



## How different agricultural research models contribute to impacts: Evidence from 13 case studies in developing countries



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### ABSTRACT

In a context of a severe funding crisis, donors and policymakers expect increased accountability from research organizations and convincing proof that public investments in research have significant and positive societal impacts. This article takes stock of the lessons learned from the use of a method (ImpresS) designed by CIRAD to analyze the impact of research undertaken in partnership with a range of different actors in a developing-country context. The method uses a case study approach, and relies on the evaluation of the impact pathway and on contribution analysis. Thirteen case studies were selected to represent the diversity of partnerships, research activities and types of innovation. The results confirm the diversity and complexity of the innovation processes encompassing the non-linearity of changes over extended periods, the diversity of impacts, the shifting roles of actors engaged in the innovation process, and the diversity of activities carried out by the research community to contribute to outcome and impact generation. Interactions between researchers and other actors throughout the innovation process appeared to play key roles along the impact pathway. Based on the 13 case studies, we identified four generic models through which research contributes to impact: participatory transfer of knowledge and technologies, co-design of innovation, support for the innovation process, and promotion of open innovation. Our results underline the need for research institutions to recognize and accept the diversity of functions fulfilled by researchers if they want to contribute in an effective manner to the generation of impacts. Another challenge is to learn how to take advantage of clusters of projects embedded in innovation pathways in order to sustain research activities over a long timeframe.

**Significance statement:** Impact evaluation is increasingly being requested from the research community as a measure of accountability by both donors and civil society. Conducting it properly is challenging, especially in the context of developing countries. Quantitative studies are often biased toward expected and tangible impacts. Complementary qualitative approaches are focused on understanding causality and are more in line with the actors' participation in impact evaluation. CIRAD has developed a method and used it to assess 13 case studies involving research conducted in partnership in widely differing environments. Some main lessons learned include the long timeframe needed for impacts to be achieved, the diversity of impacts the research community needs to consider, and the multiple roles played by the research community in co-developing outcomes with

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diverse stakeholders. Results show that the research community can contribute to impacts by using several models of intervention.

## 1. Introduction: what type of models should the research community use to achieve impacts?

Understanding and improving the contribution of agricultural research for development (AR4D) to global food security and poverty alleviation through sustainable agricultural is becoming increasingly important. In a context of a funding crisis, donors and policymakers expect increased accountability by researchers and their institutions and concrete evidence that public investments in research have significant and positive societal impacts (Foray et al., 2012; Morgan et al., 2017). However, impact evaluation is difficult because AR4D cannot solve societal challenges on its own.

Diverse organizational models of innovation detailing the interactions between the research community and other actors can be found in the literature. One such model is the “transfer of knowledge and technologies” in which the research produces outputs that are directly used by other actors (Röling, 2009). This model was the basis of the Green Revolution in which new technologies (e.g. improved seeds, chemical inputs) were developed by the research community, disseminated by extension mechanisms, and adopted by farmers. But such a prescriptive model, while still being used, is subject to criticism for its inability to solve the complex problems inherent to agricultural development, such as environmental and social issues, and for its simplistic assumption of passive adoption of technologies by farmers (Ekboir, 2003). Another innovation model, based on a systemic perspective, stresses the fact that innovation is produced by interactions between a variety of public and private stakeholders within the framework of an agricultural innovation system (AIS) (Hall et al., 2003; Touzard et al., 2015). In this situation, agricultural research may contribute to innovation processes by operating through different types of partnerships and the use of participatory research methods (Röling, 2009; Douthwaite and Hoffecker, 2017). However, this systemic innovation model is sometimes criticized for its inability to easily produce generic solutions with the potential to be adopted on a large scale (De Janvry et al., 2011). More detailed innovation models are described in the literature and analyze the role of research when research does contribute to innovation. They combine various elements of the “transfer of knowledge and technologies” model and the “systemic innovation model”. However, these models usually pertain more to the industrial and business domain than to the agricultural domain (Matt et al., 2016). Tidd (2006) in his literature review identified five generations of innovations models in the industrial and business domain depending on variables such as the types and roles of stakeholders involved (including the research community), the types and intensity of interaction between stakeholders, and the level of control over the innovation process by the non-research stakeholders. The author compared the push-pull technology model with other models developed for intervening in complex systems and working with networks of actors. Amongst alternative models, the popular chain-linked model proposed by Kline and Rosenberg (1986) focuses on the intensity of interactions between the researchers and other actors during different phases of the innovation process (from market identification to final product development and distribution). Another example is the open innovation model which describes the flexible collaborations between stakeholders (including researchers) who agree to freely share the knowledge and the risks (Chesbrough, 2003).

Despite a long-standing interest in the subject (Horton and Mackay, 2003), few studies have assessed how AR4D contributes to impacts or explored its link to the application of the different innovation models (Donovan, 2011; Colinet et al., 2013). These considerations led the French Agricultural Research Centre for International Development (French acronym: CIRAD) to invest collectively in an effort to document

if and how the research it conducts in developing countries in partnerships with national research organizations fosters innovation and produces impacts. To this end, CIRAD developed a specific evaluation methodology called ImpresS (Impact of Research in Southern countries). On the basis of a cross-analysis of 13 case studies evaluated by the ImpresS method, this article has the goal of analyzing how research contributes to impacts in order to identify the different models of AR4D that contribute to impacts. Our results should provide generic insights on how agricultural research organizations can enhance their contribution to impacts.

## 2. Method

### 2.1. The participatory impact evaluation method used in the case studies

The ImpresS methodology does not focus on the attribution of impacts to research, which is often based on economic and statistical approaches (Joly and Matt, 2017). It draws instead on a set of key concepts: case study research (Yin, 2009), impact pathway evaluation (Douthwaite et al., 2003), and contribution analysis (Mayne, 2001). These choices originated from the scientific interest in understanding the processes and mechanisms that enable agricultural research to contribute to impacts. The evaluation followed participatory principles (Baron and Monnier, 2003) to arrive at a shared perception among actors of the specific process being evaluated and its effects (Habermas, 1984) and to improve the quality and relevance of the evaluation by mobilizing different kinds of knowledge and perceptions (Ridde, 2006). To this end, a range of different actors took part in workshops, focus groups and surveys to characterize the innovation process and the consequent impacts. They also took part in a final workshop to discuss, refine, and validate results.

For each case study, the evaluation using the ImpresS methodology started by reconstructing, in collaboration with the actors, the narrative of the innovation process, including the roles played and strategies adopted by every stakeholder in the innovation process. We focused in particular on the activities of researchers, which included capacity building activities, and we analyzed the types and intensity of interactions between researchers and other actors, including public ones. To do so, we analyzed three to eight specific and concrete situations of interactions involving research for each case study by using approaches based on learning theories (Toillier et al., 2018). In a second step, the impact pathway approach was mobilized to map the causal chain linking the inputs used by the research community, the research outputs, the outcomes, which are generated when actors use and transform the outputs, and, finally, the impacts, which are the long-term changes arising from the outcomes. Impacts were identified by collecting “descriptors of change” from the actors involved in the innovation process which express their perception expressed, by using their own words, of what has actually changed as a result of the intervention. Each impact was characterized by a set of quantitative and qualitative indicators that accounted for the changes that took place between the start of the innovation process and the evaluation. Values for these indicators were collected through *ad hoc* surveys, interviews, focus groups and secondary data.

To implement the ImpresS methodology, 13 case studies were selected by the authors from a pool of 54 candidate case studies drawn from CIRAD's research interventions to illustrate the diversity of partnerships, research activities and types of innovations to which CIRAD's research has contributed in the past 40 years (Table 1). In this selection, we observed 9 case studies with research activities stretching back several years into the past and with observable and stabilized impacts.

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