An Approach to the CGIAR as a Provider of International Public Goods

Francisco Sagasti and Vanessa Timmer
(with the collaboration of Mario Bazán)

Lima, and Vancouver, November 2008

Table of Contents

Preliminary note

This report is a revised version of a draft prepared by the authors in March 2008 as a contribution to the work of the CGIAR Independent Review Panel (IRP). We are indebted to Elizabeth McAllister, Chairperson, for the opportunity to work on this subject. We would like to thank IRP members Elizabeth McAllister, Keith Bezanson, Jeff Waage and John Mugabe, IRP secretaries, Ken Watson and Karin Perkins, and John Lyman, Selçuk Ozgediz and the participants in an IRP workshop held in Ottawa in May 2008, for their valuable comments and suggestions. Dana Dalrymple, who for many years has championed the use of the concept of international public goods in agricultural research, made extensive comments to improve the report. We also are grateful to Mario Bazán for his assistance in the preparation of this report.

We owe special thanks to Jim Ryan, member of the CGIAR Science Council, who prepared a most useful discussion paper on international public goods and the research continuum at the CGIAR. Ryan's paper was presented at a Science Council workshop held in The Netherlands in 2006 and, although we were unaware of his paper when preparing the first draft of our report, we found many points in common and a rather high degree of convergence in our views.

The revisions introduced in this document take into account discussions that took place in several events and meetings that were part of the CGIAR Change Management Process, as well as material presented in the final report of the Independent Review Panel and its supporting documents.[1]

Francisco Sagasti and Vanessa Timmer

Lima and Vancouver, November 2008

[1] Independent Review of the CGIAR System, Report to the Executive Council, Elizabeth McAllister (Chair), *Bringing together the best of science and the best of development,* Washington DC, September 2008.

List of acronyms

AIDS	Acquired Immunodeficiency Syndrome
BRICS	Brazil, Russia, India and China
CBD	Convention on Biological Diversity
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIFOR	Center for International Forestry Research
CIP	International Potato Center
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
CIMMYT	International Maize and Wheat Improvement Centre
EPMRs	External Program and Management Reviews
EU	European Union
FAO	Food and Agricultural Organization
GEF	Global Environmental Facility
GFAR	Global Forum on Agricultural Research
GMO	Genetically modified organism
GPG	Global public good
GRPRs	Global and Regional Program Reviews
HIV	Human immunodeficiency virus
ICARDA	International Center for Agricultural Research in the Dry Areas
ICLARM	World Fish Center
ICRAF	World Agroforestry Centre
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDRC	International Development Research Centre
IEG	Independent Evaluation Group
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
INRM	Integrated natural resource management
IPG	International public good
IPGRI	International Plant Genetic Resources Institute
IPPC	International Plant Protection Convention
IRP	Independent Review Panel
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
ITTO	International Tropical Timber Organization
IUCN	World Conservation Union
IWMI	International Water Management Institute
MDB	Multilateral Development Banks
MDG	Millennium Development Goals
MG	Merit good
MOU	Memorandum of Understanding
MFR	Managing for Results
NPG	National public good
NRM	Natural resource management
NRS	National public good with regional spillovers

PBR	Plant breeders' rights
RBM	Results-based Management
SAREC	Swedish Department for Research Cooperation
SGSV	Svalbard Global Seed Vault
TAC	Technical Advisory Committee
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UN	United Nations
US	United States of America
UPOV	International Union for the Protection of New Varieties of Plant
WARDA	Africa Rice Center
WIPO	World Intellectual Property Organization
WTO	World Trade Organization
WWF	World Wide Fund for Nature

A Review of the CGIAR as a Provider of International Public Goods

Francisco Sagasti and Vanessa Timmer

Executive summary

This paper is a contribution to the work of the Independent Review Panel (IRP) of the CGIAR. It focuses on the CGIAR as a provider of "International Public Goods" and aims at answering two of the questions posed in the terms of reference for the IRP:

- Has the CGIAR system maintained a focus on global or international public goods?
- Is the CGIAR efficient and suited to the development and dissemination of international public goods?

To answer these questions, a conceptual framework to view CGIAR activities from the perspective of International Public Goods (IPGs) is put forward. The paper begins by describing the main characteristics of public goods in general and their relation to international development, before proceeding to review the CGIAR system-wide priorities and how can they be viewed from an IPG perspective. The conceptual framework is then applied to five CGIAR activities, before offering some concluding remarks on the prospects for the CGIAR as a provider of agricultural research international public goods.

Non-excludability and *non-rivalry* are the essential characteristics that differentiate a private good from a public good. *Non-excludability* means that it is either impossible or prohibitively costly to exclude those who do not pay for the good from using or consuming it. Once the good has been produced, its benefits, or harm, accrue to all. The *non-rivalry* property implies that any one person's use or consumption of the public good has no effect on the amount of it available for others. Additional concepts closely linked to the notion of public goods are *externalities* and *free riding*. *Externalities*, or third-party effects, involve situations where the costs or benefits of any particular good or action are not reflected in the price of the good itself. *Free riding* refers to a lack of incentives on the part of users or consumers to finance their supply. Public goods elicit patterns of behavior that are quite rational from the individual agent's viewpoint, but that can have negative effects for the community. For this reason, *collective action* —in the form of government intervention, agreements between private agents or a combination of both— has become the focal point of policy concerns regarding the provision of national and international public goods.

The process of globalization that has been unfolding at the turn of the 21st century implies that concerns, issues, decisions and activities that were previously national or local in nature have now acquired a wider scope and have moved beyond the exclusive control of nation states. Although many of these "cross-border externalities" are not new, the speed and broad reach of their contagion effects have changed their character in a fundamental way. These international and global externalities can be addressed effectively only through cooperative actions involving multiple actors widely spread throughout the world. Moreover, because cooperative actions on this basis are likely to involve significant

degrees of non-rivalry and non-excludability, the concept of international public goods is being applied increasingly in analyzing and articulating policy responses to the new challenges of a fractured global order.

The collective action problems that are inherent to public goods in general apply to international and global public goods to a larger extent. Even if there is general agreement that the potential gains from international concerted action are great, there is no supranational government authority to devise and impose solutions as the norm at the national level (e.g. taxation, regulation, market creation). Moreover, the boundaries between international and global public goods are quite diffuse and these terms are frequently used interchangeably. In addition, the transition from acknowledging that a good, service or outcome is desirable, to declaring that it is an 'international public good' is not straightforward or automatic. It is heavily influenced by public awareness and political decisions, and requires collective action at the level of the international community (which includes not only national governments, but also private corporations and civil society organizations). It also begs the question of "desirable for whom?"

International public goods have to ultimately be produced, utilized or provided by some individual or agent in a specific location. Declaring something to be a global public good has meaning only when embedded in a political and policy process that assures its delivery. For this reason, it is necessary to span the continuum of activities and interventions —from global to international to national and to local— to ensure that the whole range of activities involved in delivering international public good are in place. There is also the need to specify the extent to which supranational entities are supposed to arrange for the provision of the global public good, and to what extent should they engage in regional, national or even local affairs to ensure this happens. This, in turn, involves complex negotiations, either in formal settings or through informal means, in order to: (1) establish explicit or implicit rules and regulations for interventions by supranational entities; (2) create new or utilize existing organizations to take part in the provision of the good; (3) mobilize financial resources to pay for the activities associated with the production of the international public good; and (4) define operational policies and procedures to influence the actions and behavior of national and local agents. Without such arrangements, which imply designing and putting in place a *delivery system*, declaring that something is an "international public good" would just be an empty gesture.

These considerations lead to differentiate between the *core component* of the IPG delivery system, which should be taken care of by the international community, from the *complementary activities* that are the primary responsibility of national and local entities. The concept of a delivery system for the provision of international public goods can be related to "managing for results" or "results-based management" approaches that focus attention on establishing clear goals and objectives, on measuring inputs and outputs, on mapping direct and indirect outcomes, on assessing impact and on performance evaluation and evidence-based learning.

Results-based management approaches can be directly linked to the discussion of "international public goods" and to their "core" and "complementary" components through the concepts of a *zone of influence* and *zone of control*. The *zone of control* includes the elements of the results chain for which the organization under consideration (the CGIAR in this case) is directly accountable. The *zone of influence* includes the results chain components that lie beyond the organization's direct control —the outcomes and impacts

for which it can be held indirectly responsible for exerting influence to ensure they materialize. Outcomes and impacts involve decisions and actions by others not under the purview of the organization, but for which it remains responsible through managing its activities to achieve outcomes, monitoring the effectiveness and influence of outputs on partners and customers, and trough learning and taking corrective actions based on performance evaluations.

These issues have important implications for an institution like the CGIAR, for it is not enough just to make available the *core component* of the IPG delivery system in the form of research results or knowledge services, but it is also necessary to facilitate their adoption and use by developing country partners and agents. This involves a range of "complementary" activities (adaptation, dissemination, extension, technical assistance, policy advice, training, among others) that allow the core component to filter down through a network of institutions from the global and international to the national and local levels. While the CGIAR cannot be seen as directly accountable for engaging in this broader range of complementary activities, most of which are beyond its control, it can be held responsible for playing a promoting and catalytic role to ensure they are carried out.

The CGIAR was established in 1971 to increase food production and agricultural productivity in developing countries through scientific research. Building on the experience of its four initial member centers (CIAT, CIMMYT, IRRI and IITA), and riding on the success of the green revolution that introduced high yield varieties of key crops in India and other developing countries, the CGIAR was a pioneer in the provision of what are now called "international public goods" in agriculture. The "consultative group" model, used by the World Bank to mobilize and coordinate aid from several donors to a specific developing country, was adapted to coordinate support for a thematic issue —international agricultural research— involving several recipient centers.

Even though the terms "international public goods" were not used explicitly to describe its functions, terms such as "spillover effects" and "positive externalities" were common in the 1970s and 1980s. The idea of treating the CGIAR as a provider of international public goods goes back at least two and a half decades, and it began to be clearly articulated in the late 1990s and early 2000s. Yet, it is also clear that not all that the CGIAR does can be placed under the international public goods category. This raises the question of whether the CGIAR is best placed to produce all types of agricultural international public goods, or whether other organizations in the expanding set of research and service networks in this field —regional and national centers, civil society organizations, national centers, private sector firms, public-private partnerships— may be better suited to take charge of the provision of some agricultural IPGs.

In some cases the task of the CGIAR may be that of transforming private goods and local public goods into international public goods, rather than directly producing IPGs. This would require adding some of the features of public goods (non-excludability, non-rivalry, international reach) to the results of the work of other entities, be they private, public or civil society organizations, so as to expand their geographical scope of application and widen access to them. It could also involve translating and adapting knowledge generated in specific settings to make them applicable in different contexts, and to provide a readily available institutional capacity to coordinate international agricultural research that can quickly respond to emerging needs and demands. In turn, and particularly in the case of research results, this is closely related to how the CGIAR views the use intellectual

property rights, and the way in which it interacts and works in partnership with private corporations.

There are three main ways in which CGIAR can be considered a provider of international public goods. First, CGIAR is a **global knowledge producer** that conducts and disseminates research in the fields of agriculture, forestry, fisheries, policy and environment. Second, CGIAR's activities contribute to the provision of international public goods by offering **specific products and services** that go beyond the generation and dissemination of knowledge and are made available to users at the local, national, regional and international levels. Third, the **institutional capacity for conducting and coordinating international agricultural research** that CGIAR has developed —and which can be deployed to respond to emerging requests or urgent demands— can in itself be considered an international public good. In addition, the CGIAR served as a model for other international research networks, particularly during its early years, and as such has contributed to better international governance practices, which can be considered in itself an IPG.

By providing these three types of international public goods, the CGIAR also contributes to the overarching objective of reducing world poverty. CGIAR produces "high-quality science aimed at benefiting the poor" and its activities are aimed at "achieving sustainable food security and reducing poverty in developing countries". Thus, in principle, all CGIAR activities can ultimately be seen as aiming at poverty reduction and at improving the quality of life of poor people all over the world.

In 2005, the CGIAR Science Council released a report defining a set of 5 priority areas, which in turn encompass 20 system priorities, for CGIAR research over the period of 2005 – 2015. These can be summarized as follows:

1. Sustaining **biodiversity** for current and future generations;
2. Producing more and better food at lower cost through **genetic improvements**;
3. Reducing rural poverty through **agricultural diversification** and emerging opportunities for **high-value commodities and products**;
4. Poverty alleviation and **sustainable management of water, land and forest resources**; and
5. Improving policies and facilitating **institutional innovation** to support sustainable reduction of poverty and hunger.

One of the key decisions that needs to be made when examining each of the priority areas to evaluate CGIAR performance is the extent to which it should be held accountable and responsible, both for the provision of the core component and of the complementary component of a particular international public good. This is closely related to the questions of which aspects of an international public goods delivery system are under the direct control and decision-making power of the CGIAR, which aspects can it influence, condition or facilitate, and which aspects are out of its scope of action and authority. How far along the results chain in the zone of influence should the system direct its resources? These distinctions are also related to matters of contribution and attribution, primarily because a large number of other agents at the international, national and local levels intervene to deliver on the ground the international public goods associated with CGIAR priorities and functions.

The paper analyzes five specific CGIAR priorities and applies the concept of the "IPG delivery system" to assess the performance of the CGIAR as a provider of international public goods. The illustrative examples correspond to the three main types of international public goods provided by the CGIAR: knowledge, products and services and the institutional capacity for coordinating and implementing international agricultural research. The first two examples fall in the knowledge category and examine the IPG delivery systems for research results on the genetic enhancement of high value species and on sustainable income generation from forests and trees. The third and fourth examples belong to the services and products category, and deal with the creation and maintenance of gene banks, and with the provision of policy advice and the spread of best practices in agriculture. The fifth example analyzes the institutional capacity of the CGIAR to respond to demands and requests from a variety of sources, and to garner the resources and to build the partnerships necessary to implement international agricultural research programs.

From the analysis of this paper it is possible to identify some general issues and questions to assess the performance of the CGIAR as a provider of international public goods. First, *it is essential to have a clear and shared understanding of the nature of the international public goods that the CGIAR provides*. A first question that can be derived from this observation is *whether the CGIAR as a whole and its centers have defined the specific international public goods they provide in a clear and unambiguous way.* Among other things, this requires distinguishing between IPG and non-IPG related activities, and placing the former in one of the three types of IPGs that the CGIAR provides: knowledge emerging from research activities, products and services related to agricultural research, and institutional capacity for responding to specific demands for international agricultural research. Second, for each of the IPG provided by the CGIAR it is necessary to *determine the scope of activities in the core component* —for which the CGIAR has direct decision-making power and is primarily accountable—, and *the range of activities in the complementary component* —for which the CGIAR is indirectly responsible and can only exercise influence—, *so as to ensure that there is a complete delivery system for the provision of the international public good*.

Third, all the components of an IPG delivery system —awareness and political decisions, international regimes, networks of institutions, contracts and agreements and local organizations— need to be in place for a particular IPG to be provided. Answers to these questions will point out whether there are missing elements in the IPG delivery systems, and what actions are required to ensure that they are fully deployed. Finally, there is the question of *whether the CGIAR has evolved the governance and financial capabilities required to fulfill its role as a provider of international public goods*. This implies assessing whether it has in place the necessary strategic planning, management, evaluation and support systems and procedures to effectively participate in the deployment of international public goods delivery systems related to agricultural research.

Fourth, there is the matter of *whether the CGIAR has evolved the governance and financial capabilities required to fulfill its role as a provider of international public goods*. This implies assessing whether it has in place the necessary strategic planning, management, evaluation and support systems and procedures to effectively participate in the deployment of international public goods delivery systems related to agricultural research.

Finally, taking these issues into consideration, it is possible to return to the two main initial questions on the role of the CGIAR as a provider of IPGs:

- Has the CGIAR system maintained a focus on global or international public goods?

Not as fully as it could have. The material reviewed during the preparation of this paper indicates that there is a growing but uneven awareness of the implications of the role that the CGIAR could or should play as a provider of international public goods. While various documents and statements made by CGIAR authorities mention the provision of international public goods as a key rationale for its existence, it appears that there are no widely shared conceptions of what are the specific IPGs that the CGIAR should provide, how to organize the delivery systems for their provision, and how to evaluate the performance, accountability and responsibility of the various CGIAR centers in this regard. In some cases, there have been specific attempts to frame some CGIAR center activities in IPG terms (for example, in the case of natural resources management research),[2] but this has not been done in general or in most centers.

- Is the CGIAR efficient and suited to the development and dissemination of international public goods?

By and large, yes. The analysis of the preceding sections and, in particular, the review of priorities and the five examples examined in section 2, suggest that the CGIAR as a whole has a set of characteristics that makes it a suitable system for the development of and dissemination of three types of international public goods associated with agricultural research: knowledge, products and services, and institutional capacity. However, the question of efficiency in their provision would require a much more detailed empirical evidence than has been possible to gather during the preparation of this paper, and would also require a comparative study of alternative institutional arrangements for providing international public goods associated with agricultural research and development that the CGIAR now provides.

[2] See Harwood et al. (2006); Harwood and Kassam (2003)

An Approach to the CGIAR as a Provider of International Public Goods

Francisco Sagasti and Vanessa Timmer

1. Introduction

This paper is a contribution to the work of the Independent Review Panel (IRP) of the CGIAR. It focuses on the CGIAR as a provider of "International Public Goods" and aims at answering two of the questions posed in the terms of reference for the IRP:

- Has the CGIAR system maintained a focus on global or international public goods?
- Is the CGIAR efficient and suited to the development and dissemination of international public goods?

This paper suggests an approach to this task. Building on the work of Sagasti and Bezanson (2001), it offers a conceptual framework to view CGIAR activities from the perspective of International Public Goods (IPGs), so as to assess the effectiveness of the CGIAR as a provider of such goods and its prospects for the future. The term "international public goods", rather than "global public goods", will be used to characterize what the CGIAR is providing both at the global and regional levels, although these will be differentiated when appropriate.

Section 2 of the paper offers some general remarks on the concept of public goods, its relation to development cooperation, the need to have a "delivery system" for international public goods, and the linkages between public goods and management for results. Section 3 examines the ways in which the CGIAR has approached the question of providing international public goods during the last decade and a half, focusing on the system-wide priorities, reviewing the discussions on the "research continuum" at the CGIAR Science Council, and suggesting some examples of delivery systems. Section 4 derives some implications for assessing the performance of the CGIAR as a provider of international public goods, suggesting issues to be examined with particular reference to future governance and financing arrangements.

2. International public goods and management for results

2.1 The concept of public goods[3]

The idea of "public goods" has a long intellectual history that can be traced at least as far back as 1739, to David Hume's discussion of providing for the "common good." Along the way, classical economists like Adam Smith, David Ricardo and David Malthus drew attention to the need for concerted action to provide for goods that benefit a community. However, it was not until 1954 that a general theory of pure public goods was explicitly

[3] This and the following sections, as well as Annex A, are based on Sagasti and Bezanson (2001).

developed with the work of Paul Samuelson and his article on "The pure theory of public expenditure" (Samuelson 1954) and his two subsequent articles (Samuelson, 1955, 1958).

The framework set out by Samuelson continues to provide the theoretical base for the study of public goods. By introducing the idea of a "pure" concept, Samuelson was able to develop two essential characteristics that differentiate a private good from a pure public good: *non-excludability* and *non-rivalry. Non-excludability* means that it is either impossible or prohibitively costly to exclude those who do not pay for the good from using or consuming it. Once the good has been produced, its benefits – or harm – accrue to all. The *non-rivalry* property implies that any one person's use or consumption of the *public good* has no effect on the amount of it available for others.

Since Samuelson's initial exposition of the concept of public goods, an increasing number of criticisms have been leveled at the strictly economic definitions and notions of public goods.[4] It should also be recalled that Samuelson himself maintained that a public good was in fact an ideal theoretical concept that could not strictly be applied to real policy matters. Ultimately, in his view, public goods were determined by qualitative ethical factors and were dependent upon political consensus. Samuelson was very cautious in his claims about how a public good could be conceptualized and defined, and acutely aware of the practical limitations of applying his ideal concept (Samuelson, 1955, p. 389).

Following the work of Samuelson, three additional concepts have become closely linked to the notion of public goods: externalities, free riding and opportunities for gains from collective action. *Externalities*, or third-party effects, emerge when the impacts of an action are not borne by the actors directly involved, but by someone else. These can be positive, such as the effects of educating women on lowering birth rates, and negative, for example releasing contaminants into a river. Externalities are a problem because the costs or benefits associated with them are not reflected in the price of the good itself. If the cost of the externality is effectively attributed to the agent that generates it, the externality has been "internalized" and financed directly by the agent. Ultimately, the motivation to invest in the provision of public goods arises from the desire to encourage positive externalities, or to correct for negative ones.

The phenomenon of *free riding* is directly associated with the non-rivalrous and non-excludable character of public goods, and refers to a lack of incentives on the part of users or consumers to finance their supply for they could rely on others to pay for their provision. Public goods "elicit patterns of behavior that, from the individual agent's viewpoint, are quite rational. Yet from a collective viewpoint – such as that of a local community, a nation or humanity as a whole – the result is sub-optimal and can be disastrous" (Kaul *et al.*, 1999, p. 6).

Goods that have very high degrees of the properties of non-excludability and non-rivalry are often referred to as "pure" public goods. In theory, pure public goods do not require agencies such as the government or the private sector to ensure optimal levels of provision; they are just available to everyone. However, in reality public goods are rarely "pure" (Ryan, 2006, pp. 1-4). For instance, public goods such as roads have an optimal

[4] For example, Ver Eecke (1999), has decried 'the conceptual imprecision' in the way in which economists use the term public good, and has identified at least 13 different definitions in the literature. Nevertheless, provided that it is treated as 'an ideal concept', he argues that it can be valuable in helping to identify potential welfare gains from collective action.

carrying capacity at which, once reached, any additional traffic increases congestion. Thus, after a certain critical point the good becomes rivalrous. Impure public goods require government intervention, agreements between private agents or a combination of both to ensure adequate levels of provision. However, it is unlikely that private initiative alone will provide public goods at optimal levels, for a public good enjoyed by a large group will not be provided if that group can not organize itself. The fact that most public goods are "impure" rather than "pure" makes *collective action* the focal point for the intellectual and policy concerns regarding the provision of public goods.

Putting together the *existence of opportunities for collective gain* with the *reluctance to pay for and to reveal interest* in public goods, it is possible to conclude that, in spite of the potential for improving the welfare of a community (due to their non-rivalrous character), public goods are difficult to finance (primarily because of their non-excludability). Those public goods that are defined as impure, or of mixed composition, meet the criteria of non-excludability and non-rivalry only in a partial way. Impure public goods that are non-rivalrous in consumption but excludable are called *club goods* (a club is formed when users come together to provide a shared good, based on an agreed toll or tax). Goods that are mostly non-excludable, but rivalrous in consumption are called *common pool resources*, and tend to be overused in the absence of rules and enforcing mechanisms to regulate their consumption.[5] The prudent or sustainable use of common property is a matter of collective choice, and government action (e.g. regulation) may be required to ensure equitable and competitive access to club goods.

As public goods represent a rich set of activities that involve a multiplicity of dimensions, many different ways to classify them have been proposed. These classification schemes are the result of combining two or more dimensions. Such dimensions have included spillover range (geographical extension, range socio-economic groups, generations), aggregation technology (summation, best shot, weakest link, weighted sum), type of benefit (risk reduction, capacity, utility), activity (core and complementary), and means or goals (intermediate, final), among others.

In short, the concept of "public goods" has three interrelated characteristics. First, they produce significant externalities; second, they are – to a very important degree – non-rivalrous and non-excludable; and third, they generate opportunities for improving welfare through collective action. These opportunities emerge because of the intrinsic characteristics of public goods, especially because joint initiatives can overcame the scale limitations that preclude individual agents from producing them, allow the creation of regulatory regimes that prevent free-riding (an agent benefiting from the public good without contributing to its provision) and offer the possibility of generalizing individual best practices. In addition, social and cultural preferences, usually expressed in the form of public awareness and political will, determine which public goods to offer and the trade-offs involved in their provision.

[5] The term 'common pool' is based on the work of Garrett Hardin on "The Tragedy of the Commons' (1968), which describes a group of herdsmen who graze their cattle in a common pasture. The tragedy starts the moment any one of the herdsmen realises that he can gain personal benefit by increasing the size of his herd on the pasture. Each extra animal grazing the commons leads to additional destruction of the common pool resource. The negative effects, however, are distributed within the group of users. Given this distribution of costs and benefits it is quite sensible for each herdsman to add extra animals to the flock, which ultimately leads to the destruction of the common pasture due to overgrazing.

However, this renewed emphasis on applying the international public goods lens to a variety of issues has led to a certain degree of confusion, and has mystified policy and decision makers who have to apply the concepts in practice (Sagasti and Bezanson, 2001, pp. 1-3). This is in part because the term "public good" has been used to describe a large number of products and services that do not comply strictly with the economic definition derived from economic theory, and also due to the fact that sometimes it is used to indicate that a good or service is just made available to its potential users, and in others that the entity providing the public good is responsible for ensuring it is not only produced but also delivered and utilized by its final consumers.

2.2 International public goods

The process of globalization that has been unfolding at the turn of the 21st century involves, among many other things, a major transfer of political power. Concerns, issues, decisions and activities that were previously national or local in nature have now acquired a wider scope and have moved beyond the exclusive control of the nation state. Although many of these "cross-border externalities" are not new (war and disease have spread internationally for thousands of years), the speed and broad reach of their contagion effects have changed their character in a fundamental way. As the actions of one or more agents (government, corporations, associations and even individuals) create costs or benefits for other agents not party to the transaction and located beyond national, institutional and organizational boundaries —and even across generations— narrowly construed domestic and local policy responses are clearly insufficient.

The cross-border nature of these externalities can be addressed effectively only through cooperative actions involving multiple actors widely spread throughout the world. Moreover, because cooperative actions on this basis are likely to involve significant degrees of non-rivalry and non-excludability, the concept of international public goods is being applied increasingly in analyzing and articulating policy responses to the new challenges of a fractured global order.

However, applying the concept of public goods at the international or global levels creates several conceptual and practical problems. The externalities associated with international public goods can be global in the sense of affecting the whole planet; regional when they affect a subcontinent, continent, or hemisphere; or sub-regional when their impact extends to a relatively small number of neighboring countries. Determining criteria as to what constitutes an international public good is not simple, and evaluating whether a product or service has resulted in delivering an IPG is equally difficult.

Ryan (2006) building on papers by Dalrymple (2004), and Gardner and Lesser (2003), focuses attention on the difficulties of unambiguously defining what constitutes an international public good. For example, is knowledge that is intended to be internationally relevant but ends up being locally or nationally specific considered an IPG? Is it the intention at the planning stage or the final output/impact of activities that should form the core of the criterion? Is a product/knowledge/service an IPG if its outcomes are in one country but have global significance (e.g., preserving forested area which combats climate change). Ryan (2006, p. 21) concludes: "what is important is that the *expected* outputs are *intended* to be relevant to as many countries as possible with the *intention* of maximizing

international impacts via spillovers. Whether or not those impacts actually turn out to be international and pervasive is of less importance than they were originally planned to be. *Ex ante* intentions are more important than *ex post* realizations from the point of view of accountability."

These considerations suggest that arranging for the provision of international public goods is much more complex than in the case of public goods at the national or local levels. For one thing, free-riding problems are exacerbated at the international level. Once an international public good is provided, it cannot be divided into discrete units to be consumed by separate consumers. All those countries, institutions, organizations and individuals with a stake in the international public good can receive its benefits, whether or not they contribute to its provision. A further factor is that the beneficiaries of global public goods are likely very numerous and involve diverse cross sections of the world's population. Their interests and concerns will vary and cooperation will not be easy to achieve, partly because of differences in cultural values, policy priorities and other preferences, and also because of lack of information, understanding and trust.

Moreover, nations differ both in their need for international public goods and their capacity to supply them. The degree to which different countries benefit from an international public good depends on their situation and on the characteristics of the specific good. Income levels, standards of living, geography, culture and values have a major influence on the willingness to pay for and participate in the provision of an international public good.

One of the main policy implications of the concept of public goods is that the State must play a role in their provision, so as to reap the benefits of collective action. A supranational government backed by the power to tax could ensure there is no mismatch between the demand and supply of international public goods. However, and notwithstanding the growing number of international regimes, as well as many other examples of successful international cooperation, there is no realistic prospect of creating the international equivalent of a national government in the medium term. Therefore, as Kindelberger (1986) put it, there is the need to provide "international public goods without international government", which in turn requires an unusual degree of coordination of efforts across national borders and among a wide variety of stakeholders. International cooperation is essential to increase the provision of public goods and decrease the proliferation of public bads.

A further issue is that the emphasis on the "international" character of international public goods must not lose sight of the fact that their actual provision is ultimately rooted in specific activities at the national and local levels. Without the capacity to engage in actions that contribute to the supply of international public goods, national and local governments, institutions, organizations and individuals cannot participate in their provision. In the case of international public goods, this brings to the fore the question of how to articulate initiatives of a multiplicity of agents operating at the global, international, regional, national and local levels.

As a consequence, strong national and local foundations are required to reap the benefits of global public goods and contribute to their provision. In the case of developing countries, this underscores the complementarity between the provision of global public goods and domestic capacity building efforts, for it does not make sense to focus primarily on the financing and provision of global public goods without simultaneously assisting

developing countries in their own development efforts that lead to the actual production and consumption of such goods.

As will be discussed in section 3, this has important implications for an institution like the CGIAR, for it is not enough just to make available the "core" component of the IPG delivery system in the form of research results or knowledge services, but it is also necessary to facilitate their adoption and use by developing country partners and agents. This involves a range of "complementary" activities (adaptation, dissemination, extension, technical assistance, policy advice, training, among others) that allow the core component to filter down through a network of institutions from the global to the local levels. While the CGIAR cannot be seen as directly accountable for engaging in this broader range of complementary activities, most of which are beyond its control, it can be held responsible for playing a promoting and catalytic role to ensure they are carried out.[6]

2.3 International public goods and development assistance

The transition from acknowledging that a good, service or outcome is desirable, to declaring that it is an international public good is not straightforward or automatic. It is heavily influenced by public awareness and political decisions, and requires collective action at the level of the international community (which includes not only national governments, but also private corporations and civil society organizations). It also begs the question of "desirable for whom?" Nevertheless, the outlines of a broad consensus is emerging around the fact that "global public goods" must be related, in some form or another, to worldwide poverty reduction, and to a more equitable distribution of the benefits of social, economic and technical progress. Indeed, it has been suggested that achieving equity at the international level and between generations may be considered as a global public good (Rao, 1999). Thus, the contribution of a particular good, service or outcome to poverty reduction and to improvements in international equity could be used as one of the main criteria to decide on whether it should be considered as a global public good.

Moreover, given that international public goods, or indeed any commodity, resource or service, has to be ultimately produced, provided and utilized by some individual or agent in a specific location, it is necessary to specify how far down the continuum from global to local to draw the line between what is an international public good and the host of regional, national and local activities and policies that are necessary for it to materialize. There is also the need to specify the extent to which supranational entities are supposed to arrange for the provision of the international public good, and to what extent should they engage in regional, national or even local affairs to ensure this happens.

This, in turn, involves complex negotiations, either in formal settings or through informal means, in order to: (i) establish explicit or implicit rules and regulations for interventions by supranational entities; (ii) create new or utilize existing organizations to take part in the provision of the good; (iii) mobilize financial resources to pay for the activities associated

[6] Ryan (2006) uses the terms "core" and "complementary" in a different way from that used in this paper. Both of these describe activities carried out by the CGIAR, with core referring to knowledge production or research, and complementary to the role it plays as catalyst, facilitator or advocate. In contrast, core activities in this paper are those performed by the CGIAR and complementary activities are those carried out by the variety of partners with which the CGIAR is engaged.

with the production of the global public good; and (iv) define operational policies and procedures, which should ultimately influence the actions and behavior of national and local agents. Without such arrangements, which imply designing and putting in place a *delivery system*, declaring that something is an international public good would just be an empty gesture.[7]

The extrapolation of the rather precise concept of "public good" from economics to broader contexts, specifically those in which development policies and interventions take place, requires considerable conceptual stretching. The actual delivery of an international public good involves both "core" activities at the global and international levels in a restricted sense, and a much broader set of "complementary" actions at the national, regional and local levels. Core activities would be the primary responsibility of the international community of nations, associations and corporations, while the complementary activities would fall under the purview of national, and local —and possibly regional— entities. Drawing a line between these two sets of activities has numerous operational and financial implications.[8]

The distinctions between the core and complementary components of IPG delivery systems, and their linkages to resource allocation patterns in development assistance have generated two main and opposite concerns. One of these, largely present in the late 1990s, has been that development assistance resources for specific poverty reduction initiatives at the national and local levels —which overlap to a large extent with the complementary activities of the IPG delivery system— would be diverted to finance the provision the core component in ways that could benefit developed countries as much (or even more) than developing countries, thus distorting the purpose and nature of development assistance.[9] As a counterpoint, it has been argued that an IPG approach to development assistance could complement and increase financing for poverty reduction initiatives, primarily by opening access to additional sources of funds that are not part of the development assistant envelope, such as budgets of the ministries environment, agriculture and health in donor countries.

[7] The concept of an IPG delivery system can be related to the CGIAR Science Council discussions on the "research continuum", and which aimed at determining the appropriate scope for CGIAR interventions at the national and local levels. See Science Council (2006) and the background paper prepared by Ryan (2006) on the subject.

[8] An example of these difficulties is the provision of treatment for HIV/AIDS infected persons from a global public goods perspective. No reasonable individual would question as a desirable outcome the provision of adequate treatment to persons infected with HIV/AIDS. There is, however, considerable disagreement on the extent to which such treatment should be approached on the basis of considering it a global public good. Some advocates argue that the global public good refers only to the knowledge about how to produce treatment drugs or vaccines, and should thus be made available at low or no cost to those countries and firms that can produce it for local consumption, and even for export to other developing countries. Others are proposing that the actual delivery of the drugs to persons who would benefit from them constitutes a global public good, which would not require knowledge to be disclosed, but which implies putting in place arrangements for purchasing, distributing and administering treatment drugs to all infected persons. Finally, there are those who argue that, however terrible and devastating the disease may be for the HIV/AIDS affected groups, this is simply not a global problem, that there are other health priorities for developing countries, and that these concerns are primarily local and national and do not qualify for the label of 'global public good'.

[9] Some examples could be the use of development assistance to finance the core component of international initiatives aimed at mitigating the impact of global climate change (for which developed countries bear a higher degree of responsibility), or to finance the core component of global programs to stop the spread of pandemics (especially in developed countries), rather than the complementary activities at the local level to prevent their emergence in developing countries.

An equally important but opposite concern, which has emerged in the 2000s, has been that an emphasis on poverty reduction narrowly understood could diminish the amount resources allocated to the provision of IPGs that are essential for reducing poverty and improving living standards. It may be counterproductive for donors to focus exclusively on specific poverty reduction initiatives at the local level —which are closely related to the complementary component of the IPG delivery system— to the detriment of support for more general, widely applicable core component undertakings that generate knowledge, products, services and capabilities essential to underpin local poverty reduction initiatives.

These considerations lead to the concept of an "idealized international public goods delivery system", which can be used to examine the extent to which a particular public good is produced, provided and ultimately consumed by those who benefit from them. Annex A describes such an idealized delivery system.

2.4 International public goods and managing for results

The concept and implications of a delivery system for the provision of international public goods can be related to "managing for results" (MFR) or "results-based management" (RBM) approaches that focus attention on establishing clear goals and objectives, on measuring inputs and outputs, on mapping direct and indirect outcomes, on assessing impact, and on performance evaluation and evidence-based learning. It has been argued that effective results-based management motivates individuals within an organization, helps to communicate priorities to enlist support, and allows the establishment of clear links between performance on the one hand and rewards and recognition on the other. Effective performance measures are outcome or results focused, simple and few in number, realistic but challenging, are broadly used by the organization, are rooted in up-to-date and detailed facts, and are visible, interactive and informational. Individuals within the organization need to have a clear understanding of their role in achieving this performance and can segment performance information in order to interpret results, draw lessons and improve performance throughout the organization.[10]

According to the World Bank, results-based management aims at improving the *relevance, efficiency* and *efficacy* of decision-making and increasing the *legitimacy, transparency, responsibility, fairness*, *accountability* and *probity* of the governance and management structures (see Box 2.4.1). Together with several other approaches and techniques that seek to establish a link between the resources, time and effort allocated to certain activities and the effects or consequences that result from these activities, results-based management is closely associated with strategic planning and management practices, has evolved incrementally during the last three decades, and has been widely adopted by international organizations.

Figures 2.4.1 and 2.4.2 present the various elements of a results-based approach to management. Figure 2.4.1 depicts a *results chain*, composed of the causal or logical relationships that link the activities, inputs, outputs, outcomes and impact of a given policy, program, or initiative, focusing on the effect that these intend to produce. *Inputs* are the human, material, financial and other resources used to carry out activities, produce outputs

[10] Executive Session on Public Sector Performance Management (2001); Office of the Auditor General of Canada (2003)

and accomplish results. Based on the mission, goals and objectives of an organization, an *activity* is an operation or work process internal to an organization that is intended to produce specific outputs (e.g., products or services). An *output* is the direct product or service stemming from the activities of a policy, program or initiative, and delivered to the target customer, user or partner. Outputs are tangible and can also be called deliverables. *Outcomes* are the external consequences attributed to an organization, policy, program or initiative that is considered significant in relation to its commitments, goals and objectives. An outcome involves an intentional change in a system that can be measured and is achieved in partnership with other entities and organizations. This change can either be negative or positive, direct or indirect, and intended or unintended. Outcomes are often difficult to measure due to external factors and conditions that can confound attempts of assigning causality. *Intermediate outcomes* are the first level of effect of outputs and can serve as milestones towards achieving a result, whereas *final outcomes* are the ultimate or long-term consequences of outputs. The term *impact* is used to describe changes in the external environment, which correspond with the mission and overarching goal of the organization and program.

Box 2.4.1 Standard managing for results evaluation criteria

Relevance – the extent to which specific objectives and activities are consistent with the overall mission, priorities and goals established for the organization or entity

Efficacy – the extent to which these specific objectives were achieved, or expected to be achieved, taking into account their relative importance

Efficiency – the extent to which the organization achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least compared to alternatives

Legitimacy – the way in which governmental and managerial authority is exercised in relation to those with a legitimate interest in the program – including shareholders, donors, other stakeholders, implementers, beneficiaries, and the community at large

Transparency – the extent to which an organization's decision-making, reporting, and evaluation processes are open and freely available to the general public

Responsibility – the extent to which the organization accepts and exercises responsibility to stakeholders who are not directly involved in the governance of the program and who are not part of the direct chain of accountability in the implementation of the program

Fairness – the extent to which partners and participants, similarly situated, have equal opportunity to influence the activities of the organization and to receive benefits from it

Accountability – the extent to which an organization's governance and managerial authority fulfills the obligation to demonstrate and take responsibility for performance in light of agreed expectations, and the extent to which accountability is defined, accepted, and exercised along the chain of command and control within an organization

Probity – the adherence by all persons in leadership positions to high standards of ethics and professional conduct over and above compliance with the rules and regulations governing the operations of the organization

Source: *Based on and adapted from IEG (2007)*

Different evaluation criteria are appropriate at different steps in the results chain. The mission, goals and objectives can be assessed based on their relevance and clarity. As defined in Box 2.4.1, *relevance* refers to the extent to which objectives and project activities are consistent with the mission, priorities and goals established by the organization For example, has the organizations identified the right objectives to accomplish its mission and goals? *Clarity* refers to the degree to which the mission, goals and objectives are expressed in such a lucid, comprehensible, and unambiguous way that they can serve as explicit guidelines for structuring activities and for monitoring outputs, outcomes and impacts. For evaluating *efficiency*, an organization shifts its focus to an analysis of how well inputs are transformed into outputs and to the direct and attributable measures of results and performance. The relevance and adequacy of activities and projects, which result from choices about what outputs to produce with given inputs, are important in the evaluation of organizational efficiency (Bezanson et al., 2003, p. 6). An organization monitors its *effectiveness* by moving its evaluation beyond the transformation of inputs into outputs towards evaluating the results of their actions and the extent to which these go beyond project or activity outputs and contribute to outcomes and impact.

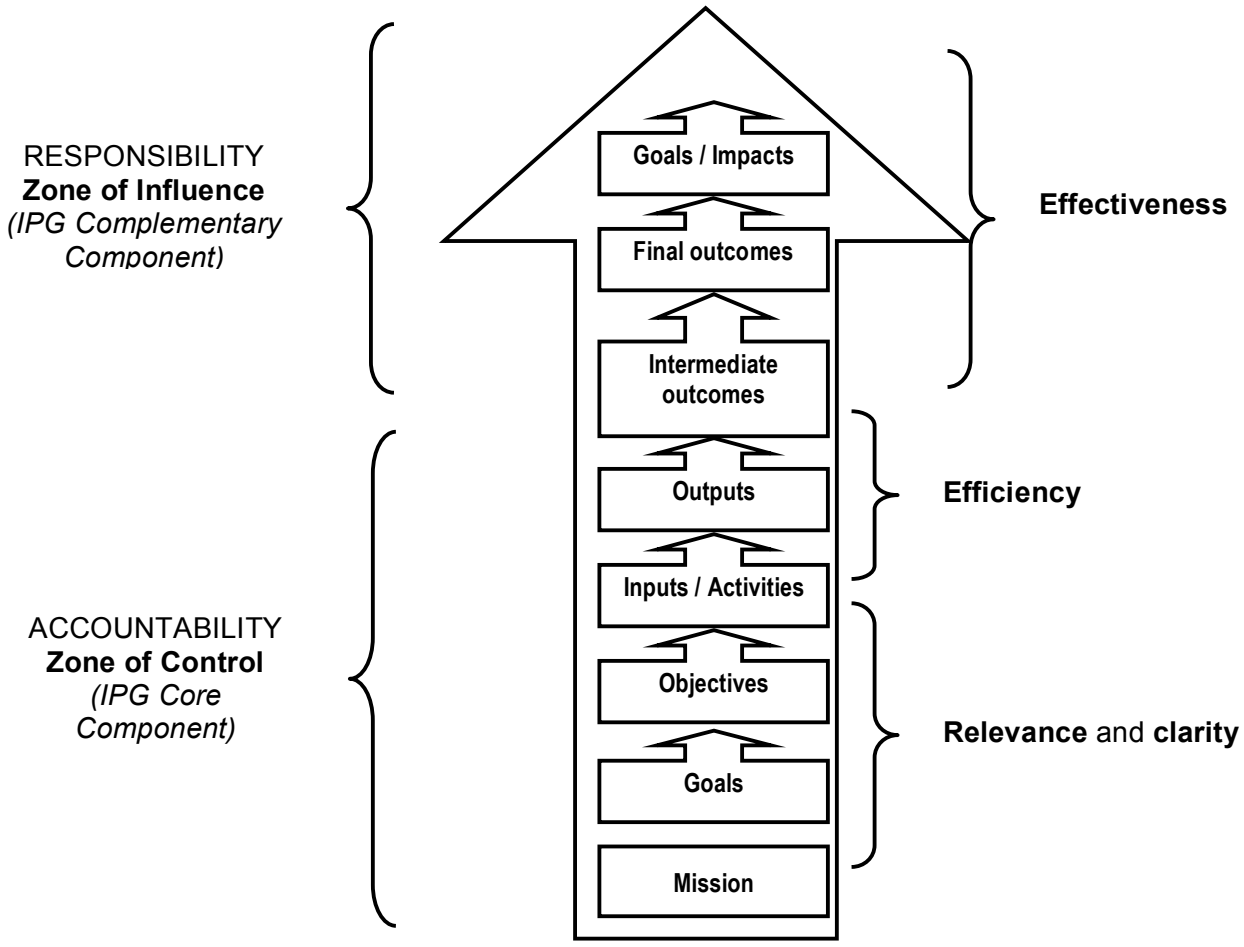
The results-based management approach ties directly to the discussion of international public goods, and to core and complementary activities, through the concepts of a *zone of influence* and *zone of control*. The *zone of control* includes the elements of the results chain for which the organization under consideration (the CGIAR in this case) is directly accountable —the definition, relevance and clarity of the mission, goals and objectives of the organization, the production or co-production of outputs, and the monitoring of resource use for efficiency and efficacy. The *zone of influence* includes the results chain components that lie beyond the organization's direct control —the outcomes and impacts for which it can be held indirectly responsible for exerting influence to ensure they materialize. Outcomes and impacts involve decisions and actions by others not under the purview of the organization, but for which it remains responsible through managing its activities to achieve outcomes, monitoring the effectiveness and influence of outputs on partners and customers, and through learning and taking corrective actions based on performance evaluations.

There is an overlap between the "zone of control" and the notion of "core activities", and between the concepts of "zone of influence" and "complementary activities". However questions remain: how far along the results chain into the zone of influence should an organization direct its resources? To whom is the organization ultimately accountable for delivering results from its activities? As Figure 2.4.2 indicates through depicting a closely intertwined and dynamic interaction between two organizations in a network, it is important to take into consideration that there is often a performance relationship or ladder of influence between an organization that creates outputs and its partners/customers/users who interpret and use the organization's outputs. The partners' use of the organization's outputs can be conceived of as an intermediate outcome for the organization, and is also an input into the partner's work, usually at the activity or output stage. In addition, this is not a linear relationship as the partner's work, in turn, can influence the organization, for example, by providing information about the relevance and usefulness of the organization's output.

Thus it can be seen there is a correspondence between the concepts associated with the delivery system for an IPG and those associated with results-based management approaches, particularly with regard to the core and complementary components on the

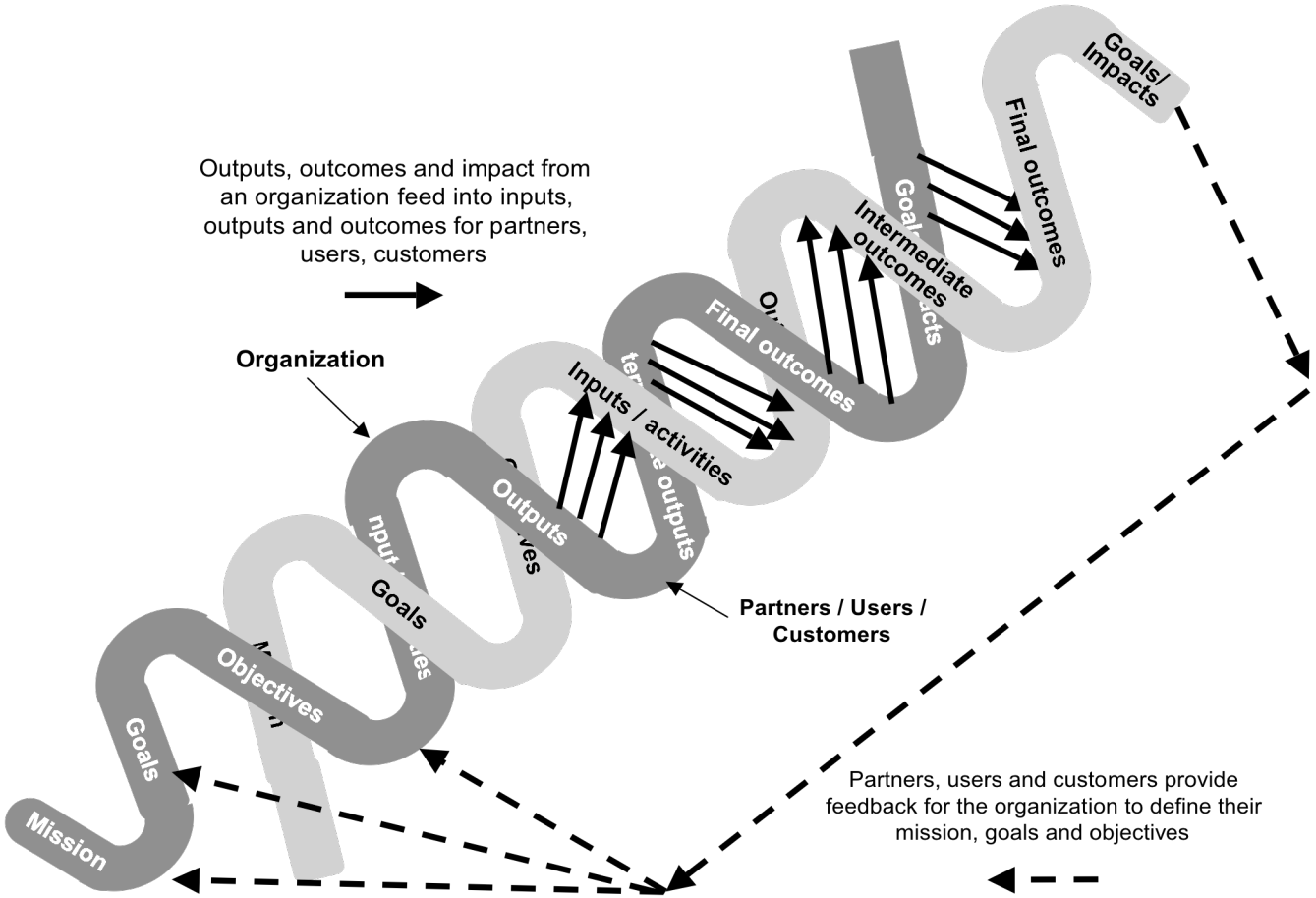
one hand, and the zone of control and zone of influence that allow to distinguish between those aspects for which an organization can be held fully accountable and those for which it bears some responsibility.

Figure 2.4.1: Results-based Logic Model, Zone of Influence/Zone of Control, Core/Complementary IPG Components and Evaluation Criteria[11]



[11] Adapted from the work of Dutch Leonard, Kennedy School of Government, Harvard University and Elizabeth McAllister for the World Bank.

Figure 2.4.2: Interactions and Mutual Influences between an Organization and its Partners[12]



[12] Adapted an expanded from graphics created for the World Bank Seminar for Vice-Presidency Units 2003, Strategy and Resource Management, Special Projects.

3. International public goods, management for results and the CGIAR

3.1 The CGIAR as a producer of international public goods

The CGIAR was established in 1971 to increase food production and agricultural productivity in developing countries through scientific research. Building on the experience of its four initial member centers (CIAT, CIMMYT, IRRI and IITA), and riding on the success of the green revolution that introduced high yield varieties of key crops in India and other developing countries, the CGIAR was a pioneer in the provision of what are now called "international public goods" in agriculture. The "consultative group" model, used by the World Bank to mobilize and coordinate aid from several donors to a specific developing country, was adapted to coordinate support for a thematic issue —international agricultural research— involving several recipient centers.

Even though the terms "international public goods" were not used explicitly to describe its functions, terms such as "spillover effects" and "positive externalities" were common in the 1970s and 1980s. The idea of treating the CGIAR as a provider of global public goods goes back at least two and a half decades, and it began to be clearly articulated in the late 1990s and early 2000s. Harwood *et al.* (2006) mention that in the 1987 and 1992 priorities and strategies reports the term "international public goods" was not used, and that it was in 1997 that the Technical Advisory Committee (TAC) (1997) that the term appeared explicitly and in a clear way:

> "Centers' products should be international public goods. The reason being that given the high opportunity cost of CGIAR resources, product limited to use in a single country that also meet the CGIAR opportunity cost criteria would be so valuable in terms of local opportunities that the country itself would finance the effort, and at lower costs, thereby becoming its own alternate supplier … As the quality of being an international public good is either presents or absent, this characteristic is viewed by TAC as a *necessary* condition for consideration in priority setting." (TAC, cited by Harwood *et al.,* 2006, p. 4)

In his report for the Global Public Goods Task Force, Barton (2006) uses the CGIAR as an early example of global public goods, and Gardner (2003) states that the CGIAR was the first program providing global public goods that was supported by the World Bank. Subsequently, the Science Council indicated in its paper on priorities for the CGIAR, prepared after an extensive process of consultations and analysis, that "the priorities… respond to regional and national needs for international public goods research" (CGIAR Science Council 2005). In his discussion paper for the CGIAR Science Council, Ryan (2006) sets out to operationalize the concept of international public goods in light of the CGIAR's role in research for development. The CGIAR position in research for development and its delivery of IPGs was further explored in a 2006 workshop held in the Netherlands (CGIAR Science Council, 2006a). In addition, Dalrymple (2006, 2008) points out that the CGIAR Chair stated in October 2000 that two of the challenges facing the organization were "maintaining science and research at the Centers at the highest levels" and "strengthening the CGIAR's position as a provider of public goods".

From this perspective, the creation of challenge grants and programs, which aim at pulling together initiatives from various CGIAR centers to address specific issues, can be considered as an effort to reinforce the IPG provider character of the CGIAR. These statements and actions responded to the growing importance that international public goods acquired in the late 1990s and early 2000s as ways of approaching international collaboration and programs (e.g., Wallner, 2002; Kaul *et al.,* 2003; Maskus and Reichman, 2005).

Yet, it is also clear that not all that the CGIAR does can be placed under the international public goods category (Ryan, 2006). As CGIAR members respond to specific requests and particular demands to produce knowledge, translate existing knowledge into technologies and provide services, among other things, the result of their work acquires more and more the character of local public goods, or even private goods (Dalrymple, 2006, 2008). The heterogeneity of CGIAR membership and the wide variety of activities in which its centers engage preclude the possibility of unambiguously labeling the CGIAR as a primarily producer of international public goods. This raises the question of whether the CGIAR is best placed to produce all types of agricultural international public goods, or whether other organizations in the expanding set of research and service networks in this field —regional and national centers, civil society organizations, national centers, private sector firms, public-private partnerships— may be better suited to take charge of the provision of some agricultural IPGs.

Moreover, in some cases the task of the CGIAR may be that of transforming private goods and local public goods into international public goods, rather than directly producing IPGs. This would require adding some of the features of public goods (non-excludability, non-rivalry, international reach) to the results of the work of other entities, be they private, public or civil society organizations, so as to expand their geographical scope of application and widen access to them. It could also involve translating and adapting knowledge generated in specific settings to make them applicable in different contexts, and to provide a readily available institutional capacity to coordinate international agricultural research that can quickly respond to emerging needs and demands.[13] In turn, and particularly in the case of research results, this is closely related to how the CGIAR views the use intellectual property rights, and the way in which it interacts and works in partnership with private corporations (Science Council, 2006b).[14] The growing role played by private firms in the provision of breeding materials, which focus primarily on commercial farmers and places restrictions on the free flow of genetic resources, highlights the importance of intellectual property rights ownership of research results in agriculture. This is particularly the case when the emphasis on commercialization may reduce poor smallholder's access to genetic material, and when seed varieties commercialized by private firms are based at least in part on publicly funded research or on the appropriation of freely exchanged seeds between farmers.[15]

[13] We owe these insights to John Mugabe and Jeff Waage (personal communications).

[14] On this matter see Barton (2006), Dalrymple (2006) and Science Council (2006b). In addition, Marco Ferroni (personal communication) has pointed to us that in the process of using or consuming an international public good it is necessary that a farmer, corporation or other agricultural producer ultimately transform it into a private good from which it can reap benefits.

[15] We are grateful to John Lyman (personal communication) for calling these matters to our attention.

As an illustration of how the CGIAR has been seen as an IPG provider, a 2002 study by the World Bank's Independent Evaluation Group distinguished between activities and outputs in their classification of CGIAR centers and priority areas. In cases where activities can be considered to be providing international public goods, the Independent Evaluation Group (IEG) further distinguished by the target audience and user of the outputs:

> "Outputs were considered global if the project developed methodologies adaptable to specific environments in two regions or more, if global information systems (such as on forest genetic resources) were strengthened, or if research results were expected to be used by agricultural research policymakers across countries in two or more regions or by the donor community and other actors in the international research community. Outputs were considered regional if modeling tools for resource management were developed that assist with priority setting at the regional level, if the project focus was associated with users in a single region, or if the project contributed to networking among national programs in a single region." (IEG, 2002, Annex F)

The results of this study reveal that CGIAR not only produces international (global) public goods but also plays a significant role in producing national public goods with regional spillover effects (Ryan, 2006). This distinction is important as it can be linked to delivery systems for international public goods. In the study, the IEG defines the CGIAR as a provider of IPGs if its *outputs* are international in scope, rather than defining IPGs in a more restrictive manner (See Annex B).

However, there have been calls to caution when applying the concept of international public goods to what the CGIAR does. For example, Pardey (2006, p.85) questions whether an IPG focus is appropriate for the CGIAR given the fact that its outputs are not necessarily public:

> "The substantial deliberations on characterizing the products of the CGIAR as International Public Goods (IPGs) is, perhaps, helpful in contextualizing the role of the CGIAR, but not much use in a practical, priority setting context. For one, it could be construed to rule out products like hybrid crop varieties that are intrinsically excludable on technical grounds. More fundamentally, most research products are not intrinsically public —technically, non-rival and non-price excludable— or private goods; they fall in the "shades of grey" category, have multiple attributes (with some attributes that are more or less rival or excludable than others), and, above all, can be made more or less public (or not) through policy and practical actions on the part of the CGIAR or others. For example, a new advanced breeding line of rice can be ceded to the public domain, or, alternatively the CGIAR may seek plant breeders' rights (PBRs) on that variety in multiple countries thereby making it excludable for commercialization, but not breeding, purposes in those countries. In addition the CGIAR could file for utility patent protection on the variety in the United States, which if successful confers the CGIAR with the legal right to exclude all others from using, making, selling or importing that particular variety in that jurisdiction. That is, it is as much how the CGIAR opts to use its research products, not necessarily something intrinsic in the product itself that determines if the output is more or less a "public good."

Against this background, and acknowledging the complexity of the task, for the purposes of this study, there are three main ways in which CGIAR can be considered a provider of international public goods. First, CGIAR is a **global knowledge producer** that conducts and disseminates research in the fields of agriculture, forestry, fisheries, policy and environment. As Morrissey *et al.* (2001) state "knowledge itself is an international public good" with "core activities at the global level" embodied in "international research centers", such as CGIAR. The distinction between the "core" and "complementary" components is useful to place the role that the CGIAR plays in the provision of international public goods, for it focuses attention on the extent to which the CGIAR should generate and make knowledge available for other entities to deploy and apply it, and on the extent to which it should actively make efforts to ensure that national and local institutions, as well as other international institutions, apply the knowledge generated and made available by the research centers affiliated with the CGIAR. This points to the dual role played by CGIAR partners as *producers of knowledge* through agricultural research (core component of the IPG delivery system), and as *catalysts, facilitators and promoters* of the use of such knowledge in practice at the local, national and international levels (complementary component of the IPG delivery system).

Second, CGIAR's activities contribute to the provision of international public goods by offering **specific products and services** that go beyond the generation and dissemination of knowledge and are made available to users at the local, national, regional and international levels. The results of CGIAR research lead to better products and technologies such as genetically improved seeds, to methods and practices for increasing agricultural productivity and promoting the sustainable use of natural resources, and to services that benefit a large number of users such as biodiversity conservation through gene banks. Once again, CGIAR can just offer these services for others to make use of them (core component), or in addition it could actively promote and facilitate their use through a range of activities to support and assist potential users (complementary component).

Third, the **institutional capacity for conducting and coordinating international agricultural research** that CGIAR has developed —and which can be deployed to respond to emerging requests or urgent demands— can in itself be considered an international public good. In addition, the CGIAR served as a model for other international research networks, particularly during its early years, and as such has contributed to better international governance practices, which can be considered in itself an IPG.[16] For historical reasons, CGIAR has a unique ability to implement science research programs across countries and regions in response to specific requirements. Relative to national and regional agricultural programs, CGIAR has demonstrated a significant capacity to exercise its influence to mobilize resources and attract relevant partners, including prominent international scientists, in order to mount and execute research programs. The existence and availability of this institutional capacity can be considered as the core component of this IPG that the CGIAR provides, while the way in which it is deployed and

[16] In the 1970s and 1980s there were frequent calls to 'create a new CGIAR' to undertake development-oriented research in a variety of fields such as renewable energy and primary health care among others.

mobilized when responding to specific requests may be seen as involving complementary activities.[17]

There is an additional way in which the CGIAR can be considered to be a provider of international public goods. The international partnerships the CGIAR has created during the last few decades can be considered as a contribution to the provision of the public good "international governance." The CGIAR is not unique in this respect as there are numerous other global public goods programs that have existed prior to and have formed since CGIAR's inception. However, the CGIAR was one of the first global research undertakings that received extensive support, had significant impact, and expanded rapidly. Its evolution over time can be viewed as a sort of laboratory for experimenting with new approaches to coordinated global action to provide insights for other undertakings, particularly when its shortcomings, challenges and successes in adapting its governance structures to the demands of international and global collaborative undertakings.

Therefore, CGIAR conducts research and disseminates research results; provides products and services that other agencies, private firms, civil associations and organizations deliver; and has a acquired an institutional capacity to coordinate and implement international agricultural research in response to emerging demands. By providing these three types of international public goods, the CGIAR also contributes to the overarching objective of reducing world poverty. CGIAR produces "high-quality science aimed at benefiting the poor" and its activities are aimed at "achieving sustainable food security and reducing poverty in developing countries".[18] Thus, in principle, all CGIAR activities can ultimately be seen as aiming at poverty reduction and at improving the quality of life of poor people all over the world.

However, during the last decade and a half, and primarily as a result of the shift that has taken place towards poverty reduction as the key overarching objective of international development assistance, greater emphasis has been placed by donors on supporting interventions at the local and national levels related to income generation, food security, access to basic social services, and similar actions that are directly related to improvements in the wellbeing of the poor. Relatively less emphasis is placed on the generation of knowledge of wide applicability to design and implement poverty reduction initiatives, which by its own nature is removed from actual interventions.

[17] In a comment to the first draft of this paper, Dalrymple (personal communication) suggests that this third type of IPG produced by the CGIAR should be labeled "institutional capacity for coordinating international agricultural research" and that it should focus on the ability to implement scientific research programs across countries and regions, rather than having anything to do with global governance or with "seeing things through impact". Dalrymple poses key questions with regards to institutional capacity: (i) is it just the result of resources or influence and exists at the expense of others research entities (e.g. NARS)?; (ii) is it a feature of CGIAR centers that have an eco-regional focus rather than a scientific research focus?; (iii) is it the result of opportunistic behavior when identifying and getting involved high-profile research where it has little scientific capacity but strong institutional capacity?; and (iv) is institutional capacity considered as an IPG the result of having a powerful research platform that can be quickly and effectively deployed to address new research challenges? He concludes that as time passes and other agricultural research organizations at the regional, national and local levels develop their own institutional capacities, the comparative advantage of the CGIAR may progressively shift more towards the first two types of IPGs: generating knowledge and offering specific products and services.

[18] http://www.cgiar.org/who/index.html

This suggests the question of whether interventions at the local level would be as effective, or even possible, without the knowledge generated and the services provided by entities that operate at higher (regional, international, global) levels. In the case of the CGIAR, and within an IPG delivery system framework, these arguments would mean that a preference of donors to focus primarily on the complementary rather than on the core component of the IPG delivery system runs the risk of not counting with the widely applicable knowledge and services that are necessary for national and local interventions to succeed. At one extreme it could be said that donors that concentrate exclusively on financing interventions at the local level and national levels (complementary components) are "free-riding" on the contributions of other donors that finance the generation of knowledge and provision of services (widely applicable, non-rivalrous and non excludable core components) that are essential for the existence of the international public good.

3.2 International public goods and the CGIAR continuum from scientific research to development impact

A CGIAR Science Council workshop examined in May 2006 the way in which international public goods relate to the activities of the CGIAR along the "research continuum" that spans from research in CGIAR Centers to actual implementation of research results in the field. Working paper by Ryan (2006) and the Science Council Secretariat (2006) set the ground for a discussion on the role of the CGIAR at various stages of the agricultural research IPG delivery systems.

A first concern was to reaffirm and delimit the scope for CGIAR Center engagement in the provision of IPGs in relation to the work of regional, national and local agricultural research institutions, particularly when they are weak or undeveloped. This is an issue raised by Ryan (2006, p. 18), who asks whether the CGIAR Centers should play a role equivalent to those of the NARS in countries that lack agricultural research capacities. The Science Council workshop report concluded that:

> … the CGIAR has the correct mission and mandate and … it should continue to conduct research focused on the production of IPGs. … The development and delivery of IPGs in agricultural research relies on a complementary set of national and local partners. Research planning requires ex-ante assessment that will maximize the chance of wide spread application of the outputs and the likelihood of spillovers. Appropriate intellectual property regimes to foster the CGIAR's freedom to operate and to deliver IPGs are also required. (CGIAR Science Council, 2006a, pp. 45, 47).

In addition, a background paper prepared by the Science Council Secretariat for the workshop recognized that:

> "… the production and delivery of IPGs depends on the concerted action of several players. Centers have, in the past struggled with the question of how far along the Research for Development continuum they should go, particularly in cases when suitable enabling conditions for the delivery and uptake side do not exist or are not fully adequate. The variable capacity of NARS to undertake complementary adaptive research and technology dissemination activities, even within regions, has

> been recognized. Some have argued that in the absence of currently viable extension mechanisms (such as in the poorest countries of Africa) or where state systems have collapsed or deterred the development of efficient alternatives, including the private sector, the CGIAR has to move into the missing middle ground and conduct more development-related activities to ensure the dissemination of its own technologies. …"
>
> "The counter argument might be that if the research question can be formulated clearly in advance … CGIAR activities could be much more clearly allotted to research or development categories … Also, the CGIAR cannot be held accountable for the failure of national systems and it has neither the resources nor the comparative advantage to disseminate technologies on a sufficient scale for more than piecemeal outcomes. Extension approaches have been moving for some time towards the introduction of private incentives to extension systems to increase the efficiency of agricultural technology dissemination. Centers should similarly aim to work with private partners or public national partners using private incentives where possible." (CGIAR Science Council Secretariat, 2006, p. 41).[19]

A second major concern refers to the possible focus on poverty reduction for the provision of international public goods, an issue that was raised in section 2.3 of this report. Ryan argues there may be a tradeoff between a focus on development impact and on producing international public goods:

> "With the growing imperative on [CGIAR Centers] to measure and document their impacts, especially on the poor, the scope for ensuring this while at the same time engaging only in the production of IPGs, may become more limited. To help ameliorate this, there is a need for a stronger focus on the complementary advantages of CGIAR Centers and their research, so that their IPG outputs have a better chance of leading to local gains in terms of poverty alleviation. However, potential trade-offs between pursuing measurable and more immediate poverty impacts and engaging in the production of IPGs with generally longer time horizons before identifiable impacts, appear inevitable and require more recognition, elaboration and discussion." (Ryan, 2006, pp. 19-20).

Discussions at the Science Council workshop clearly pointed out that the implementation of the system priorities and achieving impact require both what we have called the "core" and the "complementary" components of an IPG delivery system in this report:

> "Research for the alleviation of poverty requires greater attention to institutions and to the development of enabling policies (as well agricultural technologies and methods) and will require greater dovetailing of the various agricultural research outputs within wider development programs aimed at several scales." (CGIAR Science Council, 2006a, p. 47)
>
> "… there is a need to distinguish between research for development and the conduct of development activities per se, for which the CGIAR has little or no comparative

[19] The background paper for the workshop held in The Netherlands, which was prepared by the Science Council Secretariat (2006, pp. 28-29), referred explicitly to the idealized delivery system for international public goods developed by Sagasti and Bezanson (2001) and reproduced in Annex A of this report.

> advantage. The placement of CGIAR research should be considered in relation to the complementary activities and partners required to implement the goals of the System Priorities. Historically, the niche of the CGIAR has been to conduct strategic research and provide the link between the basic and more adaptive ends of the research for development continuum." (CGIAR Science Council, 2006a, p.46)

This is closely related to priority setting at the CGIAR where, according to Ryan (2006), there are tensions between a demand-led agenda arrived at through a broad consultation process, and what Dalrymple (2005) refers to as a "demand-informed" but "supply-led" approach to priority setting.[20]

Box 3.2.1 quotes extensively Pinstrup-Andersen (2006), former Chairman of the CGIAR Science Council, on why an international public goods approach to the work of the CGIAR is useful and may help place the role of the Centers along the continuum from scientific research to development impact.

Box 3.2.1: International public goods and the CGIAR: views from a former Science Council Chairman

Answers to three interrelated questions are of critical importance for the future priorities and activities. … What is an "international public good"? Should [CGIAR] centers prioritize the creation of such goods? And, where on the research-development continuum should the CGIAR supported activities be?

Public goods have two characteristics. First, the use of the good by one individual does not detract from that of another and second, it is impossible to exclude anybody from using the good. A public good is international, if it is of use across country borders. But across how many borders? That is a matter of judgment.

My answer to the second question is YES. Why? For two reasons. First, research that produces private rather than public goods, i.e. goods that can be protected with exclusive property rights, are likely to be produced by the private sector. Second, research results of use to many countries may not generate enough benefits to any one country to warrant national research. Adding the benefits that several countries can obtain justifies international research. Identifying those areas of research that would remove the largest number of people from poverty but that would not be undertaken by the private sector or publicly funded national systems, is the most important part of setting priorities within the CGIAR.

But what do we do in countries where the publicly funded agricultural research system is absent or in very poor shape? We help strengthen national or regional systems. Capacity strengthening is a legitimate activity of the CGIAR. So is advocacy to get national governments and development assistance agencies to do it. Doing the research for them is usually not. It reduces the incentive for the national government to allocate funds to a national system and it tends to crowd out national researchers, while spending CGIAR money that would be

[20] Because farmers and the poor in developing countries do not play a direct role in CGIAR priority setting, Ryan (2006, p. 10) there is a principal agency problem, as stakeholders and the CGIAR are in essence aiming to reflect a derived demand for international agricultural research that will be most relevant to the ultimate intended beneficiaries. Rudy Rabbinge, Chairman of the CGIAR Science Council, has also emphasized the need to engage with CGIAR stakeholders to implement IPG delivery systems: "The CGIAR is a mission-oriented organization, not a university. This requires that the Centers and Programs consider not only concrete products but also assistance to processes. This in turn requires a different attitude: one which is more open, with a clear vision of what stakeholders need and how the System can work with such stakeholders." (CGIAR Science Council, 2006a, p. 50).

better spent generating research results of use to several countries. Most CGIAR research would best be done in collaboration with national researchers in selected developing countries. It should be useful to the country where it is done, but also to several others.

Third … in my opinion, [CGIAR] centers should prioritize research for development, maintaining close collaboration with advanced research institutions for more basic research and with national and international institutions for adaptation of knowledge and technology from international research as well as delivery systems. Facilitating interaction and delivery through networks has been effective in a number of cases. Placing the CGIAR in the middle of the continuum will, I believe, contribute to the maximization of impact per dollar spent, particularly if we operate within an innovation systems approach, in which each institution is capitalizing on its comparative advantage. But what if there is no delivery system? Then the research results from CGIAR research will rot on the shelf. Rather than giving in to the temptation to develop delivery systems for particular communities or countries, a temptation that is particularly strong if donors are ready with money, I believe [CGIAR] centers should engage in advocacy with national governments and development assistance agencies to have such delivery systems developed, either through publicly funded national institutions, or international agencies such as FAO, IFAD, World Bank, the regional banks, NGOs, or private consultancy firms. For delivery systems to be effective, investments are likely to be needed in rural infrastructure such as roads, markets, credit institutions, extension, and water management infrastructure. To maximize impact, investments in primary education and health care may be needed. We in the CGIAR should do a much better job putting pressure on the appropriate institutions to get these jobs done, rather than pretending that we have to do it all.

Source: Per Pinstrup-Andersen, reproduced in the Appendix to Jim Ryan, "International Public Goods and the CGIAR niche in the R for D Continuum: operationalising Concepts", in CGIAR Science Council: *Positioning the CGIAR in the research for development continuum,* November 2006, pp. 23-24.

3.3 CGIAR priorities and international public goods

In 2005, the CGIAR Science Council released a report defining a set of 5 priority areas, which in turn encompass 20 system priorities, for CGIAR research over the period of 2005-2015 (See Box 2.1). These priorities were identified through a Science Council-led participatory and collaborative process guided by three key criteria: "(i) the expected impact on poverty alleviation, food security and nutrition, and sustainable management of natural resources taking into account the expected probability of success and expected impact if successful; (ii) whether the research is of an international public goods nature; and (iii) whether there are alternative sources of supply of the research and whether the CGIAR has comparative advantage in undertaking the research" (CGIAR Science Council 2005, p.1).

The first criteria aligns with CGIAR's interest in supporting the United Nations Millennium Development Goals (MDGs) including the goals of poverty reduction and ensuring environmental sustainability. The second criteria is central to the discussion in this paper as the report clearly states that "the vision for the longer term is one in which the CGIAR is a provider of international public goods through agricultural research aimed at the alleviation of poverty" (CGIAR Science Council 2005, p. 1).

Box 3.3.1: System Priorities for CGIAR Research 2005 – 2015

Priority Area 1: Sustaining biodiversity for current and future generations
Priority 1A: Conservation and characterization of staple crops
Priority 1B: Promoting conservation and characterization of under-utilized plant genetic resources to increase the income of the poor
Priority 1C: Conservation of indigenous livestock
Priority 1D: Conservation of aquatic animal genetic resources

Priority Area 2: Producing more and better food at lower cost through genetic improvements
Priority 2A: Maintaining and enhancing yields and yield potential of food staples
Priority 2B: Tolerance to selected abiotic stresses
Priority 2C: Enhancing nutritional quality and safety
Priority 2D: Genetic enhancement of selected species to increase income generation by the poor

Priority Area 3: Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products
Priority 3A: Increasing income from fruit and vegetables
Priority 3B: Income increases from livestock
Priority 3C: Enhancing income through increased productivity of fisheries and aquaculture
Priority 3D: Sustainable income generation from forests and trees

Priority Area 4: Poverty alleviation and sustainable management of water, land and forest resources
Priority 4A: Integrated land, water and forest management at landscape level
Priority 4B: Sustaining and managing aquatic ecosystems for food and livelihoods
Priority 4C: Improving water productivity
Priority 4D: Sustainable agro-ecological intensification in low- and high-potential areas

Priority Area 5: Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger
Priority 5A: Science and technology policies and institutions
Priority 5B: Making international and domestic markets work for the poor
Priority 5C: Rural institutions and their governance
Priority 5D: Improving research and development options to reduce rural poverty and vulnerability

Source: CGIAR Science Council 2005

The five priority areas for CGIAR research (Box 3.3.1) can be summarized highlighting in **bold** font the key concepts in each as follows:

1. Sustaining **biodiversity** for current and future generations;
2. Producing more and better food at lower cost through **genetic improvements**;
3. Reducing rural poverty through **agricultural diversification** and emerging opportunities for **high-value commodities and products**;
4. Poverty alleviation and **sustainable management of water, land and forest resources**; and
5. Improving policies and facilitating **institutional innovation** to support sustainable reduction of poverty and hunger.

These priorities were developed to “have a greater impact through a more consolidated research focus” by encapsulating “major areas of science within the CGIAR’s comparative advantage in its assistance to developing country agriculture” (CGIAR Science Council

2005, pp. 4, 10). Priority area 1 focuses on the role of the CGIAR in biodiversity conservation for food and agriculture, as well as in identifying under-utilized species and genetic resources (e.g., trees, livestock, aquatic genetic resources) that provide opportunities for income generation by the rural poor. CGIAR's role in increasing production of major staple crops is part of Priority area 2, with an additional emphasis on the provision of novel genes for adaptation and yield enhancement (drought tolerance and biofortification), as well as activities related to high value crops, livestock and fish.

Priority area 3 focuses on CGIAR's poverty reduction role, primarily through the creation of income-generating opportunities for the poor. This involves, among other things, agricultural diversification, expanding the range of high-value products, managing conditions of growth for individual sectors (fruits, vegetables, fish, forest products, livestock) and establishing linkages to markets. Priority area 4 focuses on the nexus between agricultural and natural resource management research to assist decision-making in the field, sustain productive natural resources (water, fisheries and forestry), enhance the benefits to the poor, and combat land degradation in farming systems. Finally, priority area 5 highlights research on institutions, including insights on innovation and capacity building within CGIAR, national centers and partnerships. It also covers policy-making in science, technology and intellectual property rights to improve the effectiveness of agricultural research, and to create enabling environments for alleviating poverty.

Tables 3.3.1, 3.2 and 3.3.3 below categorize these priority areas according to the three main types of IPGs produced by CGIAR as defined in the preceding section. The first column summarizes the priority areas derived from CGIAR's mission to increase food security for the poor both "through scientific research and [through] research-related activities". As Tables 3.3.1 and 3.3.2 indicate, there is a knowledge component in each of the priority areas (research) as well as a product/service component (research-related activities), both of which are described in the second column. As indicated earlier, the CGIAR has the institutional capacity to coordinate and implement international agricultural research programs across regions and countries. This contribution, which is primarily linked to priority area 5, is characterized in Table 3.3.3.

The three main criteria to define an international public good can be applied to examine the extent to which each of the five priority areas and 20 specific priorities of the CGIAR can be considered an IPG. The three criteria are: (i) **non-excludability**, which means that once a good is produced, its benefits —or harm— accrue to all, and that it is either impossible or prohibitively costly to exclude those who do not pay for the good from consuming it; (ii) **non-rivalry**, which means that any one person's consumption of the public good has no effect on the amount of it available for others; and (iii) **substantive international or global reach**, which means that the public good has benefits that extend across countries and substantial cross-border externalities.

The third column of the tables outlines the degree (high, medium or low) to which the global knowledge, products, services and institutional capacity are non-rivalrous, non-excludable and international in character. The final two columns describe the "core" and "complementary" components of the International public goods produced by the CGIAR. The three criteria described in the third column apply in particular to the "core" component of the delivery system for the international public good in question.

One of the key decisions that needs to be made when examining each of the priority areas to evaluate CGIAR performance is the extent to which it should be held accountable, both for the provision of the core component and of the complementary component of a particular international public good. This is closely related to the questions of which aspects of an international public goods delivery system are under the direct control and decision-making power of the CGIAR, which aspects can it influence, condition or facilitate, and which aspects are out of its scope of action and authority. How far along the results chain in the zone of influence should the system direct its resources? These distinctions are also related to matters of contribution and attribution, primarily because a large number of other agents at the international, national and local levels intervene to deliver on the ground the international public goods associated with CGIAR priorities and functions.

As indicated before, there are interpretations that hold that international public goods related to development should extend all the way to cover the achievement of specific development outcomes in local settings, most of which require the intervention of a host of other national and local development agents. For this reason, it is important to delimit how far down the delivery system the core component —whose provision should be the primary responsibility of the CGIAR— should reach, and what actions or interventions should be considered as part of the complementary component —for which the CGIAR plays the role of facilitator, catalyst, promoter, bridge-builder, convener or advocate, rather than that of direct generator or provider (Ryan, 2006, pp. 14-16).

Such a distinction is particularly important when examining how CGIAR priorities relate to the ultimate objective of poverty reduction, so as to calibrate expectations of what the CGIAR can reasonably aspire to achieve. In practice, as an entity that conducts research, provides research-related services and offers insights on global governance, its contribution to poverty reduction is once removed from the operational on-the-ground interventions specifically designed for this purpose.

In his analysis of CGIAR priorities and the way they link to development outcomes, Lynam (2007) underscores the complexity of the task of tracing the impact of CGIAR activities at the field level: “There is in essence the need to understand the necessary and sufficient conditions for research investments to be translated into development outcomes, and yet either those are not known with certainty or cannot be provided at sufficient levels in a coordinated manner ... Nevertheless, some system for accountability of investment in the development process is necessary to guide future investment, which has been given recent emphasis by the entry of the newly created philanthropic foundations into the development arena while bringing with them the performance measures of the business community.” Lynam (2007, p. 8).

Lynam elaborates his argument comparing agricultural research with health interventions in the following way:

> “Agriculture is a large sector of the economy, and its development has an analogue in the very large question of how to develop the manufacturing sector in Africa. Even a relatively narrow question of how many farmers adopt a new variety is dependent on such factors as agroecological conditions, education of the farmer, availability of extension services, access to output markets, availability of credit, or efficiency of input markets. These were all factors in place in the Asian green

> revolution, but all to varying extents ineffective in sub-Saharan Africa. Therefore, how is investment in varietal research in Africa to be evaluated in terms of its potential impact, when it is so conditional on the existence of other preconditions? … development challenges … all fall into this class of problem. They require a multiplicity of interventions with strong coordination, something provided by the state during the Asian green revolution and which must be provided by the market in the African context. The CGIAR now provides a significant subset of these necessary conditions, but they have to be closely tailored to the economic and institutional context." Lynam (2007, p. 9).

As Tables 3.3.1, 3.3.2 and 3.3.3 and the descriptions of the following section indicate, there are different degrees to which CGIAR system priorities and activities provide the core and complementary components of international public goods.

Table 3.3.1: CGIAR as a Global Knowledge Producer

Priority Area	***Description***	***IPG features*** *(mainly applicable to the core component)*	***Core component*** *(Zone of Control)*	***Complementary component*** *(Zone of Influence)*
Priority Area 1: **Sustaining biodiversity for current and future generations**	• Agricultural research results on crops, livestock, and aquatic animal genetic resources • Research results on and characterization of staple crops and under-utilized plant genetic resources • Best practice knowledge on biodiversity conservation	• Non-excludability: HIGH • Non-rivalry: HIGH • International reach: HIGH	Generation of knowledge on staple crops and characterization of their biodiversity; development of methodologies for biodiversity research, studies and inventories; increases in evolutionary resilience derived from biodiversity knowledge and characterization	Adaptation and interpretation of knowledge and methodologies on sustaining biodiversity to fit national and local conditions; provision of knowledge, information and assistance to other international entities involved in sustaining biodiversity
Priority Area 2: **Producing more and better food at lower cost through genetic improvements**	• Results from agricultural research on yields, tolerance to abiotic stresses, nutritional quality • Results from gene discovery and improvement research, genetic and physiological improvements and breeding	• Non-excludability: HIGH • Non-rivalry: HIGH • International reach: HIGH / MEDIUM	Increases in the stock of cumulative knowledge about specific characteristics / functions / potential and value of various agricultural crops and seeds; development of methodologies for genetic research and enhancement	Additional research and trials conducted at the national and local levels to adapt genetically improved crops and seeds to specific conditions with the aim of increasing productivity and resilience; provision of assistance to international institutions involved in these activities
Priority Area 3: **Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products**	• Agricultural research results on agricultural diversification, and on high-value commodities such as fruit and vegetables and livestock • Results from research on fisheries, aquaculture, forestry, and natural environment	• Non-excludability: MEDIUM • Non-rivalry: MEDIUM • International reach: LOW	Generation of knowledge about general principles on agricultural diversification and high-value commodities; development of research approaches / methods / procedures regarding agricultural diversification and emerging opportunities derived from it	Knowledge and specific application procedures generated by agencies operating at the international, national and local levels to apply the principles and methodologies in practice and in a way that is relevant to local settings
Priority Area 4: **Poverty alleviation and sustainable management of water, land and forest resources**	• Results from agricultural research on sustainable agro-ecological intensification • Research results on land, water, and forest management; on aquatic	• Non-excludability: MEDIUM • Non-rivalry: LOW • International reach: LOW	Generation of knowledge about the relationship between agricultural practices and the sustainable use and management of water, land and forest resources	Adaptation and interpretation of general knowledge about sustainable resource management and agriculture in specific settings for local

	ecosystems; and on water productivity			application, and knowledge about actions to adopt at the local level; provision of knowledge, information and assistance to international entities engaged in these activities
Priority Area 5: **Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger**	• Results from research on science and technology policies and institutions • Research insights on rural institutions and governance • Results from research on international and domestic markets • Results from research on reducing rural poverty and vulnerability	• Non-excludability: HIGH • Non-rivalry: HIGH • International reach: HIGH	Generation of knowledge about public policies, partnerships, financial mechanisms, and interventions by the public sector, civil society and private sector to improve the functioning of agricultural systems	Adaptation of the institutional, financial and policy knowledge to apply specifically to the national and local level; information and assistance to international entities engaged in these activities

Table 3.3.2: CGIAR as a Provider of Products and Services

Priority Area	***Description***	***IPG features*** *(mainly applicable to the core component)*	***Core component*** *(Zone of Control)*	***Complementary component*** *(Zone of Influence)*
Priority Area 1: **Sustaining biodiversity for current and future generations**	• Gene banks • Characterization and inventories of species / stocks • Genetic and genomic stock distribution • Training on gene pools • Strategies, methodologies, and policy recommendations / protocols for conservation • Facilitating linkage of new species to breeding programs	• Non-excludability: MEDIUM (club good) • Non-rivalry: HIGH / MEDIUM • International reach: HIGH	Creation, maintenance and operation of gene banks; information systems on biodiversity and properties of genes; gene bank training and technical assistance	Two-way provision of specimens and samples for biodiversity conservation efforts and gene banks; distribution of genetic and genomic stock; local adaptation and distribution of training programs on biodiversity conservation, use of gene banks and gene pools, and on breeding programs
Priority Area 2: **Producing more and better food at lower cost through genetic improvements**	• Genetically improved seeds / staple crops / germplasm (including for biofortification, higher yield, resistance to drought and stresses) • Training on incorporating technologies into genetic improvement programs for efficiency and capacity	• Non-excludability: MEDIUM (club good) • Non-rivalry: HIGH • International reach: HIGH / MEDIUM	Development of genetically improved seeds / staple crops / germplasm; training on techniques and technologies for using genetically improved seeds and crops and for monitoring their use	Interventions and measures to acquire and distributed improved seeds; adaptation to local settings of training programs and techniques on use and monitoring of genetically improved agricultural entities
Priority Area 3: **Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products**	• Training on agricultural diversification • improved production technologies for selected species • Training on inputs to increase productivity, reduction of production risk, and access to and competitiveness in markets • Training on strengthening institutions and management skills • Best practice documentation and training for improved productivity of aquaculture products and forest products and effective institutions for their management	• Non-excludability: MEDIUM (club good) • Non-rivalry: HIGH / MEDIUM • International reach: MEDIUM	Development of services, training, and information systems on best practice on agricultural diversification and high-value agricultural products; capabilities to provide capacity building services and advise to national and local entities	Specific technical assistance interventions (raining, information systems, coaching) on agricultural diversification and high-value species adapted to the national and local levels

	• Promotion of marketing approaches			
Priority Area 4: **Poverty alleviation and sustainable management of water, land and forest resources**	• Best practices in natural resource management, governance and management systems, and stakeholder engagement on socio-ecological planning at landscape and farm levels • Promotion of technology-oriented methods • Methodologies / tools for biological assessment • Training on sustainable natural resource management and factors that determine decision-making on managing natural resources	• Non-excludability: MEDIUM • Non-rivalry: LOW • International reach: MEDIM / HIGH	Development of information systems on sustainable resource management best practices; training in the sustainable management of water, land and forest resources	Adaptation of sustainable resource management information and training interventions and instruments to make them relevant to national and local situations, and used by national and local agents.
Priority Area 5: **Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger**	• Policy recommendations • Training on domestic and international market • Best practice case studies in institutional innovation • Training and capacity building • Methodologies for partnership building	• Non-excludability: HIGH • Non-rivalry: HIGH • International reach: MEDIUM	Publications, databases and information systems on policy recommendations; Training and capacity building for improving policies and institutions	Adaptation of institutional training, capacity building and policies to adapt to the local and national setting

Table 3.3.3: CGIAR as a Repository of Institutional Capacities for International Agricultural Research

Priority Area	***Description***	***IPG features*** *(mainly applicable to the core component)*	***Core component*** *(Zone of Control)*	***Complementary component*** *(Zone of Influence)*
Priority Area 5: **Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger**	• Organizational capacity to respond rapidly and effectively organizing research programs at the regional and national scales in response to specific demands • Capacity to mobilize resources and funding for international agricultural research • Creation of partnerships including with prominent scientists for international agricultural research • Provision of instances, examples and practices related to the creation, operation and maintenance of international research networks on development issues.	• Non-excludability: HIGH • Non-rivalry: HIGH • International reach: HIGH	Acquisition and maintenance of institutional capabilities to organize and coordinate international research programs, mobilize financial resources, and to create partnerships for implementing international agricultural research programs, providing services and capacity building – all of this in response to specific needs and requests; description and dissemination of CGIAR accumulated knowledge and experience about establishing and running development-oriented international research networks	Providing support and assistance to other regional, national and local entities in the agricultural research system to pose requests and demands to the CGIAR, to apply the results of research, to take advantage of the accumulated knowledge and experience in managing research networks; and to make use of the services and benefit from capacity building activities undertaken by the CGIAR

3.4 Some examples of CGIAR activities viewed through an IPG lens

Considered as a whole, an examination of the system priorities through an IPG lens clearly indicates that the CGIAR is actively engaged in the production of international public goods, although this is by no means the only activity it performs. This section identifies five specific CGIAR priorities and applies the concept of the "IPG delivery system" outlined in the preceding sections to assess the performance of the CGIAR as a provider of international public goods. As described in Annex A, the components of an idealized international public goods delivery system are related to the three domains of the global, networks and local, and can be divided into the core and complementary components.

The illustrative examples correspond to the three main types of international public goods provided by the CGIAR: knowledge, products and services and the institutional capacity for coordinating and implementing international agricultural research. The first two examples fall in the knowledge category and examine the IPG delivery systems for research results on the genetic enhancement of high value species and on sustainable income generation from forests and trees. The third and fourth examples belong to the services and products category, and deal with the creation and maintenance of gene banks, and with the provision of policy advice and the spread of best practices in agriculture. The fifth example analyzes the institutional capacity of the CGIAR to respond to demands and requests from a variety of sources, and to garner the resources and to build the partnerships necessary to implement international agricultural research programs.[21] The first three examples will be explored in more detail than the last two.

3.4.1 Genetic enhancement of high-value species

CGIAR Priority 2D is focused on "genetic enhancement of selected species to increase income generation by the poor", which has been a long-standing feature of CGIAR's work. The development of new varieties of rice, wheat and maize and their positive impact on yields in developing countries was the stimulus for the creation of the CGIAR system in 1971. The CGIAR has continued to focus on increasing the yield, stability and diversity of high-value agricultural products including fruits and vegetables, livestock forages, and crops that have dual value as food and feeds.

Genetic enhancement research focuses on the following target traits: yield improvements research for traditional and exotic species, nutritional content, water-use efficiency, control of flowering, post harvest quality traits, selection and rapid propagation of species (perennials), and pest and disease resistance. In the case of low-potential environments, research is directed at enhancing fodder species for growth while reducing anti-nutritional components for livestock. In addition, crop utility and value are increased through augmenting the feed component of selected food-feed crops.

The description and assessment of the delivery system for a genetically enhanced high-value crop or product has to take into consideration the roles that CGIAR plays as part of a large network of international partnerships and organizations involved in improving the

[21] The authors of this paper are not experts in agricultural research, so the cases examines in this section should be seen as illustrative examples to be revised, modified and expanded.

productivity of key crops of value to the poor. The description below and figure 3.4.1 follow the conceptual framework advanced in section 1 and Annex A.

Knowledge, public awareness, political decision. There is considerable knowledge and public awareness on the use of genetic modification techniques, both for profit making purposes and for increasing income generation by the poor, and this issue has been hotly debated at the international level. Private corporations, international institutions, civil society organizations, national agencies and many experts have argued about the benefits and dangers of genetically modified organisms (GMO), and politicians and policy makers in various countries have either supported or banned their use. For example, the European Union has tabled Directives that enforce the strict labeling of GMOs, while the United States is enthusiastic about them and has challenged these EU Directives in the WTO for constraining trade in agricultural products. Yet, in general, developing country views have not been as clearly articulated and heard in these debates, which suggests there is a role for the CGIAR in this regard.

International regimes. The United Nations Convention on Biological Diversity (CBD) has established general principles for the delivery of genetically enhanced agricultural products. The Cartegena Protocol on Biosafety was signed by the Conferences of the Parties of the CBD in 2000 in order to protect biological diversity from the potential risks posed by living modified organisms resulting from modern biotechnology. This protocol is specifically concerned with the trans-boundary movement of any living modified organism resulting from modern biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity. The issue area of genetically enhanced agricultural species is also subject to some of the provisions adopted by the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which aims at reducing distortions and impediments to international trade. The World Intellectual Property Organization (WIPO) was created in 1967 with the goal of promoting the protection of intellectual property throughout the world, including intellectual property rights issues related to genetically modified seeds and organisms. The International Convention on the Protection of New Varieties of Plants was signed in 1961 and revised subsequently, with the goal of providing and promoting an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society. This convention led to the creation of International Union for the Protection of New Varieties of Plant (UPOV). Specific plant varieties are protected under the International Plant Protection Convention (IPPC) and the Convention on International Trade in Endangered Species of Flora and Fauna (CITES).

Networks of institutions, financing mechanisms and operational procedures. In addition to the CGIAR and its Centers, the International organizations and partnerships involved in the delivery of this international public good include the secretariats of the CBD, CITES, WTO and WIPO; large agribusiness, private companies that produce seeds and private research centers; and international civil society organizations, some of which have launched large-scale campaigns against GMOs. These are complemented by regional and national organizations that participate in the translation of knowledge and provision of services by linking activities at the international level with those at local levels. Financial mechanisms include resources provided by consortia of public and private donors (e.g. CGIAR), bilateral and multilateral loans and grants (e.g. International Fund for Agricultural Development (IFAD)), private corporation resources allocated for this purpose and private foundation grants, among others. Operational policies and procedures are embedded in

the guidelines derived from the various international conventions, in regional and national directives and in international standards, and priority setting, resource allocation, monitoring and evaluation processes established by these entities to conduct and finance research on genetic enhancement of high value species.

Agreements and contracts with national entities. The various entities in the networks described above have to work with a large number of national and local public, private, civil society and community organizations to transmit the knowledge and information associated with genetically enhanced high value species to the end users. This usually requires formal agreements that take the form of contracts, memorandums of understanding and other protocols that specify the obligations of each party and pave the way for the actual delivery of the international public good at the local level.

National and local entities. Government agencies promote, disseminate and regulate the use of seeds, crops and high-value agricultural products (including those that are genetically enhanced) at the national and local levels. Other dissemination mechanisms include local agricultural fairs, extension services, technical assistance which can be organized and provided by public, private and civil society organizations. However, private firms, individual farmers, agricultural cooperatives and farmer associations are the end users ultimately involved in the practical application of the knowledge on genetically enhanced species generated by the CGIAR.

What is the role of the CGIAR in this international public goods delivery system? At one extreme it can be argued that it should limit itself simply to conduct research, publicize and make available the results of its work on genetically enhanced species. At the other extreme, it could be stated that CGIAR should ensure that the international regimes, networks of entities, agreements and national actions and institutions are all in place and functioning to apply the results of its research activities. This has a bearing on the determination of the "core" component of the IPG delivery system, for which the CGIAR is directly responsible and should be held accountable, and on the determination of the "complementary" component, in which the CGIAR plays the more limited role of facilitator or enabler. Therefore, the first question to be asked would be:

- *How clearly has the CGIAR defined the boundaries of the core (zone of control) and complementary (zone of influence) components of the delivery system for the international public good "genetic enhancement of high- value species"?*

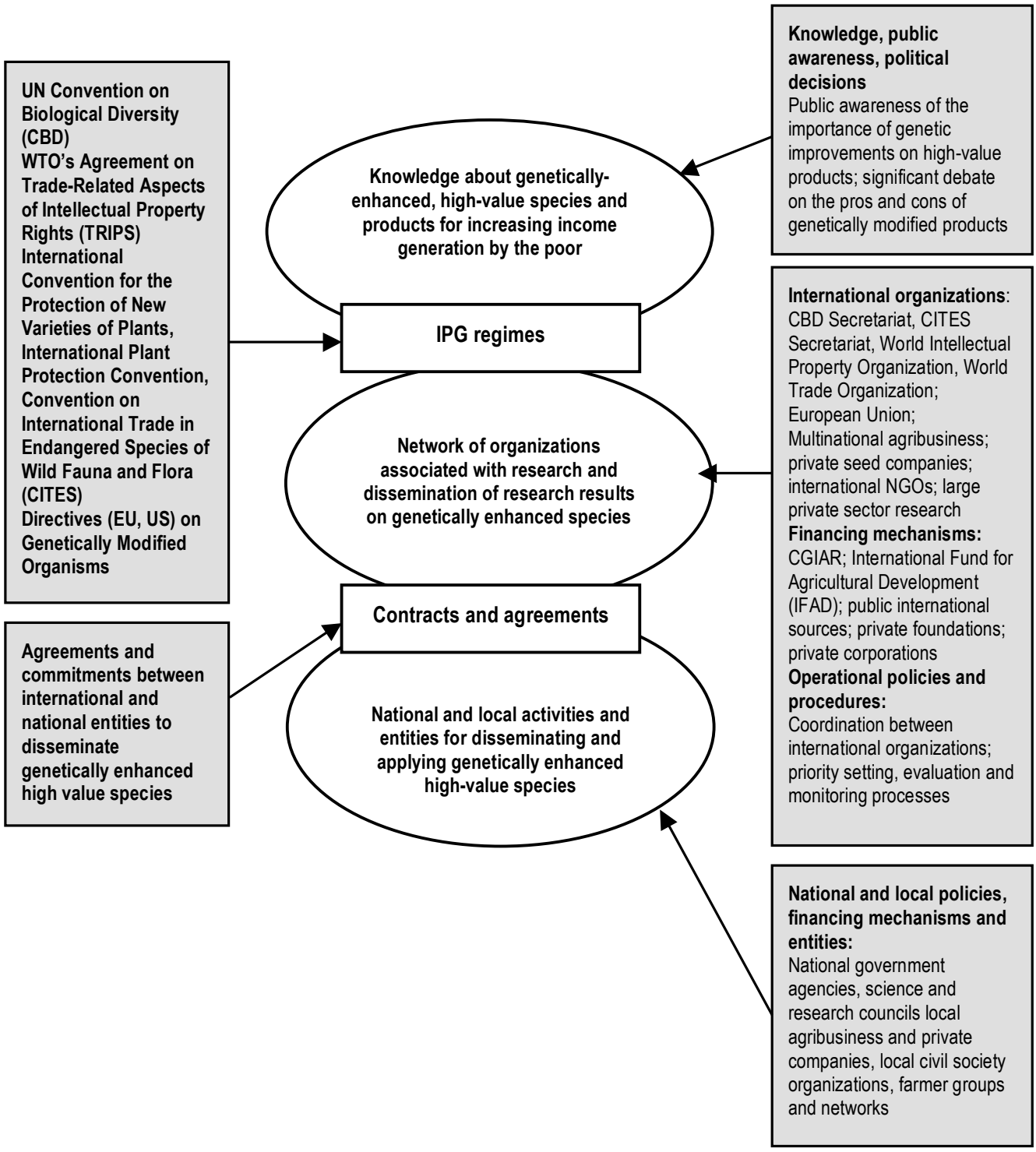
Once the reach of the core and complementary components has been defined, the analysis suggests some questions to evaluate the performance of the CGIAR as a provider of international public goods in this priority area. As examples it is possible to mention:

- *To what extent has the CGIAR contributed to clarify and raise the level of international debate on GMOs and related issues?*
- *Has it played an active role in assisting policy makers in developing countries to adequately frame the debates at the national level?*
- *How has it contributed to the creation, consolidation and well functioning of the international regimes associated with high value genetically enhanced species?*

- *Does the CGIAR have the appropriate governance structures to manage its relations with other organizations in the networks of institutions, financing mechanisms and operational procedures involved in this priority area?*
- *Has the CGIAR contributed to the establishment of adequate financing mechanisms to deliver the international public good of knowledge about high value genetically modified species?*
- *Has it played an appropriate facilitator role to improve the performance of other entities at the international and national levels that participate in the generation, diffusion, adaptation and use of knowledge about high value genetically modified species?*
- *Has it promoted or conducted evaluations on the roles that genetically enhanced high-value species play as an input in poverty reduction initiatives.*

Responses to questions like this, in addition to others that could be added once the scope of the core and complementary components of the IPG delivery systems have been defined, will contribute to provide the evidence for assessing CGIAR performance as a provider of international public goods, particularly when aggregated across the whole range of IPGs in which the CGIAR is involved.

Figure 3.4.1: IPG Delivery System for "Knowledge about Genetic Enhancement of High-Value Species"



3.4.2 Knowledge about sustainable income generation from forests and trees

In the 1970s, the CGIAR expanded its research focus from increasing crop productivity to other interests including natural resource management, policy, agroforestry, forestry, fisheries, livestock and water management. This section explores research priority area 3D on CGIAR's role in providing sustainable income generation from forests and trees. CGIAR research in this area focuses on identifying the full range of tree and forest products and services, on defining the favorable institutional and policy contexts and market opportunities for income generation.

Managing forests in a sustainable way ensures that forests maintain their value for the local communities over the long-term. At the national level, market level and at the level of society, there is a potential demand for forest and tree products including food (and livelihood security), fodder, fuel wood, biomass, and medicines. There are also other advantages derived from trees and forests, some of them intangible, including social, environmental and cultural benefits.

The practice of "agroforestry" ensures that the benefits and services of trees —including providing fertilizer, biodiversity values, energy and shelter— are maintained in agricultural areas by encouraging farmers to integrate trees into agriculturally productive landscapes. Significant international research on agroforestry is conducted through the World Agroforestry Centre (ICRAF) in Nairobi, one of the CGIAR Centers. ICRAF staff and scientists also undertake policy research to support policy-making that encompasses information about important upstream/downstream interactions in forest and product use, and knowledge about ecological systems and biological processes.

Effective forest policies mitigate potential conflicts and develop trade-offs amongst users, and identify pathways for the appropriation of benefits by local communities and small farmers. The following paragraphs and Figure 3.4.2 offer a brief description of the delivery system for the international public good "knowledge about sustainable income generation from forests and trees."

Knowledge, public awareness, political decision. CGIAR, and in particular the World Agroforestry Centre (ICRAF), play an important role in raising public awareness and knowledge about the value of forest and trees for local communities and farmers. Research conducted at ICRAF provides insights into the products and services derived from forests and trees, as well as into the necessary institutional, policy and market conditions for ensuring the benefits from forest and tree income generation for the poor.

International regimes. The international public regimes that frame this issue area include the UN Convention on Biological Diversity, which has a program on both agricultural diversity as well as forest diversity. The UN Framework on Climate Change is also a part of the international regime arena for this area, particularly given the mechanisms under the Kyoto Protocol, which specify the role of forest and trees in carbon capture and climate change mitigation. Forestry issues are negotiated at the international level through the UN Forum on Forests, which develops non-legally binding instruments on forests and facilitates the implementation of forest-related agreements. In addition, specific forest plants and species are protected under the Convention on International Trade in

Endangered Species of Flora and Fauna (CITES) and are governed by trade agreements negotiated through the World Trade Organization (WTO).

Networks of international institutions, financing mechanisms and operational procedures. The CGIAR Centers are part of a network of international, regional and national organizations that participate in the delivery of sustainable forest management. These include the International Tropical Timber Organization (ITTO), the World Conservation Union (IUCN), the Rainforest Challenge partnership, and the Forest Landscape Restoration Partnership. It also includes international civil society organizations such as Conservation International and the World Wide Fund for Nature (WWF). Financing mechanisms for this work include the Global Environmental Facility (GEF), the World Bank, multilateral development banks (MDBs), private donors and civil society organizations, international public funds and market mechanisms for forest products and services. International organizations and governments coordinate with agents at the local level through operational policies and procedures defined through the CBD, GEF, multilateral development banks, and bilateral agreements.

Agreements and contracts with national entities. Specific agreements and contracts are also established to define the legal responsibilities of contracting Parties at different scales. These agreements include the forest certification programs, such as those established by the Forest Stewardship Council, to promote environmentally appropriate, socially beneficial, and economically viable management of the world's forests. These, in turn, influence international trade in forest products, including access to European or other markets.

National and local entities. At the national and local level, governments legislate and promote sustainable forest management practices and provide the regulatory environment for forest and tree product markets. Local civil society organizations and communities can provide support and training on harvesting forest and tree products and on the practice of agroforestry, while local businesses can support entrepreneurial efforts by farmers to sell forest and tree products to the local market. Formal and informal training is offered at universities, colleges, farmer field schools and through peer-learning, helping spread the knowledge base to local researchers, policy makers and farmers. Local farmers adapt knowledge about income generation from forest and trees to their local setting and share their experience with national and international organizations to inform future research in this area.

What is the role of the CGIAR in this international public goods delivery system? Unlike the first example in the section above, national and local entities play a larger role in determining the applicability of the research results on forest and tree products. Critical information on the effectiveness of specific forest management and tree product harvesting practices are gathered at this local scale. In this case, it is likely that the core component of this particular IPG delivery system will extend to include activities to adapt and tailor widely applicable knowledge and policies to conditions operation at the national and local levels.

Given this national and local focus, is the CGIAR producing international public goods through its work in this research priority area? According to Harwood et al. (2006), it can be stated “that much natural resources management research, as well as that on agricultural systems that have high interaction with local environments, is often very

location-specific"; however, their analysis examines the ways in which "modern approaches to integrated natural resources management research (INRM) can have broad international applicability and serve as a highly useful foundation for development of locally-adapted technologies".

International applicability is achieved by ensuring, for example, that empirical research be conducted across multiple sites across numerous ecosystems, by disaggregating complex systems into sub-systems to facilitate the identification of similarities across sites, and by coordinating research design to that common objectives and methods and a clear research framework can be established across multiple countries and sites. In addition, by developing tools that are effective in natural resource management, are easy to apply and are low cost, CGIAR scientists working in this area can support the translation and adaptation of international research to local contexts. Harwood et al (2006) discuss the "knowledge chain" that needs to exist across international, regional, national and local levels with "the ultimate goal [of making]… the range of research and experiential knowledge available for both upstream and downstream use, both within and between efforts within each domain." This paper uses the term "service delivery system" to make a similar point about the need for connectivity across scales and users of knowledge.

Once again, the first question to ask would be:

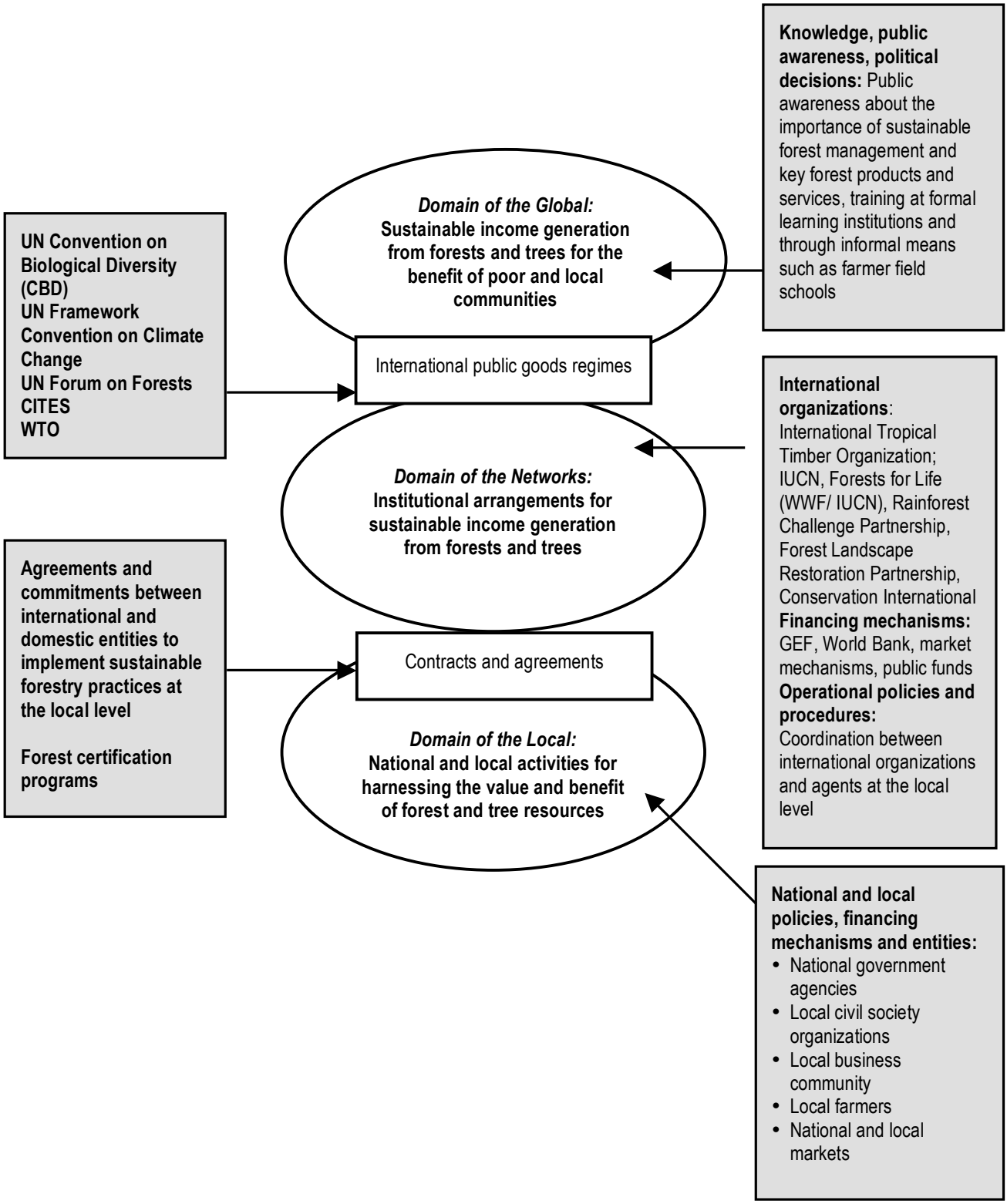
- *How clearly has the CGIAR defined the boundaries of the core (zone of control) and complementary (zone of influence) components of the delivery system for the international public good "knowledge about Sustainable Income Generation from Forests and Trees"?*

The analysis suggests some questions to evaluate the performance of the CGIAR as a provider of international public goods in this priority area. As examples it is possible to mention:

- *To what extent has the CGIAR contributed to defining sustainable forest management practices and identifying the full-range of tree products available for income generation for the poor?*
- *Has it played an active role in assisting policy makers in developing countries to adequately support sustainable forest management at the national level?*
- *How has it contributed to the creation, consolidation and well functioning of the international regimes associated with the natural resource management of forests and tree species?*
- *Does the CGIAR have the appropriate governance structures to manage its relations with other organizations in the networks of institutions, financing mechanisms and operational procedures involved in this priority area?*
- *Has the CGIAR contributed to the establishment of adequate financing mechanisms to deliver the international public good of knowledge about income generation from forests and trees?*
- *Has it played an appropriate facilitator role to improve the performance of other entities at the international, national and local levels that participate in the generation, diffusion, adaptation and use of knowledge about income generation from forests and trees?*

Responses to questions like this will contribute to provide the evidence for assessing CGIAR performance as a provider of international public goods.

Figure 3.4.2: IPG Delivery System for Knowledge about Sustainable Income Generation from Forests and Trees



3.4.3 Gene banks as a CGIAR product and service

CGIAR priority 1A and B focus on the key role of CGIAR in creating and maintaining gene banks. CGIAR scientists play a critical role in the collection, characterization and conservation of plant genetic resources. Gene banks can be considered international public goods as they safeguard these collections of genetically diverse seeds and other plant materials within the public domain. The collections have considerable potential, and may be even seen as essential, to keep crops healthy and improve their productivity and to sustain agricultural growth.

The gene banks receive traditional varieties, crop breeding lines and enhanced varieties of major staples such as wheat, rice, and maize and lesser-known varieties such as cowpea and pearl millet. Special attention is given to crop wild relatives containing genes for pest and disease resistance, improved nutritional value and tolerance to heat, cold and drought.

There are currently eleven gene bank operated by CGIAR Centers and supported by the CGIAR. The gene bank collections house over 600,000 accessions of crop, forage and agroforestry species. CGIAR centers are predominantly focused on the core component of the international delivery system of gene banks considered as international public goods, although they also perform a range of complementary activities. The following paragraphs and Figure 3.4.3 offer a brief description of the delivery system for this international public good.

Knowledge, public awareness, political decision. There is widespread knowledge and awareness of the importance to humanity of protecting and conserving plant genetic resources for food and agriculture for future generations. The CGIAR describes its commitment to this goal as follows:

> *"The CGIAR is committed to conserving these collections for the long-term and to making the germplasm and associated information available as global public goods. The collections held by the CGIAR gene banks are among the largest in the world and arguably the most important for the livelihoods of the poor and global food security. In fulfilling its stewardship obligations, CGIAR invests $6 million every year to maintain these valuable resources for the benefit of humanity"*[22]

This knowledge has led to political decisions to establish gene banks and recognize their importance within international regimes, including the UN Convention on Biological Diversity. Through this regime, nation-state governments recognize that conserving biodiversity in the form of crop, forage and agroforestry species serves to foster evolutionary resilience and the potential use of biodiversity for future generations.

International regimes. The Convention on Trade in Endangered Species of Flora and Fauna (CITES) is another regime that influences the creation and maintenance of gene banks by ensuring that the collection and distribution of gene bank species does not threaten their survival. In 2006, the CGIAR Centers and the Food and Agricultural Organization (FAO) signed agreements with the Governing Body of the International

[22] http://www.cgiar.org/impact/genebanksdatabases.html

Treaty on Plant Genetic Resources for Food and Agriculture. This treaty provides policy guidance related to the gene bank collections and is a key part of the international regime governing this area.

Networks of international institutions, financing mechanisms and operational procedures. At the international level, organizations such as the Food and Agricultural Organization (FAO) form partnerships to protect plant genetic resources. These international partnerships often provide the financial mechanisms to create and maintain gene banks. For example, the most recently created gene bank is the Svalbard Global Seed Vault (SGSV), a new storage facility that opened in 2008 and is located on a remote Norwegian island near the Arctic Circle. The vault itself was constructed through financing from the Norwegian government, and the facility's operations will be financed through the Global Crop Diversity Trust, hosted jointly by the UN Food and Agriculture Organization and Biodiversity International.

Agreements and contracts with national entities. In order to ensure that the products and services associated with gene banks are available to the end users, the various entities in the networks described above have to work with a large number of national and local public, private, civil society and community organizations. Formal agreements outlining the obligations of each party are often drafted as contracts, memorandums of understanding and other protocols to support the delivery of the international public good at the local level.

National and local entities. In the case of gene banks, the role played by local and national organizations is primarily in sourcing, collecting and transferring plant genetic resources to the gene banks, as well as receiving seeds from their repository. National governments regulate and facilitate this collection and subsequent distribution. Local and national scientific and research councils play a role in identifying new plant varieties for collection.

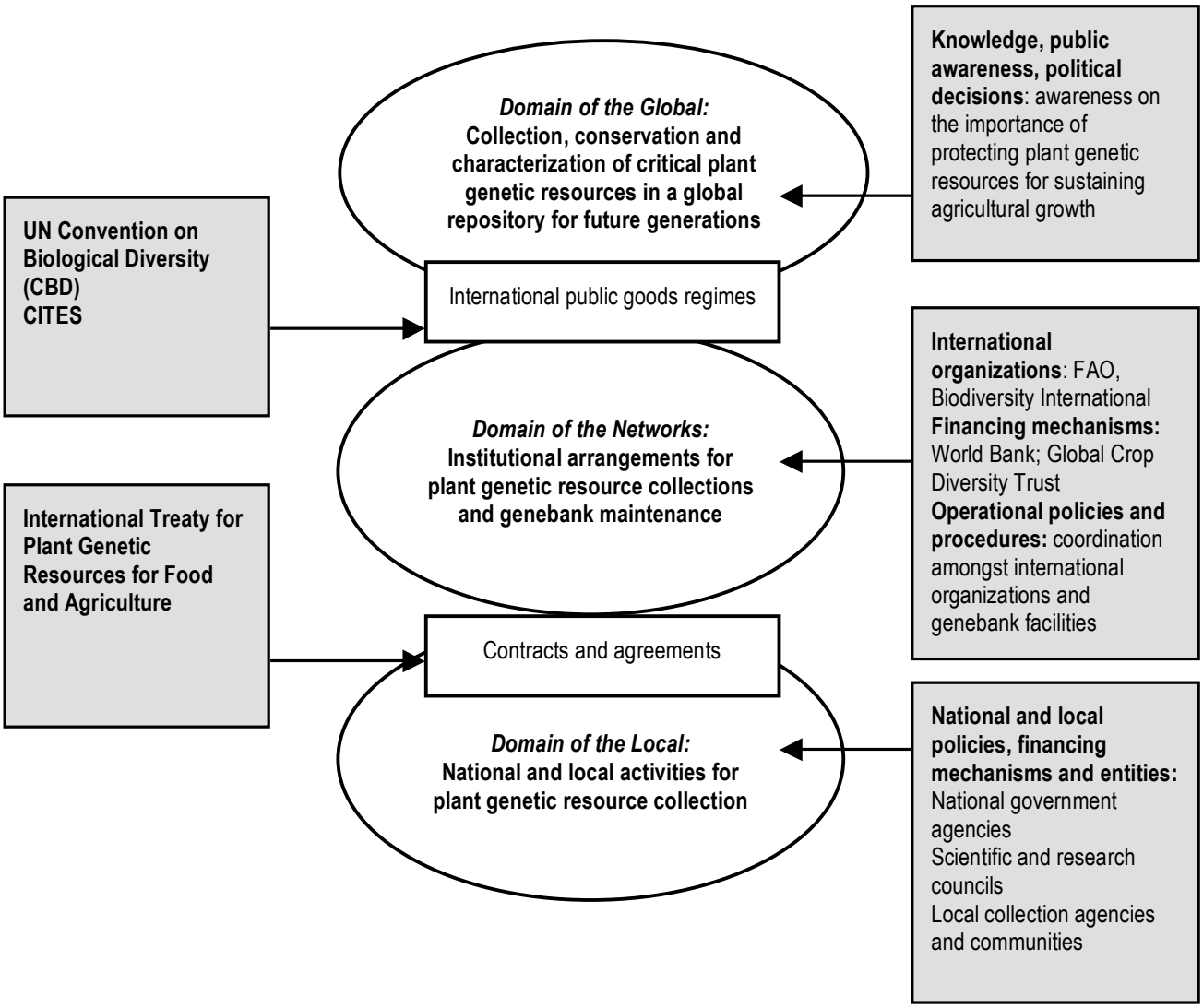
What is the role of the CGIAR in this international public goods delivery system? The core component in this priority area resides largely with CGIAR and at the international level, as the CGIAR Centers are primarily responsible for the creation and maintenance of gene banks. Although national and local entities supply the gene banks with plant genetic resources and are beneficiaries of any distribution from the gene bank resources, the CGIAR holds primary responsibility for this international public good.

Some questions can be asked to evaluate the performance of the CGIAR as a provider of international public goods in this priority area. As examples it is possible to mention:

- *To what extent has the CGIAR contributed to establishing and maintaining gene banks?*
- *Has it played an active role in ensuring contributions to the gene banks from national and local entities?*
- *How has it contributed to the creation, consolidation and well functioning of the international regimes associated with gene banks?*
- *Does the CGIAR have the appropriate governance structures to manage its relations with other organizations in the networks of institutions, financing mechanisms and operational procedures involved in this priority area?*
- *Has the CGIAR contributed to the establishment of adequate financing mechanisms to deliver the international public good of gene banks?*

- *Has it played an appropriate facilitator role to improve the performance of other entities at the international, national and local levels that participate in the generation, diffusion, adaptation and use of gene banks and their plant genetic resources?*

Figure 3.4.3: An IPG Delivery System for Gene banks



3.4.4 Research on science and technology policies and institutions

Priority area 5 A describes the role of CGIAR in building capacity at the national and local levels for designing and implementing science and technology policies and institutions. This role is shifting as conditions around the contemporary science and technology situation evolve, particularly with regards to institutional arrangements, research collaboration, intellectual property rights and to changes in research approaches, methods and costs. For example, publicly performed research and development are experiencing a general slowdown, while private sector support for science and technology is increasing and private corporations and foundations are now playing larger role. There is also a shift in the perceptions amongst policy-makers, producers, and consumers of technology in terms of the demand for, regulation and use of new agricultural technologies, products and services. The following paragraphs and Figure 3.4.4 offer a brief description of the delivery system for the IPG "research on science and technology policies and institutions."

Knowledge, public awareness, political decision. There is a general awareness that supporting the development of science and technology is critical for agricultural growth, sustainable development and poverty reduction, even though in many developing countries such awareness is still emerging at an early stage.

International regimes. The issue of science and technology policies and institutions has been addressed through the United Nations World Summit on Sustainable Development's 2002 Implementation Plan as well as within the Millennium Development Goals, among other broad-based agreements that have important consequences for science, technology and innovation, especially in the field of agriculture (e.g. food security, nutrition, use of GMOs). Intellectual property rights are taking centre stage with an international regime emerging through the Conventions managed by the World Intellectual Properties Organization (WIPO), and a new emphasis on securing patent rights by private corporations and academic institutions. However, even though there are many international fora where research policies are discussed, there is no specific regime to guide or govern interactions among the various public, private and civil society entities involved in formulating and implementing science and technology policies related to agricultural research and its results.

Networks of international institutions, financing mechanisms and operational procedures. CGIAR Centers such as the International Food Policy Research Institute (IFPRI) conduct research and also contribute to capacity strengthening of institutions in developing countries to conduct research on agriculture and food policies. In fact, the policy research components of each of the CGIAR centers play a role in the capacity building of science and technology institutions and promoting supportive policies to encourage research and development across scales. International organizations that are relevant to this area include policy and research networks such as the Global Forum on Agricultural Research (GFAR) and the Network on Science and Technology for Sustainability. Some public and private research support organizations (e.g. International Development Research Centre (IDRC), Swedish Department for Research Cooperation (SAREC)) play an important role in the generation of knowledge on effective policies and institutional arrangements.

Agreements and contracts with national entities. Contracts and agreements are developed between international organizations and institutions at the national level, such

as governments and Science and Research Councils, to deliver training programs, policy advice and technical assistance for supporting science and technology policy making and implementation.

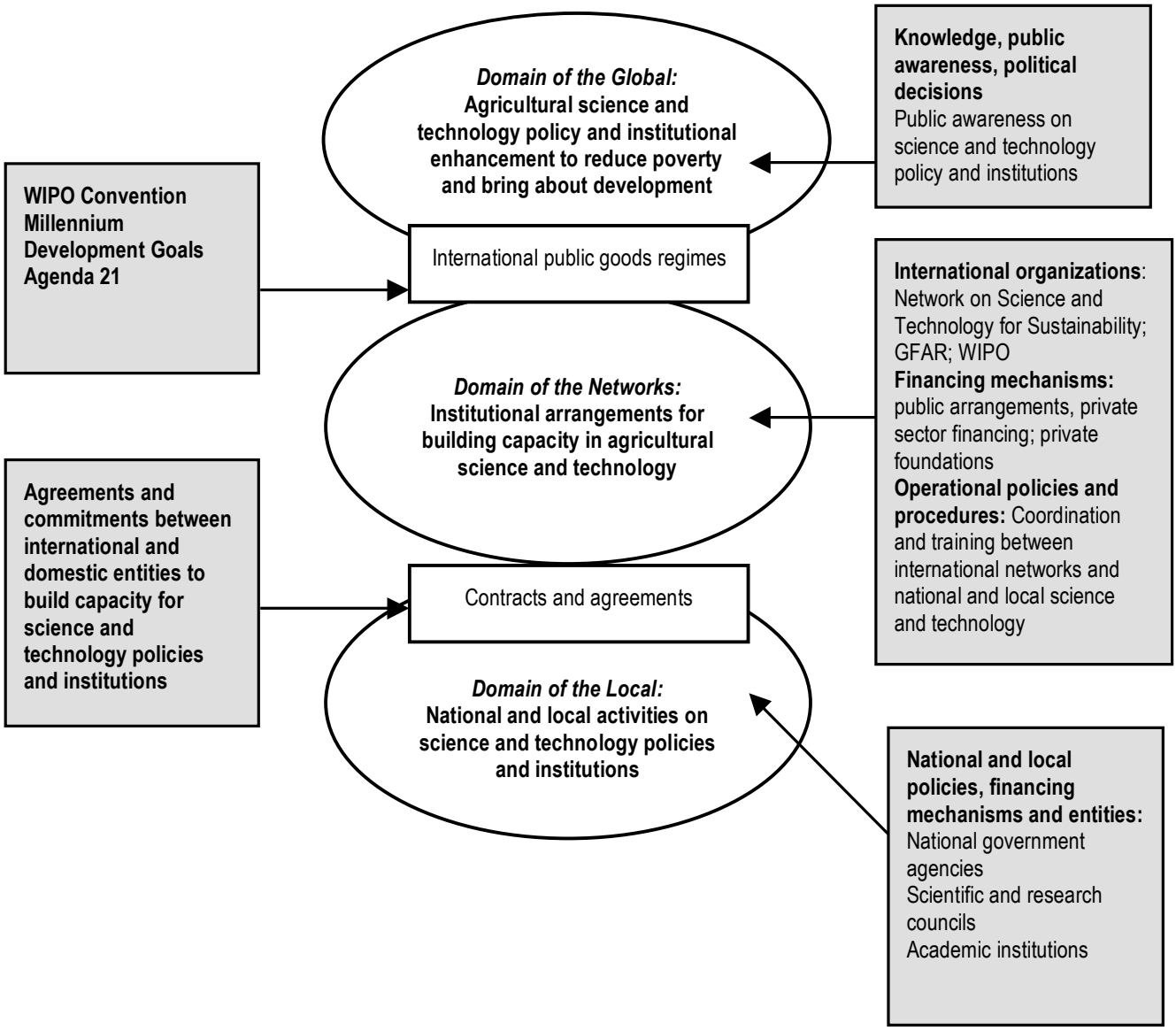
National and local entities. Entities at the national and local level include national governments, scientific research councils, and academic institutions that formulate and implement science, technology and innovation policies, and for supporting capacity building for science and technology in the field of agriculture. These enter into a variety of collaboration arrangements with other national, regional and international agencies to exchange experience and spread best practices in science and technology policy design and implementation.

What is the role of the CGIAR in this international public goods delivery system for research on policies and institutions related to agricultural research? The CGIAR is just one group in a vast network of entities across scales that are engaged in assisting to formulate and put in practice science and technology policies. The core component of this delivery system comprises research activities on the nature, content, implementation procedures, instruments, efficiency and effectiveness of alternative policies to promote and support agricultural development geared to poverty reduction, as well as the results of such research activities. It can also include the generation of knowledge on ways to examine, reinterpret and adapt findings on policy design and practice from one setting to another. Complementary activities would include providing specific advice, technical assistance and capacity building services to regional, national and local policy making institutions.

Some questions can be asked to evaluate the performance of the CGIAR as a provider of the international public good "research on Science and Technology Policies and Institutions". As examples it is possible to mention:

- *To what extent has the CGIAR contributed to improving the quality of science and technology policy making in agricultural research for development?*
- *How has it helped to establish, develop, and maintain agricultural science and technology policy and institutions in developing countries?*
- *Has it played an active role in developing countries to help them in adequately framing the debates at the national level on the role of agricultural research, especially in controversial fields (such as research on GMOs)?*
- *How has it contributed to the creation, consolidation and well functioning of the international regimes associated with science and technology policies and institutions in the field of agriculture?*
- *Does the CGIAR have the appropriate governance structures to manage its relations with other organizations in the networks of institutions, financing mechanisms and operational procedures involved in this priority area?*
- *Has the CGIAR contributed to the establishment of adequate financing mechanisms to support capacity building efforts in science and technology policy research, design and implementation?*
- *Has it played an appropriate facilitator role to improve the performance of other entities at the international, national and local levels that participate in the creation of science and technology policy and institutions?*

Figure 3.4.4: An IPG Delivery System for Science and Technology Policies and Institutions



3.4.5 Institutional capacity for international agricultural research[23]

Priority area 5 A highlights the institutional capacity of CGIAR and its ability to coordinate international agricultural research. The mission of the CGIAR is "to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment." Historically, the CGIAR has been uniquely placed to implement agricultural research programs across regions and countries, in contrast with regional and national agricultural research centers and private agricultural research programs that have a narrower geographical scope.

The CGIAR has achieved this through the acquisition of institutional capabilities to organize research programs in response to specific demands, through its capacity to mobilize resources and funding for international agricultural research, and through the creation of partnerships and mobilization of prominent scientists for joint international agricultural research efforts. As a result, the CGIAR frequently emerges as the organization with sufficient resources and political influence to implement agricultural research for development programs over large areas, particularly in Asia. However, this position is now being challenged by the growing capacity of national research programs in countries such as Brazil, India and China, by academic-private partnerships for agricultural research, and by private research and development within multinational agribusiness companies. The following paragraphs and Figure 3.4.5 offer a brief description of the delivery system for the international public good "institutional capacity for international agricultural research".

Knowledge, public awareness, political decision. There is growing awareness that international agricultural research is critical to address food security issues, sustainable development and contribute to poverty reduction. Food scarcity and the desire for food security has led to public concern for creating mechanisms and the institutional capacity to coordinate international agricultural research programs to increase the availability of food, particularly as alternative demands on agricultural products (e.g. energy provision) are posing new challenges to food security in the early years of the 21st century.

International regimes. The creation of the CGIAR was inspired by the successful agricultural interventions in the 1960s to reduce poverty through the results of agricultural research programs. Currently, the CGIAR continues to focus on reducing poverty and contributes to the advancement of the Untied Nations Millennium Development Goals. The CGIAR has a particular role to play in address rural poverty (Goal 1, Target 1), hunger (Goal 1, Target 2), health (Goals 4, 5 and 6), and the environment (Goal 7). The CGIAR is also an instance of effort to achieve Goal 8 – developing a global partnership for development – because of its internal partnerships amongst agricultural research centers and also its capacity to build partnerships to implement agricultural research programs across scales. However, the formal and informal arrangements that underpin the functioning of the CGIAR have not evolved as to approach what may be considered as a coherent regime.

[23] The authors are grateful to Jeffrey Waage, who contributed comments and suggestions that led to preparing this section.

Networks of international institutions, financing mechanisms and operational procedures. The CGIAR has the capacity to connect with international institutions, such as the FAO, international NGOs, multinational companies, and to mobilize resources in order to implement international agricultural research. There are many instances and examples of the way in which CGIAR can mobilize research partners, financial resources managerial capabilities to design, promote and implement international agricultural research programs.[24] However, largely because of the heterogeneity of the centers, the exceedingly large number of stakeholders it has acquired over time, the differing objectives and expectations of its various members and the growing complexity of the challenges it faces have created serious governance difficulties, particularly because the governance mechanisms and procedures it employs have been the result of partial adjustments and *ad hoc* modifications in response to pressures and challenges over time. The same can be said about financial arrangements to support the activities of CGIAR centers.

Agreements and contracts with national entities. Contracts and agreements are developed between international organizations and institutions at the regional, national and subnational levels, including governments and national agricultural research centers to conduct research, adapt research findings, provide technical assistance, deliver training programs, and offer policy advice for agricultural research.

National and local entities. Entities at the national and local level include national governments, national agricultural research systems, scientific research councils, academic institutions, community organizations, and farmers groups that support capacity building for implementing international agricultural research.

What is the role of the CGIAR in this international public goods delivery system in this field? The core component of the IPG "institutional capacity for international agricultural research" provided by the CGIAR refers to creation, consolidation and maintenance of institutional capabilities to organize and coordinate international research programs, mobilize financial resources, and to promote partnerships for implementing international agricultural research programs, providing services and capacity building. The complementary component comprises the provision of support and assistance to other regional, national and local entities in the agricultural research system to pose requests and demands to the CGIAR, and to apply the results of research, make use of the services and benefit from capacity building activities undertaken by the CGIAR centers. However, in recent years several national centers in developing countries, particularly in the emerging economies, have develop their own substantive institutional capabilities for conducting agricultural research and for partnering with centers in other developing countries. This indicates that the CGIAR centers are no longer the only or main institutions with such institutional capabilities, and that they now share with some national centers the provision

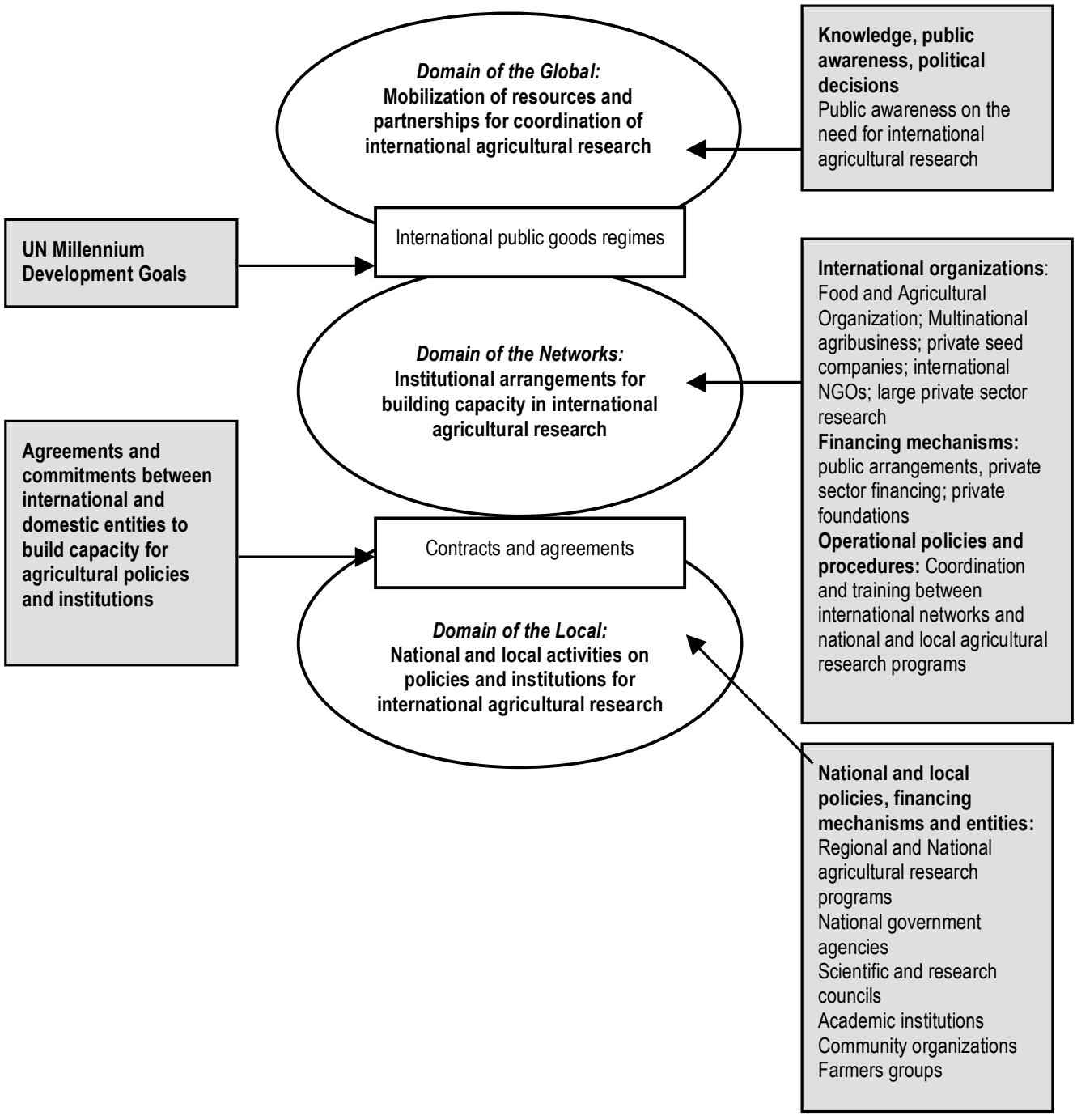
[24] To take one recent example, CGIAR has recently had success in controlling the cassava mealybug in Africa. The International Center for Tropical Agriculture (CIAT) and the International Institute Timber for Tropical Agriculture (ITTA) cooperated in introducing a parasitic wasp to control this alien pest. This was not new science since the mealybug biocontrol had been employed numerous times in regions including Africa. Other institutions at the national, regional and international level were also capable of delivering these products and services and had done so in other places. CIAT and IITA were uniquely successful in this case because of their capacity to mobilize large amounts of donor funding quickly, mount and execute a regional scientific program in Latin America and Africa which National Agricultural Research Systems and non-technical international bodies such as the UN or civil society organizations would not be able to do, and attract prominent international scientists to implement the program.

of the core component of the IPG "institutional capacity for international agricultural research."

As examples of the questions that can be asked to evaluate the performance of the CGIAR as a provider of international public goods in this priority area it is possible to mention:

- *To what extent is the institutional capacity for implementing international agricultural research programs a reflection of the CGIAR's influence and "clout" relative to the regional and national programs? Does its existence and influence exist at the expense of the development of other international agricultural research programs at other scales?*
- *How is the rise and growth of the scientific and institutional capacity of other agricultural research player —such as Brazil, India and China; large private corporations and foundations; and new academic-private partnerships— alter the influence, performance and impact of the CGIAR?*
- *Is CGIAR's strong scientific capacity of the CGIAR a key feature that enables the CGIAR to respond quickly and flexibly to changing contexts and serve as a powerful research platform that can incorporate emerging issues – e.g., climate change and biofuels – while maintaining its capacity to implement research programs and projects in the field of agriculture?*
- *Has it played an active role in developing countries to adequately frame debates on the nature and importance of agricultural research at the national level?*
- *How has it contributed to the creation, consolidation and well functioning of the international regimes associated with institutional capacity for international agricultural research?*
- *Does the CGIAR have the appropriate governance structures to manage its relations with other organizations in the networks of institutions, financing mechanisms and operational procedures involved in this priority area?*
- *Has the CGIAR contributed to the establishment of adequate financing mechanisms to deliver the international public good of institutional capacity for international agricultural research?*
- *Has it played an appropriate facilitator role to improve the performance of other entities at the international, national and local levels to build institutional capacity for international agricultural research?*
- *What is the future role of the CGIAR in light of the emergence of other international agricultural research implementation systems, including global forums on agricultural research (GFARs)?*

Figure 3.4.5: An IPG Delivery System related to Institutional Capacity for International Agricultural Research



4. Concluding remarks

This paper has explored how the concept of international public goods can be used to assess the performance of the CGIAR. It builds on many efforts to determine the unique contributions that this heterogeneous set of international research centers and related organizations can make to improve agricultural productivity, policy-making and development, with the final aim to reduce world poverty.

After a brief introductory section, the second section contains a short review of the concepts of international public goods and of their relation to development cooperation and management for results. It introduces the idea of an "delivery system" for the provision of international public goods, distinguishes between its "core" and "complementary" components, and relates these components to the concepts of "zone of control" and "zone of influence" in management for results approaches.

Section 3 presents an IPG perspective on the performance and contributions of the CGIAR to agricultural research and development. It focuses on the 20 priorities defined for the CGIAR and groups them into three main categories of IPGs: knowledge generation, provision of products and services, and institutional capacity for responding to agricultural research demands. This section also explores the extent to which CGIAR activities can be considered as parts of the "core" component of IPG delivery systems, and offers illustrative descriptions of IPG delivery systems for five of the 20 CGIAR priorities. Each of these descriptions ends with questions to evaluate the performance of the CGIAR as a provider of the particular international public good.

Even though the terms "international public goods" were not used explicitly to describe its functions, terms such as "spillover effects" and "positive externalities" were common in the 1970s and 1980s. The idea of treating the CGIAR as a provider of global public goods goes back at least two and a half decades, and it began to be clearly articulated in the late 1990s and early 2000s. As indicated above, it is clear that not all that the CGIAR does can be placed under the international public goods category, and this raises the question of whether the CGIAR is best placed to produce all types of research-related agricultural international public goods, or whether other organizations in the expanding set of research and service networks in this field may be better suited to take charge of the provision of some of them.

In addition to the questions related to specific IPGs discussed in section 3, it is possible to identify some general issues and questions to assess the performance of the CGIAR as a provider of international public goods.

First, *it is essential to have a clear and shared understanding of the nature of the international public goods that the CGIAR provides*. While it is possible to appreciate a degree of convergence in the reports on international public goods in the CGIAR context that were consulted in the preparation of this paper, different views on what exactly are the IPGs provided by the CGIAR make it difficult to determine the extent to which it should be held accountable or responsible for their provision. In addition, not all that the CGIAR does is directly related to IPGs, for its members are also engaged in the production of local public goods and in facilitating the production of public and private goods related to agricultural research. A first question that can be derived from this observation is *whether*

the CGIAR as a whole and its centers have defined the specific international public goods they provide in a clear and unambiguous way. Among other things, this requires distinguishing between IPG and non-IPG related activities, and placing the former in one of the three types of IPGs that the CGIAR provides: knowledge emerging from research activities, products and services related to agricultural research, and institutional capacity for responding to specific demands for international agricultural research.

Second, for each of the IPG provided by the CGIAR it is necessary to *determine the scope of activities in the core component* —for which the CGIAR has direct decision-making power and is primarily accountable—, and *the range of activities in the complementary component* —for which the CGIAR is indirectly responsible and can only exercise influence—, *so as to ensure that there is a complete delivery system for the provision of the international public good*. This leads to evaluation questions related to *governance and financing arrangements* for the CGIAR and its centers to: (i) *generate the core component* that lies within its *zone of control*; and (ii) *facilitate, catalyze, promote and stimulate other agents* in the IPG delivery system that are within its *zone of influence* to engage in the production of *the complementary component*. In management for results approaches (see section 1.4) the core component (CGIAR's zone of control) of the IPG delivery system is linked to an evaluation of the *relevance and pertinence of the mission, goals and objectives of the CGIAR*, and to an evaluation of the *efficiency* with which it *transforms inputs and activities* into *outputs*. The complementary component (CGIAR's zone of influence) of the IPG delivery system is linked to an evaluation of the *effectiveness* with which it leads to *intermediate* and *final outcomes*, and to the *impact* of these outcomes.

Third, all the components of an IPG delivery system —awareness and political decisions, international regimes, networks of institutions, contracts and agreements and local organizations— need to be in place for a particular IPG to be provided (see the examples in section 2.2 above). This suggests assessing whether the CGIAR has contributed significantly to the deployment of a particular IPG delivery system and, by aggregation, whether it has fulfilled its role as a provider of international public goods related to agricultural research. Taking into account that the distinction between the core and complementary components of the IPG delivery system, in evaluating the performance of the CGIAR as a provider of international public goods it is pertinent to ask questions such as:

- *Has the CGIAR promoted awareness and helped to crystallize political decisions for the provision of international public goods related to agricultural research? Has it wielded and used it convening power and international standing to mobilize broad political support for these IPGs?*
- *Has it contributed to the establishment of international regimes (both formal and informal) that regulate the interactions among the various actors involved in the provision of the IPG, and particularly of its core component? How appropriate and resilient are these regimes?*
- *Has the CGIAR taken an active part in identifying, mobilizing, establishing and working jointly with the range of international and national institutions and agents that should take part in the provision of a particular IPG? How efficient and effective have been these networks in performing the activities related to the core and complementary components of the IPG delivery system?*
- *Has the CGIAR helped to define the nature and types of contracts and agreements that link the networks of international and national institutions with local organizations*

and agents that are ultimately engaged in the production and use of the international public good at the local level? How well have these contracts and agreements worked in practice?

- *Has the CGIAR identified the appropriate local entities and organizations that should be involved in the complementary component activities that are necessary for the production and use of the international public good?*

Answers to these questions will point out whether there are missing elements in the IPG delivery systems, and what actions are required to ensure that they are fully deployed.

There is also the additional matter of *whether the CGIAR has evolved the governance and financial capabilities required to fulfill its role as a provider of international public goods*. This implies assessing whether it has in place the necessary strategic planning, management, evaluation and support systems and procedures to effectively participate in the deployment of international public goods delivery systems related to agricultural research.

Finally, taking these issues into consideration, it is possible to return to the two main initial questions on the role of the CGIAR as a provider of IPGs:

- Has the CGIAR system maintained a focus on global or international public goods?

Not as fully as it could have. The material reviewed during the preparation of this paper indicates that there is a growing but uneven awareness of the implications of the role that the CGIAR could or should play as a provider of international public goods. While various documents and statements made by CGIAR authorities mention the provision of international public goods as a key rationale for its existence, it appears that there are no widely shared conceptions of what are the specific IPGs that the CGIAR should provide, how to organize the delivery systems for their provision, and how to evaluate the performance, accountability and responsibility of the various CGIAR centers in this regard. In some cases, there have been specific attempts to frame some CGIAR center activities in IPG terms (for example, in the case of natural resources management research),[25] but this has not been done in general or in most centers.

- Is the CGIAR efficient and suited to the development and dissemination of international public goods?

By and large, yes. The analysis of the preceding sections and, in particular, the review of priorities and the five examples examined in section 2, suggest that the CGIAR as a whole has a set of characteristics that makes it a suitable system for the development of and dissemination of three types of international public goods associated with agricultural research: knowledge, products and services, and institutional capacity. However, the question of efficiency in their provision would require a much more detailed empirical evidence than has been possible to gather during the preparation of this paper, and would also require a comparative study of alternative institutional arrangements for providing international public goods associated with agricultural research and development that the CGIAR now provides.

[25] See Harwood *et al*. (2006)

Postscript

As we complete the revision of this report at the end of 2008, the CGIAR is well into a "Change Management Process" that will significantly alter the way it functions and operates. The main objective of this exercise is to retool the CGIAR partnership to face in a more effective way the challenges of agricultural research for development in a vastly changed scientific, technological, business, social, political and international context from that prevailing en the early 1970s when the CGIAR was created.

A main contribution to this change management process has been the work of the Independent Review Panel chaired by Elizabeth McAllister.[26] The present document was one of the background papers prepared for the Panel, whose final report covers ample ground and makes numerous recommendations on governance, financing, partnerships, evaluation, strategic planning and management for results. The structural changes proposed by the Independent Review Panel entail moving towards a "rebalanced partnership" and a new compact between CGIAR donors and Centers. To apply the principles of management for results and international public goods in the CGIAR, the Independent Review Panel proposed adopting a "joint strategy and results framework", which would "articulate a clear mission statement, and specify a number of strategic goals for the system over 5-10 years". While acknowledging that "considerable work will be needed to establish a system-wide CGIAR strategic framework linked to international public goods delivery systems", Panel members stated that "the work has good prospects for yielding highly significant benefits".[27] We hope this paper will contribute to the renewal of the CGIAR system by offering ideas on how to organize the provision of international public goods related to agricultural research for development.

[26] The Independent Review Panel was asked to "assess whether CGIAR is well positioned to address emerging food security and agriculture-related problems of development" It was also requested to recommend changes in the CGIAR System to improve its efficacy and effectiveness, and to address the question of the position of the CCIAR along the research to development continuum. In addition to Elizabeth McAllister, the panel comprised Keith Bezanson, G. K. Chadha, John Mugabe and Jeff Waage, supported by Karin Perkins and Ken Watson, Secretaries, and Joan Barclay and Francisco Sagasti, special advisors.

[27] Independent Review Panel of the CGIAR System, Elizabeth Mcallister, Chair, *Bringing together the best of science and the best of development*, September 2008, p. 99.

ANNEX A: The structure of an idealized "international public goods (IPG) delivery system"

One way to integrate the various issues raised in the preceding section is to articulate what may be defined as an idealized "international public goods delivery system". Such an idealized construct can help to identify and place more clearly the elements that are necessary to provide a global public good. The structure of any existing international public goods delivery system can only approach the characteristics of the ideal, which can serve as a point of reference to examine how efforts to define and deliver a global public good evolve over time. While references throughout this section are made primarily to public goods at the global level, the idealized delivery system could also be applied to regional public goods.

The components of an idealized international public goods delivery system can be placed in the three domains of the fractured global order. As shown in Figure A.1, global public goods, whether related to the global commons, to global policy outcomes or global knowledge, belong in the *domain of the global*. The host of institutional arrangements, including international organizations and partnerships, supranational financial mechanisms, and operational policies and procedures that are in charge of ensuring that the global public good is made available belong in the *domain of the networks*. The multiplicity of national and local activities related to the actual production and consumption of global public goods, which include domestic policies and incentives, national and local financial mechanisms, and the activities of government agencies private firms, civil society organizations and individuals, belong in the *domain of the local*. The conventions, treaties and protocols that formalize agreements for the provision of a global public good – that is the IPG regimes – mediate between the first two domains. Contracts, agreements, memoranda of understanding, reversal notes and other lower level legal instruments mediate between the second two domains.[28]

Thus, for all practical purposes, determining that something is a "global public good" must go hand in hand with identifying the "delivery system" associated with it. Figure A.1 presents the components of what would comprise an idealized system for the production, delivery and consumption of international public goods. Drawing from this, the components may be summarized as follows.

Knowledge, public awareness and political decision

Declaring that something is a global public good depends primarily on the *knowledge* about its characteristics and effects (impact, consequences, reach, excludability, rivalry), the extent of *public awareness* that generates pressures to ensure its availability, and on the *political decision* that providing the IPG merits concerted actions by the international community. Without establishing all the arrangements required to make it available and facilitate its consumption, the declaration that something is a "global public good" remains empty rhetoric.

[28] For a discussion of the concepts of fractured global order and the domains of the global, networks and local, see Sagasti and Alcalde (1999) and Sagasti (2004).

FIGURE A.1: **Global and International Public Goods: A conceptual framework**

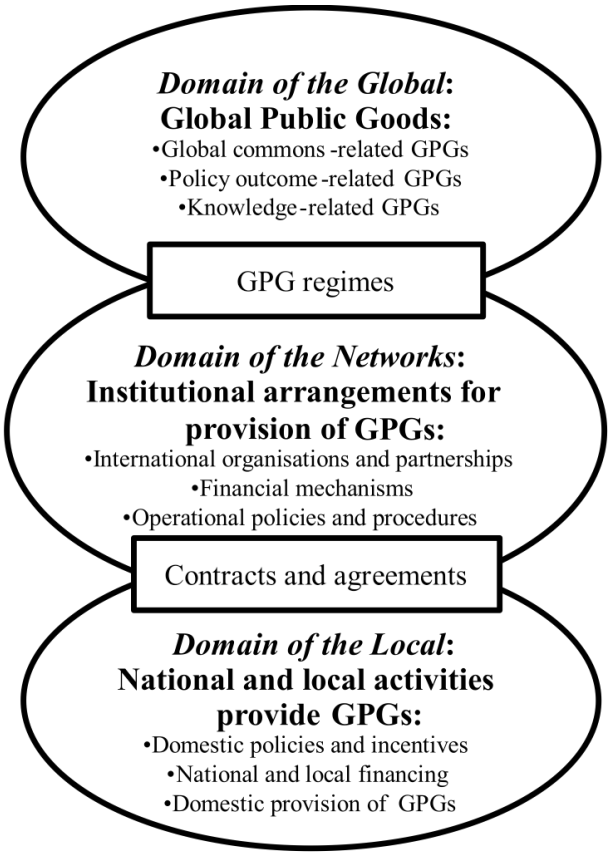
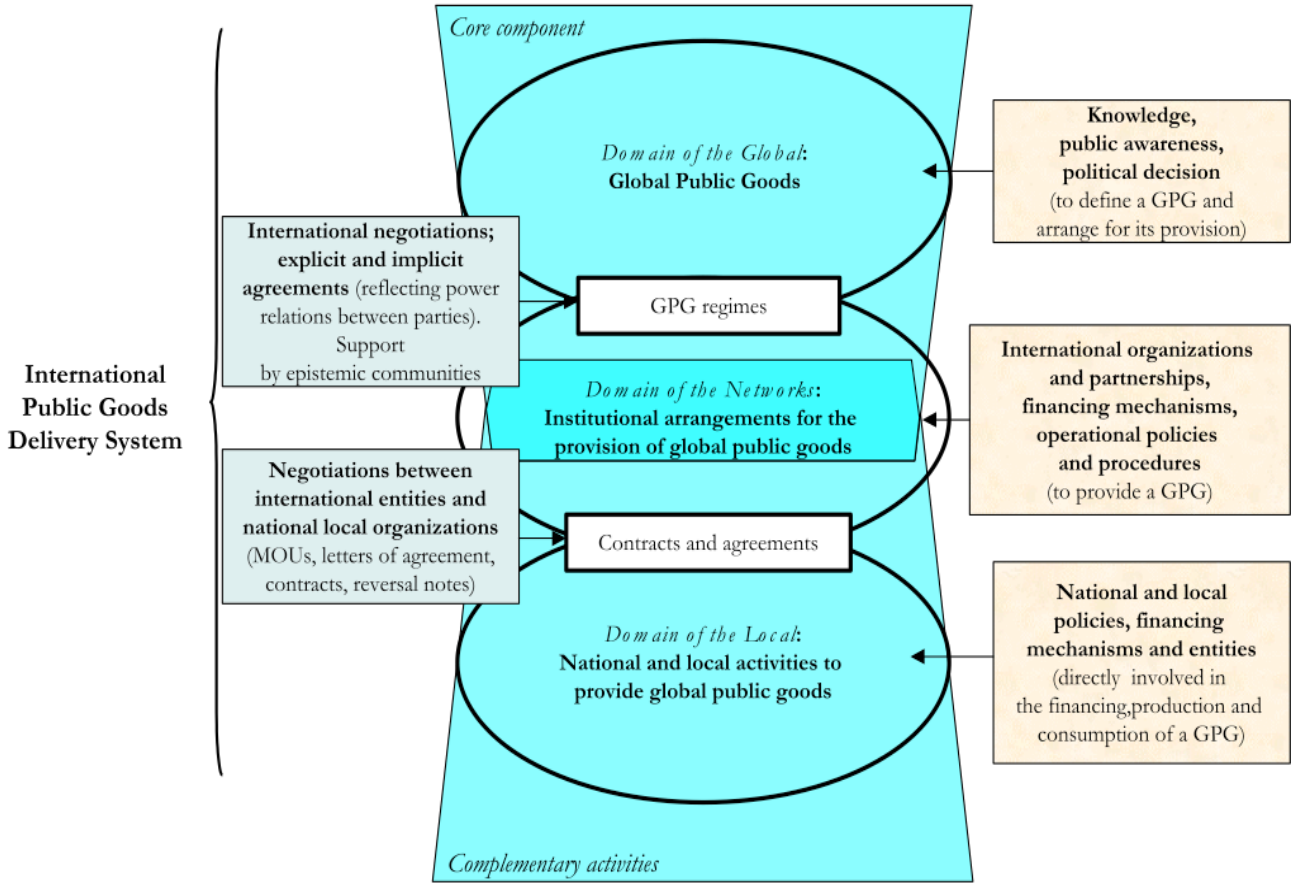


FIGURE A.2 **An International Public Goods delivery system**



This is where all the value and interest considerations appear in full view. If the concept of global public goods is to be of any practical use, it must be underpinned by a broad political consensus that there exists a set of goods, services and policy outcomes whose provision at the global level is desirable for the international community of nations, private firms and civic associations. Solidarity, equity, altruism and humanitarian values, which are all closely related to poverty eradication, must guide the process of achieving such consensus, complemented with concerns regarding the need to address global problems and to maintain the stability of the international system.

Global public goods regimes

Regimes have been defined as "norms, rules and procedures agreed to in order to regulate an issue-area" and as "arrangements peculiar to substantive issue-areas in international relations that are characterized by the condition of complex interdependence" (Haas, 1980, 1982). There is a well-developed body of theory and empirical studies on the creation, evolution and functioning of international regimes, which can readily be brought to bear in the design and operation of global public good regimes (Box A.1). Questions such as the ways in which regimes operate, the factors that condition the emergence of a regime, issue-linkages and time dimensions, and the role of knowledge in the creation and evolution of a regime have been dealt with extensively in the literature. For some scholars the analysis of regimes cannot be separated from the broader study of international "governance without government", which is one of the main issues involved in the design of international public goods delivery systems (Rittberger, 1997).

While there has been debate about whether regimes refer primarily to explicit rules or to observed behavior from which rules can be inferred, an idealized international public goods delivery system would include the conventions, treaties, protocols and other legal instruments resulting from negotiations to establish an IPG regime. In practice they would also include the explicit and implicit agreements, rules, regulations and patterns of behavior that structure the interrelations between agents involved in the provision and consumption of the global public good. The nature of the interactions between the parties interested in its provision will influence the results of such negotiations and processes that lead to agreements. For both efficiency and equity reasons, it is important that all parties that are affected by, or are involved in, the production and consumption of an IPG, should have a stake in the design of a regime and in arranging for its implementation.

The increasingly knowledge-based character of negotiations to establish IPG regimes points out that negotiators, policy- and decision-makers are facing a growing number of issues of an increasingly complex and technical nature. As a consequence, they depend more and more on the support of scientists and professionals from many disciplines, working together in what have been called "epistemic communities". An *epistemic community* is defined as "a network of professionals with recognized competence and expertise in a particular domain and with an authoritative claim to policy relevant knowledge within that domain or issue area" (Haas, 1992). They now play major roles in "articulating the cause-and-effect relationships of complex problems, helping states identify

Box A.1 International regimes and global public goods

Scholars working in the field of international relations define regimes, at one extreme, as any form of "patterned behavior" stable over time, and at the other, as "multilateral agreements among states which aim to regulate national actions within an issue area". An intermediate approach considers that regimes are "implicit or explicit principles, norms, rules and decision-making procedures around which actors expectations converge in a given area of international relations". The theory and empirical study of regimes has generated many variations around these definitions, as well as different perspectives on how to design and operationalize them, as well as how to evaluate their performance and impact. Ernst Haas suggests that alternative views about regimes are "a function of how one thinks about learning, the growth of human consciousness and about social evolution". In this regard there are broadly three approaches to explaining the reasons why regimes form, the conditions in which they change, and the factors that make them more or less effective. The first of these are power-based theories, which emphasize the importance of a single power, or hegemon, in funding and supporting regimes with benign and coercive forms of leadership. Second, there are interest-based theories, which emphasize the importance of bargaining and institutional design to outcomes. Finally, there are knowledge-based theories, which underline the importance of expert communities in defining and generating cooperative responses to global problems.

Stephen Krasner has emphasized that regimes are more than just temporary arrangements that change with every shift in power or interest. Moreover, regime-governed behavior must not be based solely on short-term calculations of interest, but must involve some sense of general obligation, such as reciprocity. A fundamental distinction is made between principles and norms on the one hand, and rules and procedures on the other. The first provide the basis defining characteristics of a regime, while the second operate within it. Thus, changes in principles and norms would imply changes of the regime itself, while changes in rules and decision-making procedures are just variations within regimes. The establishment of regimes requires deliberate action, but they are not considered as ends in themselves, but rather a means to achieve preferred or desirable outcomes at the international level.

A variety of factors converge to give rise and define the particular characteristics of an international regime. These include the interests of the actors involved in the issue, the use of political power in the service of the common good or of particular interests, the values and principles that influence the conduct of the actors, the customs and traditions that underpin their behavior and their interactions and the types of persuasion involved in the negotiations. The literature on international regimes is rich with analyses of how different interests, asymmetric power relations, previous experience in other regimes, knowledge about the issues, and the process of negotiation itself, among other factors, affect the structure, main features and stability of the regime that emerges.

Issues are seldom dealt with in isolation, particularly when actors with different objectives wish to balance the results obtained in different negotiations for the establishment of regimes. This gives rise to issue linkage and to issue areas, which allow balancing and offsetting the results of individual negotiations and may thus lead to more equitable outcomes across issue areas and regimes. Similar considerations apply when a time dimension is introduced in the design of regimes, allowing to balance the interest of various actors that may be prepared to accept tradeoffs between benefits obtained and the time when they materialize.

Knowledge about the issue or issues under discussion plays a most important role in regime creation and evolution. Ernst Haas defines this knowledge as "the sum of technical information and of theories about that information which commands sufficient consensus at a given time among interested actors to serve as a guide to public policy designed to achieve some social goal". In his view, "institutionalized collaboration can be explored in terms of the interaction between changing knowledge and changing social goals" (this will be readily apparent to those who have been following international negotiations on global climate change).

As in the case of global public goods, there have been many efforts to devise typologies of international regimes. From a GPG perspective, the theory and empirical analysis of regimes offers a rich source of material, both of conceptual and practical nature, which has to be fully integrated into the design of international public goods delivery systems.

Sources: Haas (1980, 1982); Krasner (1982); Haggard and Simmons (1987); Rittberger (1997); Young (1998).

their interests, framing the issues for collective debate, proposing specific policies, and identifying salient points for negotiation". As the differences in the capacity of developed and developing countries to generate and utilize knowledge have been increasing

significantly over time and have reached abysmal proportions, the role of knowledge and the proper functioning of epistemic communities in the design of IPG regimes merit urgent attention.

Values, preferences, interests and judgments underpin the negotiations and decisions that lead to the creation of regimes and it cannot be expected that these will proceed or be made without conflict. Moreover, in complex systems, there may be two or more regimes that pull agents in different directions with regard to the provision of an international public good. In addition, members of epistemic communities may differ from each other when referring to the extent, quality and interpretation of the knowledge that feeds into the discussions and negotiations for the creation of a regime. As a consequence, the design of regimes associated to international public goods delivery systems, should incorporate procedures for resolving conflicts between the members of the relevant epistemic community.

International public goods regimes (which include, for example the Convention on Biodiversity and its complementary agreements, the international patent system and the intellectual property rights agreements) mediate between the domains of the global and of the networks. While international relations scholars would tend to include not only treaties, conventions and protocols in the definition of an international regime, but also international organizations, financing mechanisms and related policies rules and procedures, these are dealt with separately in the analysis of an international public goods delivery system.

International organizations and partnerships

Some intergovernmental organization, specialized secretariat or partnership between public, private and civil society organizations, is required to carry out the provisions specified in the agreements that give rise to the IPG regime. This involves interpreting, administering, monitoring, enforcing and evaluating the performance of the various entities involved in the international public goods delivery system. Transgovernmental, transcorporate and transassociational networks of organizations, as well as combinations of these, are gradually becoming the main vehicle for carrying out a variety of international activities and for providing international public goods.

Thus, the provision of global public goods requires the involvement of many different agencies, organizations and associations at the international level, which raises problems of coordination and management. While it may not always be necessary to create new entities, the provision of global public goods would require that existing institutions adapt their current practices and procedures to facilitate coordination and joint actions. It would also require achieving a sensible division of labor between all of these organizations.

A growing number of organizations, programs and activities have begun to focus on the provision of international public goods, and many are redefining what they have been doing for some time, using the label of “global public goods”. Apart from raising the problem of identifying those activities that conform to a more rigorous definition of IPGs, this raises questions about the division of labor between institutions, and the related problems of coordination, collaboration and competition.

Financing mechanisms

The provision of international and global public goods requires that special resources be allocated to finance the whole range of activities involved in their delivery. A variety of activities, from raising public awareness and negotiating IPG regimes, to the performance of specific tasks at the local level that actually provide the IPG, need to be considered in the design of financial mechanisms.

It is essential to separate clearly those resources allocated to development assistance in general, which would benefit primarily the recipient countries, from those used in the provision of global public goods, which would benefit developed countries at least as much as developing countries. The report of the High-level Panel on Financing for Development, chaired by the former President of Mexico, Ernesto Zedillo, (Zedillo, 2001) has made it clear that the financing of international and global public goods should not come at the expense of development assistance flow, and particularly those directed to the poorest developing countries.

Financial arrangements for the provision of international public goods are located primarily in the domain of the networks, and in the same way as organizations, partnerships, operational policies and procedures, they overlap with other financial mechanisms geared to the delivery of regional, national and local public goods.

Operational policies and procedures

These refer to the different policies, decision-making procedures, regulations, codes and other rules internal to the organizations and financing mechanisms that are involved in the provision of an international public good. There is a great diversity of operational policies and procedures in the delivery systems for each of the global public goods. They are required for the consistent and effective application of the principles embodies and norms specified in the IPG regimes, and underpin the day-to-day operation of the network of institutional and financial arrangements that are part of an international public goods delivery system. These operational policies and procedures are placed in the domain of the networks.

Agreements and contracts

Mediating between entities placed in the domains of the networks and of the local in an international public goods delivery system there are many types of lower level legal instruments. These specify the terms of reference, obligations and rights of the national and local entities involved in the actual production and consumption of a global public good, and provide structure to their interactions with the international organizations and financial mechanisms involved in its provision. They could be, for example, grant agreements with foundations, memoranda of understanding with international agencies, loan contracts with international financial institutions, reversal notes between agencies in two countries, terms of reference for the performance of certain activities, among other instruments.

Questions such as conditionality and sovereignty, figure prominently in these legal instruments, which usually include procedures for the verification of compliance with the terms of the contract (e.g. to ensure that forests are maintained to absorb carbon emissions). As some advocates suggest that interventions to provide global public goods should reach down to the level of local entities (e.g. in the provision of treatments of HIV/AIDS), issues such as local versus international priorities, autonomy of national agencies, and dispute resolution procedures, emerge when negotiating these agreements and contracts.

National and local entities involved in the provision of an international public good

The last component of an international public goods delivery system refers to the government agencies, private firms, civil society organizations and individuals that are actually involved in activities that produce or consume a global public good.

In the last analysis, actions that make a reality the provision of such a good take place at this level in the domain of the local. Therefore, while regimes, organizations, financing mechanisms, operational policies and procedures, and contracts and agreements are necessary to establish an international public goods delivery system, nothing would happen unless the behavior of national and local entities is congruent with, and contributes to, the provision of the public good. Issues such as the evaluation of the impact of initiatives in the domains of the global and of the networks to arrange for the actual delivery of public goods, and of how to ensure that domestic policies and incentives generate changes in conduct that lead to the sustained production and consumption of a global public good, must also be examined here.

An idealized international public goods delivery system for a particular global public good would be made up of all of the elements indicated, which extend from the core component (upper trapeze in Figure A.2) to the complementary regional, national and local activities linked to its provision and consumption (lower trapeze in Figure A.2), operating in an efficient and sustainable manner. Yet, as Figure A.2 suggests, the way in which these two sets of activities overlap and relate to each other is one of the crucial aspects in establishing arrangements for the provision of international public goods. The main question is: *How far to go down along the continuum from global to local activities in defining what is the core component?* The answer to this question will, in turn, determine which organizations and programs should be involved in activities that belong the core component and, most important, *the way in which the provision of the global public good should be financed*.

A decision could be made to clearly separate the core component from the complementary activities of the international public goods delivery system, and to limit the financing arrangements associated with the global public good just to the core component. This would imply that regional, national and local entities would have to make their own preparations to finance and organize the complementary activities, although this would have to be done in close coordination with the entities in charge of the core component. Alternatively, a decision may be made that the core component of the global public good should incorporate the organization and financing of the means to deliver it all the way

down to the national and local levels. In this case, the “complementary activities” in the delivery system would overlap with and, in effect, would become part of the “core component”; they would thus have to be included in the financial arrangements associated with it.

The advantages of using the conceptual framework of an “idealized international public goods delivery system” should now be apparent. It identifies the elements that must be in place for a global public good to be defined, produced and consumed, and therefore allows assessment of what is missing in the case of a particular global public good, and how far it will be necessary to go in order to arrange for its provision. This conceptual framework also points out that there is no way of escaping values, interests and power relations in defining what is a global public good; that the knowledge of epistemic communities is critical to underpin such decision and to establish IPG regimes; that institutions and partnerships, financing mechanisms, and operational policies and procedures are required at the international level to facilitate the production of the global public good; and that all of the preceding arrangements would be, useless without the identification and involvement of national and local entities that will be in charge of actually producing and consuming the global public good.

ANNEX B: International Public Goods: Activities and Outputs[29]

Traditionally, definitions of international public goods (IPGs) or global public goods (GPGs) focus on the global or cross-border reach of the *issue* and *activities* of the public good. These two definitions provide evidence of this approach.

> Global public goods are defined as commodities, resources, services – and also systems of rules or policy regimes – with substantial cross-border spillover effects that are important for development and poverty reduction, and that can be produced sufficient supply only through cooperation and collective action by developed and developing countries. (World Bank Management, 2000 as quoted in IEG, 2007)
>
> International public goods, global and regional, address issues that: (a) are deemed to be important to the international community, to both developed and developing countries; (b) typically cannot, or will not, be adequately addressed by individual countries or entities acting alone, and, in such cases (c) are best addressed collectively on a multilateral basis (International Task Force on Global Public Goods, 2006 as quoted in IEG, 2007)

There is an alternative approach to defining the international or global reach of activities – through analyzing the *outputs* of those activities. For example, in a 2002 meta-evaluation of the CGIAR, CGIAR projects were classified according to the nature of the *project activities* and the nature of *project outputs* in order to determine whether the project produced global public goods, national public goods with regional spillovers, national public goods or merit goods. The evaluation concluded that there were no merit goods being produced and a small percentage of national public goods, and that 61 percent of CGIAR projects were producing global public goods, while 37 percent were producing national public goods with regional spill-over effects. Table B provides a detailed account of the results of this exercise.

Significantly, some CGIAR project activities with a global scope produce outputs oriented toward the national level or a combination of national level outputs with regional level dissemination of findings and lessons. An evaluation based on the nature of the *project activity* would classify this project as producing an international or global public good since its research activity was conducted in countries in two or more regions; however, an evaluation based on *project outputs* would result in a classification of this project as a national public good or national public good with regional-spillover effects. In the IEG World Bank 2002 study, the project output analysis was guided by the following criteria:

> Project outputs were classified as either global, regional, or national in scope by examining the project's outputs/results, gains/impact, milestones, and the list of intended users/beneficiaries. Outputs were considered global if the project developed methodologies adaptable to specific environments in two regions or more, if global information systems (such as on forest genetic resources) were strengthened, or if research results were expected to be used by agricultural research policymakers across countries in two or more regions or by the donor community and other actors in the international research community. Outputs were

[29] Source: taken and adapted from IEG (2002) – Annex F.

considered regional if modeling tools for resource management were developed that assist with priority setting at the regional level, if the project focus was associated with users in a single region, or if the project contributed to networking among national programs in a single region. Output was deemed national if the project aimed to increase local institutional or professional capacity by, for example, improving collaboration between the formal sector and local-level institutions, or if the users were decision makers and national program staff from the technical to upper managerial levels (IEG, 2002)

Table B. Classification of Research Programs by Center Categories and Centers

	Number of Programs					Percent of Total			
	GPG	NRS	NPG	MG	Total	GPG	NRS	NPG	MG
Commodity-oriented Centers	**62**	**40**	**-**	**-**	**102**	**61%**	**39%**	**0%**	**0%**
CIP	15	2	-	-	17	88%	12%	0%	0%
ILRI	14	5	-	-	19	74%	26%	0%	0%
CIMMYT	14	6	-	-	20	70%	30%	0%	0%
IRRI	15	12	-	-	27	56%	44%	0%	0%
WARDA	4	15	-	-	19	21%	79%	0%	0%
Ecoregional Centers	**37**	**28**	**2**	**-**	**67**	**55%**	**42%**	**3%**	**0%**
IITA	12	5	-	-	17	71%	29%	0%	0%
CIAT	9	6	2	-	17	53%	35%	12%	0%
ICRISAT	7	7	-	-	14	50%	50%	0%	0%
ICARDA	9	10	-	-	19	47%	53%	0%	0%
NRM Centers	**32**	**22**	**3**	**-**	**57**	**56%**	**39%**	**5%**	**0%**
CIFOR	7	1	-	-	8	88%	13%	0%	0%
ICRAF	12	4	3	-	19	63%	21%	16%	0%
ICLARM	10	7	-	-	17	59%	41%	0%	0%
IWMI	3	10	-	-	13	23%	77%	0%	0%
Policy Centers	**41**	**16**	**1**	**-**	**58**	**71%**	**28%**	**2%**	**0%**
ISNAR	15	3	-	-	18	83%	17%	0%	0%
IFPRI	13	7	-	-	20	65%	35%	0%	0%
IPGRI	13	6	1	-	20	65%	30%	5%	0%
Total	**282**	**172**	**12**	**-**	**466**	**61%**	**37%**	**3%**	**0%**

Key: GPG = global public goods, NRS = national public goods with regional spillovers, NPG = national public goods without regional spillovers, MG = merit goods.

This distinction is critical for this paper as it provides insight as to how to define the CGIAR as a provider of international public goods by examining both the CGIAR's activities and outputs. This is particularly important as the CGIAR is increasingly being held accountable for demonstrating its outcomes and impacts at the national and local level, and as international financial resources are increasingly being directed at national and local level activities. This raises the issue of *subsidiarity* and poses the question as to whether the CGIAR is the best vehicle for delivering agricultural research, and goods and services for the national and local level or whether National Agricultural Research Centers are better placed to deliver these activities and outputs.

Bibliography

Barton, J. H. (2006), "Knowledge", Expert Paper Series No. 6. *Knowledge International Task Force on Global Public Goods*, Stockholm, Sweden, http://www.gpgtaskforce.org.

Bertram, R. (2006), "Beyond International Public Goods: But Just How Far?", Background paper in CGIAR Science Council *Positioning the CGIAR in the Global Research for Development Continuum:* Report of a Workshop, Ministry of Foreign Affairs, The Hague, The Netherlands, Friday 19 May, pp. 65-70.http://www.cgiar.org/changemanagement/pdf/wg1_CGIAR_SC_R4D_CONTINUUM.pdf

Bezanson, K., U. Casabonne, R. Jolly, R. Picciotto, F. Prada and F. Sagasti (2003), *Evaluating Development Effectiveness in Six United Nations Agencies*, Institute of Development Studies, University of Sussex, United Kingdom.

CGIAR Science Council (2006a) *Positioning the CGIAR in the Global Research for Development Continuum:* Report of a Workshop, Ministry of Foreign Affairs, The Hague, The Netherlands, Friday 19 May, http://www.cgiar.org/changemanagement/pdf/wg1_CGIAR_SC_R4D_CONTINUUM.pdf.

CGIAR Science Council (2006b), *CGIAR Research Strategies for IPG in a Context of IPR: Report and Recommendations Based on Three Studies:* http://www.sciencecouncil.cgiar.org/activities/spps/pubs/IPR%20REPOR.pdf.

CGIAR Science Council Secretariat (2006), "Partners in Research for Development", background paper pgs. 25 - 41 in CGIAR Science Council *Positioning the CGIAR in the Global Research for Development Continuum:* Report of a Workshop, Ministry of Foreign Affairs, The Hague, The Netherlands, Friday 19 May, http://www.cgiar.org/changemanagement/pdf/wg1_CGIAR_SC_R4D_CONTINUUM.pdf.

CGIAR Executive Council (2005), Summary of ExCo 9 Discussion and Recommendations to the CGIAR on CGIAR Priorities and Strategies: 2005-2015 prepared for the 9th Executive Council Summary Record of Proceedings, October 31: http://www.cgiar.org/pdf/agm05/agm05_cgiar_p&Ss_exco9_rec.pdf.

CGIAR Science Council (2005), *System Priorities for CGIAR Research 2005 – 2015*. Washington: CGIAR, November.

Executive Session on Public Sector Performance Management (2001), *Get Results through Performance Management: An Open Memorandum to Government Executives*. John F. Kennedy School of Government, Harvard University, Cambridge, MA.

Dalrymple, D. (2008,) "International agricultural research as a global public good: concepts, the CGIAR experience and policy issues", *Journal of International Development,* 20 (3), pp. 347-379.

Dalrymple, D. (2006), *International Agricultural Research as a Global Public Good: Concepts, the CGIAR Experience, and Policy Issues,* http://www.sciencecouncil.cgiar.org/activities/spps/pubs/Dalrymple%20GPG%20Paper.pdf.

Dalrymple, D. (2005), "Setting the Agenda for Science and Technology in the Public Sector: The Case of International Agricultural Research", Working Paper, October 25.

Gardner, B. (2003), "Global Public Goods From the CGIAR: Impact Assessment", *The CGIAR at 31: An Independent Meta-Evaluation of the Consultative Group on International Agricultural Research*. Washington, DC: World Bank Operations Evaluation Department**.**

Gardner, B. and W. Lesser (2003), "International Research as a Global Public Good", *American Journal of Agricultural Economics*, 85 (3), pp. 692-697, August.

Haas, E.B. (1980), "Why collaborate?: Issue-linkage and international regimes", *World Politics,* 32 (3), April, pp. 357–405.

Haas, E.B. (1982), "Words can hurt you, who said what to whom about regimes", *International Organisation*, 32 (2), Spring: 207–43.

Haas, P.M. (1992), "Introduction: epistemic communities and international policy coordinationz", *International Organization*, 46 (1), Winter, pp. 1–35.

Haggard, S. and B.A. Simmons (1987), "Theories of international regimes", *International Organization*, 41 (3), pp. 491—517.

Hardin, G. (1968), "The tragedy of the commons", *Science*, No.162 (December), pp. 1243–1248.
Harwood, R.R., F. Place, A.H. Kassam and H.M. Gregersen. (2006), "International Public Goods through Integrated Natural Resource Management Research", *Experimental Agriculture*, 42, pp. 375-397, Cambridge, UK: Cambridge University Press.
Harwood, R.R. and A.H. Kassam (2003), "Lessons Learned", *Research Towards Integrated Natural Resources Management: Examples of Research Problems, Approaches and Partnerships in Action in the CGIAR*, prepared for the CGIAR Science Council, pp. 149-154: http:// www.sciencecouncil.cgiar.org/ publications/pdf/INRM/part4.pdf
Independent Evaluation Group (IEG), The World Bank (2007), *IEG Guidelines for Global and Regional Program Reviews (GRPRs),* 16 January. http://www.worldbank.org/ieg/grpp
Independent Evaluation Group (IEG), The World Bank (2002), *The CGIAR at 31: An Meta-Evaluation of the Consultative Group on International Agricultural Research,* World Bank: http://lnweb18.worldbank.org/.../DocUNIDViewForJavaSearch/ 73C08C1E39723D3D85256D5E0059A24A/$file/CGIAR_annexes.pdf.
Kaul, I., P. Conceicao, K. Le Goulven, and R. U. Mendoza (eds.) (2003), *Providing Global Public Goods: Managing Globalization*, Oxford: Oxford University Press.
Kaul, I., Grunberg I. and Stem M.A. (eds.) (1999), *Global Public Goods: International Co-operation in the 21st Century*, New York: Oxford University Press.
Kaul, I., Grunberg, I. and Stern, M.A. (1999), "Global public goods: concepts, policies and strategies", in I. Kaul, I. Grunberg and M.A. Stem, (eds.) (1999), *Global Public Goods: International Co-operation in the 21st Century*, New York: Oxford University Press, pp. 450–507.
Kindelberger, C.P. (1986), "International public goods without international government", *The American Economic Review*, 76(1), March, pp. 1–13.
Krasner, S.D (1982), "Structural causes and regime consequences: regimes as intervening variables", *International Organization*, 36 (2) Spring, pp. 185–205.
Lynam, J. K. (2007), *Research into Development: Assessing CGIAR Research Priorities from the Perspective of Development Challenges,* Nairobi, Kenya, November.
Maskus, K. E., J. H. Reichman, eds. (2005), *International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime,* Cambridge, UK: Cambridge University Press.
Morrissey, O., D. Willem te Velde and A. Hewitt (2001), *Defining International Public Goods: Conceptual Issues*, London: Overseas Development Institute.
Office of the Auditor General of Canada (2003), *The Managing for Results Self-Assessment Tool. Canada*, 31 January, http://www.tbs-sct.gc.ca/rma/ account/transmod/mrsat-oaegar_e.pdf.
Pardey, P. (2006), "Background paper" in CGIAR Science Council *Positioning the CGIAR in the Global Research for Development Continuum:* Report of a Workshop, Ministry of Foreign Affairs, The Hague, The Netherlands, Friday 19 May, pp. 85-90: http://www.cgiar.org/changemanagement/pdf/wg1_CGIAR_SC_R4D_CONTINUUM.pdf.
Pinstrup-Andersen, Per (2006), "Note from Chairman of the Science Council", reproduced in the Appendix to Jim Ryan, "International Public Goods and the CGIAR niche in the R for D Continuum: operationalising Concepts", in CGIAR Science Council: *Positioning the CGIAR in the research for development continuum,* November 2006, pp. 23-24.
Reifschneider, F. J B., E. Corea, I. Johnson (2007), "Revolutionizing the Evolution of the CGIAR: 2001 to 2007: A contribution to the institutional memoir and some thoughts for the future", Washington DC, CGIAR Secretariat.
Rao, J.M. (1999), "Equity in a global public goods framework" in I. Kaul, I. Grunberg and M. A. Stem, (eds), *Global Public Goods: International Co-operation in the 21st Century*, New York: Oxford University Press, pp. 68–86.
Rittberger, V., with P. Mayer, (eds), (1997), *Regime Theory and International Relations*, Oxford: Oxford University Press.
Robinson, M. and H. Elliot (2007,) *Meta-Evaluation of CGIAR External Program and Management Reviews (EPMRs)* http:// www.sciencecouncil.cgiar.org/publications/ pdf/EPMR_MetaEvaluation_Elliott%20&%20Robinson.pdf.

Ryan, J. (2006), "International Public Goods and the CGIAR Niche in the R for D Continuum: Operationalising Concepts", Discussion paper, in CGIAR Science Council (2006a). *Positioning the CGIAR in the Global Research for Development Continuum:* Report of a Workshop, Ministry of Foreign Affairs, The Hague, The Netherlands, Friday 19 May: http://www.cgiar.org/changemanagement/pdf/wg1_CGIAR_SC_R4D_CONTINUUM.pdf.

Sagasti, F. and G. Alcalde (1999), *Development Cooperation in a Fractured Global Order: An Arduous Transition*, Ottawa: International Development Research Centre.

Sagasti, F. and K. Bezanson (2001), *Financing and Providing Global Public Goods: Expectations and Prospects.* Prepared for the Ministry of Foreign Affairs, Sweden, November.

Sagasti, F (2004), *Knowledge and Innovation for Development: The Sisyphus Challenge of the 21st Century*. Cheltenham, UK: Edward Elgar Publishing Ltd.

Samuelson, P. (1954), "The pure theory of public expenditure", *Review of Economics and Statistics*, No. 36, November.

Samuelson, P. (1955), "Diagrammatic exposition of a theory of public expenditure", *Review of Economics and Statistics*, No. 37, pp. 350–356.

Samuelson, P. (1958), "Aspects of public expenditure theories", *Review of Economics and Statistics*, 40 (4), pp. 332–338.

Technical Advisory Committee (1997), *Review of CGIAR Priorities and Strategies* (AGR/TAC:IAR/96/6.1and 6.2). TAC Secretariat, FAO, Rome, Italy.

Ver Eecke, W., (1999), "Public goods: An ideal concept", *Journal of Socio-Economics,* Vol 28, pp. 139–156.

Wallner, K. (2002), "The Provision of Public Goods in International Relations: A Comment on 'Goods, Games, and Institutions'", *International Political Science Review*, 23 (4), October, pp. 393-401.

Young, O. (1998), *Global Governance*, Cambridge: MIT Press.

Zedillo, E. (2001), *Technical Report of the High-level Panel on Financing for Development*, Report commissioned by the United Nations, Secretary-General, New York, UN Secretariat.

About the authors

Francisco Sagasti chairs the Board of the Science and Technology Program at the Prime Minister's Office in Peru, is a senior associate at FORO Nacional/Internacional, a Peruvian Think Tank, a member of the Board of Governors of the International Development Research Center (IDRC), and is advisor to several international and Peruvian organizations. He has been Chief of Strategic Planning at the World Bank, Chairman of the United Nations Advisory Committee on Science and Technology, and visiting professor at the Wharton School of the University of Pennsylvania and a the University for Peace in Costa Rica. He has published more than 20 books, about 200 papers, and has also produced a nine-part TV series on development issues.
Contact: fsagasti@amauta.rcp.net.pe; and PO Box 18-1194, Lima, Peru

Vanessa Timmer is a co-founder and Director of the One Earth Initiative and Project Manager at Metro Vancouver. She recently completed her Ph.D. in Environmental Studies from the University of British Columbia, and holds a M.Sc. in Environmental Change and Management from Oxford University and a Queen's University BAH. Vanessa was a Fulbright Research Fellow at the Kennedy School of Government at Harvard University with the Initiative on Science and Technology for Sustainability. She has published several papers and co-hosts the Canadian television show, The Sustainable Region.
Contact: vanessa.timmer@gmail.com