outcomes. Up to the outcome, managers are required to monitor outputs, use of outputs, and external factors that facilitate or constrain the use of outputs, and to demonstrate causal links between the desired changes and project outputs. Beyond the outcomes, they need to monitor changes in the wider context of research and establish what contribution the project may have made to observed changes. The contribution beyond outcome must be plausibly argued, not causally demonstrated.

Annex 3. The extra need to learn and change

The results of IAs are major drivers for organizational learning and change. IA processes are key components of organizational knowledge management. Evaluation methods based on traditional approaches inhibit rather than support innovation (Perrin, 2002). Although some projects may fail, the wider innovation process will be compensated by gains from the more successful projects and looking at portfolios of projects may be more appropriate than looking at individual ones, Averages can also mislead as they disguise what is truly happening. On the other hand, just selecting successful projects destroys credibility. Focusing on learning rather than on successes, and on approaches and mechanisms that enhance innovation itself, are advocated (Perrin, 2002).

There is also concern that much IA hasn't made enough of a difference on research management or the impact orientation of research programs and institutes. Ekboir (2003), Horton and Mackay (2003), and Springer-Heinze (2002) agree that IA supports communication and decision making.

To serve this purpose, IA should be utilization-focused (Patton, 1995) and involve key intended users throughout the process. CGIAR centers, therefore, will get most out of IA if they engender a learning, risk-taking culture. Hence IA focal points should have a clear and formal mandate to support organizational learning and change, and not just the production of IA reports.

IA that is done with too much emphasis on compliance with pre-established rules and targets risks to trigger defensiveness, implementers playing it safe and other behavior (Perrin 2002). What is needed instead is people acting responsibly with regard to their mandate, asking the difficult questions, challenging their own assumptions, and doing their best possible thinking.

Annex 4. Modified standards of the Africa Evaluation Association

Utility: to ensure that IA will serve the needs of intended users and be owned by stakeholders

- U1 Stakeholder identification: persons or organizations involved in or affected by the IA (and the beneficiaries) should be included in the IA process, so that their needs can be addressed and IA findings can be usable and owned by the stakeholders.

- U2 Assessor's credibility: the persons conducting the IA should be trustworthy and competent to perform the IA, so that the findings are credible and accepted.

- U3 Information scope and selection: information collected should address pertinent questions and be responsive to the needs and interests of clients and other stakeholders.

- U4 Values identification: describe the perspectives, procedures, and rationale used to interpret the findings so as to clarify the bases for judgments. Multiple interpretations should be preserved, if these respond to stakeholders' concerns and needs for utilization.

- U5 Report clarity: IA reports should clearly describe what is being assessed, - the context, purposes, procedures, and findings of the IA - so that these are understood.

- U6 Report timeliness and dissemination: interim findings and IA reports should be shared with the intended users to the extent that this is useful, feasible and allowed. Feedback of intended users on interim findings should be taken into consideration before the final report.

- U7 IA (evaluation) impact: IAs should be planned, conducted, and reported in ways that encourage follow up by stakeholders, in order to increase the chance that the IA will be used.

Feasibility: intended to ensure that an IA is realistic and in the overall feasible.

- F1 Procedures: IA procedures should be practical, to reduce disruption while gathering data.

- F2 Political viability: the IA should be planned and done by anticipating the position of various interest groups, so that their cooperation may be obtained, and so that possible attempts by any of these groups to curtail the procedures, or bias or misapply the results can be averted or counteracted as much as possible in the given context and situation.

- F3 <u>Cost effectiveness</u>: the IA should be efficient and produce information of sufficient value, so that costs are justified. It should stay within its budget and account for its costs.

Propriety: an IA should be conducted legally, ethically, and with due regard for the welfare of those involved in it and affected by its results.

- P1 <u>Service orientation</u>: IA should be designed to assist organizations to address and effectively serve the needs of the full range of targeted participants.

- P2 <u>Formal agreements</u>: the obligations of formal parties in an IA (who does what, how and when) should be agreed through dialogue and in writing, as appropriate, so to have a common understanding of the agreement and be in a position to formally renegotiate it, if needed. Attention should be paid to informal and implicit expectations by all parties.

- P3 <u>Rights of human participants</u>: IA should be designed and conducted in such as manner as to respect and protect the rights and welfare of the subjects and communities of which they are part.

- P4 <u>Human interaction</u>: assessors should respect human dignity in dealing with those involved in the IA and not harm participants or compromise their culture or religion.

- P5 <u>Complete and fair assessment</u>: IA should be fair in examining strengths/weaknesses of what is assessed, so that strengths can be built upon and problems addressed.

- P6 <u>Disclosure of findings</u>: formal parties to IAs should ensure that all findings and limitations are made accessible to the subjects of the IA. The assessors will determine what can ensure that confidentiality is respected, and that the assessors are not exposed to potential harm.

- P7 <u>Conflict of interest</u>: conflict of interest should be dealt with openly and transparently so as not to compromise the reliability and credibility of the process and the IA results.

- P8 <u>Fiscal responsibility</u>: the assessor's allocation and expenditure of resources should be appropriate, reflect accountability procedures, be prudent, frugal, and ethically responsible.

Accuracy: intended to ensure that an IA will reveal and convey technically adequate information about the features that determine the worth of merit of what is being assessed.

- A1 <u>Program documentation</u>: the objective of the IA should be described accurately, so that the program is clearly identified, with attention to all forms of communications.

- A2 <u>Context analysis</u>: the context in which the program exists should be examined in detail (including political, social, cultural, ecological aspects) so that its influence can be assessed.

- A3 <u>Described purposes and procedures</u>: purposes and procedures of the IA should be monitored and described in enough detail, so that they can be identified and assessed.

- A4 <u>Defensible information sources</u>: information sources should be described, so that their adequacy can be assessed without compromising anonymity or cultural sensitivity

- A5 <u>Valid information</u>: information gathering procedures should be chosen and implemented to assure that the implementation is valid for the intended use. Information likely to be susceptible to bias should be checked with various methods and sources.

- A6 <u>Reliable information</u>: the information gathering process should be developed so that the collectors will assure that the information obtained is sufficiently reliable for the intended use.

- A7 <u>Systematic information</u>: information collected, processed, and reported in an IA should be systematically reviewed and any errors found should be corrected.

- A8/9 <u>Analysis of information</u>: quantitative and qualitative IA information should be appropriately and systematically analyzed so that IA questions are effectively answered.

- A10 C<u>onclusions</u>: the conclusions of IA should be justified, for stakeholders to assess them.

- A11 <u>Impartial reporting</u>: reporting should guard against distortion caused by the personal feelings and biases of any party to the IA, so that IA reports fairly reflect the IA findings.

- A12 <u>Meta-evaluation</u>: the IA should be formatively and summatively evaluated so that, on completion, stakeholders can assess its validity, usefulness and relevance.

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Annex 7. Key web resources on IA

American Evaluation Association, 2004. Guiding Principles for Evaluators. Revisions reflected herein ratified by the AEA membership, American Evaluation Association www.eval.org/

RURU, Univ. of St. Andrews, Nutley et al. www.st-andrews.ac.uk/~ruru/publications.htm

GTZ (Gesellschaft für Technische Zusammenarbeit): www.gtz.de

SPIA, SC Secretariat, FAO, Rome www.sciencecouncil.cgiar.org

Web list on Participatory Monitoring and Evaluation from the Wageningen University: portals.wi.wur.nl/ppme/content.php?Outcomes_%26_Impact

DREAM A Tool for Evaluating the Effects of Agricultural R&D www.ifpri.org/dream.htm http://www.ifpri.org/themes/grp01/dream/dream.htm

General Algebraic Modeling System (GAMS) is a system for mathematical programming and optimization, widely used for IA models, scenario studies, etc. www.gams.com/

Trade Off Models; Tradeoff Analysis, Department of Agricultural Economics and Economics Montana State University. www.tradeoffs.nl/ www.tradeoffs.montana.edu/pdf/TOAYanggen.pdf

International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT), to run scenarios. www.ifpri.org/themes/impact/impactd.asp; www.ifpri.org/themes/impact/impactddlxp.asp

Outcome mapping, Smutylo and Carden: www.idrc.ca/en/ev-26586-201-1-DO_TOPIC.html

M&E News, a web resource maintained at Cambridge University: see www.mande.co.uk

International Association for Impact Assessment: www.iaia.org/modx/

Materials www.scipol.demon.co.uk/iapa.htm; http://www.iaia.org/modx/

African Evaluation Association: http://www.afrea.org/home/index.cfm

European Evaluation Association www.europeanevaluation.org/

International Association for Impact Assessment: http://www.iaia.org/modx/

CGIAR Impact website: http://impact.cgiar.org/index.asp

Italian Evaluation association: http://www.valutazioneitaliana.it/link.php

Regulatory Impact Assessment (UK site) http://www.hse.gov.uk/ria/index.htm

Canadian Evaluation Association: http://www.evaluationcanada.ca/

Australasian evaluation society http://www.parklane.com.au/aes; www.nzaia.org.nz/

UK evaluation association http://www.evaluation.org.uk

German evaluation association http://www.degeval.de

French evaluation association http://www.sfe.asso.fr

Swiss evaluation association http://www.seval.ch

IFAD evaluation unit http://www.ifad.org/evaluation/index.htm

International Development Evaluation Association: http://www.ideasconference.org/index.htm

Institutional Learning and Change: http://www.cgiar-ilac.org/index.php?section=1

Other CGIAR IA pages: http://impact.cgiar.org/links/links.asp?mode=vis&kat=5&orderby=name

World Bank 2002. Poverty and Social Impact Analysis (PSIA)
   spa.synisys.com/resources/draftPSIAUserGuide.pdf; www.worldbank.org/poverty/impact/

World Bank, 2004. Monitoring & Evaluation: tools and approaches www.worldbank.org/ieg/ A
   manual available in six languages for download at: http://www.worldbank.org/ieg/ecd/tools/

A list of CGIAR centers that are particularly active in IA can be found at:
   http://impact.cgiar.org/links/links.asp?mode=vis&kat=5&orderby=name