



Short communication

The “efficient boundaries” of international agricultural research: A conceptual framework with empirical illustrations



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ABSTRACT

The international agricultural research centers known as CGIAR have played an important role with regard to global food security. Yet, their mandate remains debated: Should they concentrate on producing global public goods, for which they arguably have a comparative advantage, or should they engage in “downstream” activities of the research-development continuum and promote technology adoption on the ground, so as to increase their impact? This paper contributes to resolving this debate by developing a new conceptual framework, which is based on transaction costs economics and makes it possible to identify a range of factors that determine the comparative advantage of international versus national organizations. The different transactions involved in the development and uptake of products from international agricultural research are illustrated by an empirical case study of the legume improvement program of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Data collection involved a participatory mapping technique (Net-Map) as well as key informant interviews. The paper draws attention to the governance problems involved in downstream activities, which influence the comparative advantage of international versus national organizations in the research-development continuum. Policy implications are derived for the ongoing reform of the CGIAR and for future research on this topic.

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1. Introduction

The first two Sustainable Development Goals (SDGs) aim to end extreme poverty and hunger, achieve food security and improved nutrition, and promote sustainable agriculture (UN General Assembly, 2014). The strategy and results framework of the CGIAR also identifies three system level outcomes (SLOs): reducing rural poverty, improving food and nutrition security for health, and improving natural resources and ecosystem services (CGIAR, 2015). The 2008 World Development Report (World Bank, 2007) stressed the importance of agriculture-led growth to achieve these targets. Although there are differences across regions, productivity growth closely linked to investments in agricultural research and development (R&D) has driven agriculture's global success (Alston et al., 2000; Pardey et al., 2006; Raitzer and Kelley, 2008; Renkow and Byerlee, 2010). International agricultural research (IAR) plays an important role in exploiting advances in agricultural science to improve the lives of the poor in developing countries (Zeigler and Mohanty, 2010).

The international agricultural research centers (IARCs) that form the CGIAR evolved as the main international system of agricultural research.

The CGIAR centers struggle to find a balance between basic and strategic research activities located on the upstream side, and delivery programs located downstream. The general view has been that the CGIAR should concentrate on the upstream side, conducting research that produces international public goods (IPGs) (TAC Secretariat, 2000; Harwood et al., 2006; Sagasti and Timmer, 2008; CGIAR Science Council, 2005, 2008, 2009). However, there is often no functional research-development (R-D) pathway, which would ensure that CGIAR research results are implemented on the ground. Financial constraints and the requirement by bilateral donors to show impact have pushed centers down the R-D continuum, inducing them to engage in more location-specific research and promotion activities (Pingali and Kelley, 2007; Bertram, 2006; Katyal and Mruthyunjaya, 2003; Anderson, 1998; Alston et al., 1998).

To improve its structure and functions, the CGIAR system has attempted reform efforts for decades (McCalla, 2014). In the latest reform, the work of the 15 centers is organized under the cross-cutting CGIAR Research Programs (CRPs) (BCG, 2009:5; CGIAR Independent Review Panel, 2008). Donors are expected to channel their funds through the CGIAR Fund, which has three funding windows. Window 1 provides unrestricted contributions to be allocated to CRPs, while Window 2 allows donors to target specific CRPs (CGIAR SRF, 2011). Even though these two windows provide the opportunity to finance

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research in accordance with the strategy and results framework (SRF), a significant proportion of funding is still allocated through Window 3. Furthermore, bilateral¹ projects still constitute a large proportion of funding to the CGIAR. This indicates that, so far, a major objective of the reform has not yet been achieved.

It is therefore crucial, as the CGIAR undergoes another phase of reform, to analyze the outstanding debate on what activities the centers should focus on. This paper aims to contribute to this debate by developing a framework based on concepts of the New Institutional Economics² to identify the factors that determine the comparative advantage of IARCs.

From a normative point of view, the comparative advantage of IARCs is related to the question as to what governance structure is best suited for the different types of transactions involved in research and in the implementation of research findings. Transaction cost economics (Shelanski and Klein, 1995; Brown and Potoski, 2003), a branch of the New Institutional Economics, offers an analytical approach that aligns transactions that differ in their attributes with governance structures that differ in their costs and competence so as to achieve a cost-effective result (Williamson, 1991). The paper adapts this framework to the specific features of agricultural research organizations to provide conceptual guidance on how impact from IARCs can be achieved in the most cost-effective way. To use this approach, it is necessary to specify the different transactions involved in the development and uptake of products from IAR. An empirical case study of an important area of agricultural research was conducted for this purpose: research that aims to improve legume crops, which is supported by one of the CGIAR centers, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

In the case study, an innovative research tool called “Net-Map” was used. Net-Map is a participatory mapping technique (Schiffer and Hauck, 2010), which was applied to identify the different activities (transactions) and organizations involved in research on improved legumes and their promotion. After developing a typology of transactions based on the empirical study, a transaction cost economics framework was developed and used to analyze the comparative advantage of different organizations in conducting the different types of transactions. By integrating contextual factors, the framework also serves to identify why international centers engage in activities for which they are not expected to have a comparative advantage vis-à-vis national or local organizations.

2. Assessing the comparative advantage of CGIAR centers

The question of the comparative advantage of the CGIAR has been subject to long-standing debate. Two concepts have been developed in this context: the concept of a research - development continuum, and the concept of International Public Goods.

2.1. The agricultural research - development continuum

The concept of the research-development continuum is displayed in Fig. 1 (Craswell and Penning de Vries, 2001; cited in CGIAR Science Council, 2006, p. 74). Four types of research are identified: basic, strategic, applied and adaptive.

According to this concept, the CGIAR should concentrate on strategic research generating technologies that fit relevant ecological and production conditions across the developing world. The centers should collaborate with ARIs, who have their focus on basic research, and with the National Agricultural Research and Extension Systems (NARES), who

cover the spectrum from strategic to applied and participatory-adaptive research.

2.2. The concept of international public goods (IPGs) in the CGIAR

Economists differentiate pure public goods from private goods by the two criteria of being non-rivalrous³ in consumption and non-excludable⁴ (Samuelson, 1954:387). The rationale for public sector involvement in agricultural research is based on the fact that agricultural technologies have characteristics of public goods, especially if they are not embodied in a particular technology, or – as in case of seeds – if they can be reproduced by the farmers themselves. Integrated Natural Resource Management (INRM) technologies in particular involve benefits that accrue to the entire community or watershed. Private firms have limited interest since they do not have the capacity to capture much of the benefit through proprietary claims (Pingali and Kelley, 2007; Spielman, 2007). Publicly funded research centers at national and international level are expected to step in to fill this gap (Pineiro, 2007).

The view that CGIAR centers should focus on provision of public goods at the international level (IPGs) began to be explicitly mentioned in the late 1990s and early 2000s (Sagasti and Timmer, 2008; Kanbur, 2001). This concept has since been subject of discussion in various fora (CGIAR Science Council, 2006, 2008; Harwood et al., 2006).

The IPG concept can be more easily applied to traditional CGIAR research, like germplasm improvement and development of new crop varieties, for which economies of scale and spill-over effects can be determined more easily compared to other types of technologies or knowledge, such as natural resource management (Ryan, 2006). Some critics consider the IPG criterion as a conceptual barrier with an unrealistic division of labor between research and development that does not give sufficient attention to institutional constraints (CGIAR Science Council, 2008). Besides, going by the basic definition of public goods, every document placed on the internet with free access would fulfill this IPG criterion whether or not it leads to achievement of CGIAR system level outcomes.

These arguments show that there are contrasting views on whether the IPG concept is refined enough to be the key criterion that offers strategic direction on what the CGIAR centers should do or not do. Against this background, this paper develops a more refined framework to provide conceptual guidance for assessing the comparative advantage of IARCs.

3. Methodology

The research presented in this paper consists of two components: (i) A case study, which aims to provide a detailed account of the research and dissemination process of improved technologies produced by IARCs, and (ii) a conceptual framework, which defines the functional boundaries of IARCs based on their comparative advantage, taking the case study results into account.

To develop a transaction costs framework, it was important to understand all transactions involved in the R-D process. In order to achieve this in a participatory manner, the Net-map procedure was chosen. It involved asking a series of questions regarding the main actors, their linkages, and the level of influence of each actor on the intended outcome (adoption of new varieties). Follow-up questions were asked on governance challenges involved in the process.

To develop the conceptual framework, the case study was combined with an application of the fiscal federalism literature (Oates, 1972) and

¹ In 2015, contributions through the CGIAR Fund represented 59% of total funding (\$554 million) and bilateral project grants represented 41% of funding (\$389 million) (CGIAR Fund Office, 2015: 4).

² The New Institutional Economics is a multidisciplinary field that focuses on the role of institutions in economic theory. It includes aspects of economics, history, sociology, political science, business organization and law (Kherallah and Kirsten, 2001).

³ The non-rivalry criterion means that any one person's consumption of the public good has no effect on the amount of it available for others.

⁴ Non-excludability implies that it is either impossible or very costly to exclude those who do not pay for the good from utilizing it, and once the good has been produced its benefits (or harm) accrue to everyone.

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