Producing and delivering international public goods in agricultural research: Lessons for the CGIAR research program on Livestock and Fish

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CGIAR is a global partnership that unites organizations engaged in research for a food secure future. The CGIAR Research Program on Livestock and Fish aims to increase the productivity of small-scale livestock and fish systems in sustainable ways, making meat, milk and fish more available and affordable across the developing world. The Program brings together four CGIAR Centers: the International Livestock Research Institute (ILRI) with a mandate on livestock; the WorldFish Center with a mandate on aquaculture; the International Center for Tropical Agriculture (CIAT), which works on forages; and the International Center for Research in the Dry Areas (ICARDA), which works on small ruminants.

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Abstract

International Public Goods (IPGs) refers to knowledge and technologies that are easily accessible (either free or low-cost) and have broad applicability across international boundaries. An IPG within the context of international research for development has two dimensions namely the technical (hardware) and the ‘orgware’ (software). Once an IPG is produced, several strategies are employed to use the good to achieve development outcomes. Over the years, monitoring and evaluation (M&E) of IPGs has evolved from centralized, top-down approaches to inclusive and participatory approaches, that do not only focus on the technologies produced but also on processes and institutions for delivery. M&E has further developed to not only being used as an accountability tool but also as a learning tool. The transformation of research outputs into IPGs and the evolution of M&E of the IPGs to catalyse learning is however unclear within the Agriculture research systems. The paper seeks to review previous work carried out on the production and use of IPGs, and the monitoring and evaluating methodologies that are applicable. A clear understanding of IPGs is critical because a wide range of transnational problems such as widespread poverty, food insecurity and environmental degradation in less developed countries requires the production of IPGs.
Introduction

According to Kamanda and Batilan (2010), a wide range of transnational problems such as widespread poverty, food insecurity and environmental degradation in less developed countries requires the production of international public goods (IPGs). A ‘pure’ IPG is a commodity or activity whose benefits are non-rival and non-excludable (Kaul and Le Goulven 2003). ‘Non-rivalry’ means that one country benefiting from consuming the good does not preclude another from doing so. ‘Non-excludability’ means that no country can be excluded from benefiting. Most research output can be non-rival; that is, it cannot be diminished with use. According to Harwood et al. (2006), exclusion can result from the inability to access and use the IPG. A case example would be although information on vaccine production and feed formulations are made freely available to all potential users, a country’s lack of a robust private sector is likely to limit the extent to which that country benefits from the IPG (Knabur et al. 1999). The private sector alone will not provide a sufficient number of public goods, since it will prioritize private, rather than, social benefits (UNIDO 2008). Individual countries also have insufficient incentive to make optimal contributions to IPGs, given that poor countries lack the resources to make significant contributions to the provision and/or production of IPGs (Bocalandro and Villa 2011). There is consensus among the above-cited scholars that IPGs tend to be underfunded and undersupplied, particularly those IPGs that would benefit the economic development of countries. It is unsurprising therefore that Ryan (2006) recommends that CGIAR centers, being international institutions funded through public money, should have a mandate to produce outputs that are freely available to and accessible by the international community.

Once IPGs are produced, several strategies which include publications, advocacy and deliberate scaling out are employed to use the good to achieve development outcomes in other locations. Monitoring and evaluating (M&E) of IPGs is critical to allow research teams learn from the production and delivery processes and make necessary adjustments to the theory of change. By inculcating M&E in the design of interventions, evaluating the impact of IPGs on development outcomes is made easier. The greatest challenge in evaluating any intervention is obtaining a credible counterfactual i.e. what would have happened to participating units if they had not participated? Without a credible answer to this question, it is not possible to determine whether the intervention actually influenced participant outcomes or is merely associated with successes (or failures) that would have occurred anyway (Heinrich et al. 2010). The report is guided by the following aims:

1. To provide a comprehensive understanding of the production and delivery of IPGs in a wide range of research and development undertakings;
2. To provide insights on the evolution of monitoring of IPGs and its implications on monitoring and evaluating IPGs under CGIAR’s Research Program on Livestock and Fish.
3. To provide concrete recommendations for appropriate approaches to evaluating the production of IPGs under the Livestock and Fish program.
Methodology

Different projects and programs theories of change that have a mandate to produce IPGs were reviewed. Using the insights from other researchers and programs, Livestock and Fish program theory of change that guides and seeks to transform research outputs into development impacts was analysed. A longitudinal approach to understanding how the definition and monitoring of IPGs has evolved over time was further employed. In addition, literature on the development of IPG production and delivery within international agricultural systems from the 1970s to the present was reviewed. This included literature on methods used by other institutions to make convincing attribution/contribution claims. Sources of literature reviewed were published and unpublished literature, project action plans, M&E manuals and guides. These were obtained from a wide range of institutions that included Humidtropics, Aquatic Agricultural Systems Program, Sub Saharan Africa Challenge Program (SSA CP), Sustainable Water Management Improves Tomorrow’s Cities’ Health (SWITCH) program and the Promoting Local Innovations in Ecological Agriculture program and Natural Resources Management (Prolinnova) program.

One of the authors attended a Forum for Agricultural Research in Africa (FARA) workshop in Johannesburg from 24-28 November 2014. During the workshop, the researcher interacted with different staff implementing different programs, including representatives from the Humidtropics Program, SSA CP, Aquatic Agricultural Systems program and CGIAR centers that included the International Centre for Tropical Agriculture (CIAT), the International Maize and Wheat Improvement Centre (CIMMYT) and the WorldFish Center. These interactions provided not only useful literature, but also opportunities to discuss how different researchers conceptualize IPGs, their respective M&E strategies and also strategies to deliver IPGs to areas outside a given test environment.
Production and delivery of IPGs

In the context of international agricultural research, an IPG refers to a non-country-specific investment in knowledge, i.e. basic research in technology meant to be in the public domain (e.g. vaccines, conservation agriculture technologies, germ plasms, improved crop varieties and crop management packages). The Aquatic Agriculture Systems views IPGs as ready-made solutions that can be transferred to diverse locations and contexts. The SSA CP and Humidtropics both define an IPG as a set of methods for organizing research for development. These definitions reflect the fact that numerous on-station research efforts have generated technologies that were meant for the public domain but were not taken up. All of the above-mentioned programs seek to craft the institutions and processes necessary to not only make knowledge available, but to also enable its use. Given the definitions, one can see that an IPG has two dimensions, the first being technical (hardware) and comprise the technical biophysical innovations. These include germplasms and other innovations that have been on the shelf and were not taken up for one reason or another. The other dimension is ‘orgware’ (software) and comprise social/institutional innovations—including changes in policy, marketing organizations, legal frameworks and service provision, that are necessary to enable people make use of new ideas and technical opportunities. The link between the two is beneficial in the sense that, removing institutional and infrastructural constraints gives unlimited space to using available technical opportunities.

All CGIAR research programs and the SSA CP combine technical and orgware dimensions which are tried and tested. The purpose of most research initiatives is: to prove that outputs are credible and based on sound evidence; show potential users results in practice, and also show IPGs are relevant to addressing persistent problems. Research also proves that the results are compatible with existing users’ established values, norms and facilities. In the process of piloting, new IPGs are also produced in the form of: new institutions coordinating research for development; new knowledge; new products; new technologies; and best practices. The assumption of piloting is that once the method of combining the orgware and technical dimensions in one site succeeds in achieving intermediate development outcomes and system level outcomes, it becomes easier to scale the project out to other geographical locations and/or value chains. Different programs/projects have used a combination of strategies to transform research outputs into IPGs as discussed below.

Passive strategies

In all projects studied, once new knowledge is produced it is made available to the public via open access journals for public scrutiny and for validation of the research results. The dissemination of the IPG into the international community also occurs via international workshops, news briefs (TV and radio), success stories, evaluation reports (both internal and external), leaflets and videos. Such dissemination is intended to provide substantive evidence of the IPG’s success and to make a case for replicating and extending its coverage. Some of these programs provide process documentations and M&E strategies to potential users of the IPG who live outside the test environment.

Vertical and horizontal scaling

Scaling up has become increasingly popular within international agricultural research. Linn (2012) defines ‘scaling up’ as an effort to increase the impact of innovations successfully tested in pilot/experimental projects so as to benefit more people and to foster policy and program development on a lasting basis. Scaling up has two dimensions namely vertical and horizontal. Vertical scaling up is institutional in nature and involves other sectors or stakeholder groups: from grassroots organizations to policymakers, donors, development partners and regional and international agencies and investors. Institutionalization occurs when the development of adaptive capacity involves a range of activities—including training, building networks, creating functional organizational structures and gaining institutional support—and those activities in turn become part of an institution in a sustainable way. Horizontal scaling up most often refers to spreading
innovations to people and communities in locations outside the pilot area but within the same sector or stakeholder group. A good example can be found in the Dandume Local Government area of Katsina State in Nigeria, where scaling out of The Integrated Agricultural Research for Development (IAR4D) IPG spread from the initial five pilot villages to all 11 villages in Dandume LGA with support of the local government (Adekunle et al. 2014). Most programs are often challenged by lack of budgets for scaling. The SSA CP for example is in the process of strategizing the scaling of what it calls “ground breaking work” to other geographical areas to reach more people and also to entrench it within the national development policies of countries. The organization has thus proposed to create an effective M&E framework for tracking activities related to scaling.

Using regional integration

Sagasti and Timmer (2008) lament the lack of a supranational governmental authority to mobilise resources for the production of IPGs. Lombaerde and Langenhove (2011) propose regional integration as an appropriate solution for this shortfall; such integration can create a context within which IPGs can be produced and delivered to a grouping’s member states. Regional integration can eliminate barriers to adoption of IPGs and promote the formulation of common policies. The SSA CP is governed and managed by sub regional agricultural research organizations. The Centre for Coordination of Agricultural Research and Development for Southern Africa coordinates and manages SSA CP pilot learning sites in Southern Africa. The Association for Strengthening Agricultural Research in East and Central Africa coordinates and manages research within pilot learning sites in East and Central Africa. The Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles/West and Central African Council for Agricultural Research and Development (CORAF/WECARD) coordinates and manages the learning sites in West Africa. These sub regional organizations have also disseminated IPGs to other geographical areas and also entrenched them within the national development policies of countries within their influence. For example, CORAF/WECARD in partnership with International Crop Research Institute for Semi-Arid Tropics (ICRISAT) has promoted plant breeding technologies and seed system development in Ghana, Cameroon, Mali and Burkina Faso through an integrated agricultural system (ICRISAT, 2013).
Evolution of monitoring and evaluation of IPGs

Monitoring and evaluation (M&E) provides a framework for reviewing progress; identifying problems in planning; and making adjustments so that the project makes a positive impact. In discussing the evolution of M&E for IPGs, we focus on changes in the understanding of IPGs, changes in the strategies of delivering IPGs and changes in the content of M&E.

M&E in the context of technological development

The first CGIAR centers formed in the 1970s (International Maize and Wheat Improvement Centre, the International Centre for Tropical Agriculture, the International Rice Research Institute and the International Institute of Tropical Agriculture) had a focus on increasing the productivity of wheat, rice and maize — the staple foods for over 60% of the world’s population. They developed improved high yielding cultivars that were widely adaptable internationally across a wide range of growing environments (Sagasti and Timmer 2008). Research was largely on-station and based on non-participatory approaches. During the first decade of their operation, terms such as ‘spillover effect’ and ‘positive externalities’ were commonly used and research and development was viewed as a linear process. Researchers or other implementing agents carried out developmental research and then produced reports/academic papers/policy briefs and also convened an international workshop where the nature of the IPG was explained and the lessons learnt articulated (Moriarty et al. 2005).

By the end of the 1970s, donor pressure for accountability and signs of progress toward poverty eradication led to fundamental changes in M&E. Indicators were now largely focused on technological innovations, with a particular interest in efficiency and cost effectiveness (Estrella and Gaventa 1998). In 1980, calls for holistic agricultural production systems foregrounded the issue of natural resource management. Frameworks for the conceptualization of and improvements to major production and natural resource use systems also evolved, thanks to the participation of key stakeholders. These stakeholders ensured proper prioritization, relevance and also enhanced stakeholder ownership and clarified roles. This process broadened the focus of M&E to include biogeophysical issues. However, M&E approaches remained top-down, non-participatory and very specialized, largely serving as a tool to control and manage programs, activities and resources (Segone 1998).

M&E in the context of interactive approaches to technology dissemination

In the early 1990s, poor adoption of IPGs within test sites forced agricultural development practitioners to involve farmers in the research process—via action research and other interactive methodologies (such as Farmer Field Schools, look and learn tours and the lead farmer approach) (Khatam et al. 2010). The goal was to bring best bet technologies to farmers and improve adoption of the same using participatory processes. This new approach was based on the understanding that once IPGs are appealing to farmers, farmers will adopt them in their main fields. Questions about whether the IPGs were relevant to the farmers’ socio-economic and cultural contexts were barely considered. International agencies institutionalized M&E and used it mainly as an accountability tool to satisfy public opinion and governments’ need to know how public aid funds were being used (Segone 1998). The focus was largely on utilization i.e. the number of dissemination strategies used and the number of farmers reached. Although project beneficiaries were involved in the projects themselves, their involvement at the M&E stage was not fully institutionalized. During this same period, rapid rural appraisal techniques were widely used to monitor field level processes such as the extent to which farmers use the technologies being promoted (Crawfold 1997).

While the adoption of action research and other participatory approaches made research activities and agendas more relevant and practical, it focused solely on the individual or community level and household incomes did not improve (Moriarty et al. 2005). The SSA CP (2008) attributed the stagnation of household income to poor market linkages and a lack of complementary efforts from governments. Furthermore, many of the local innovations could not be scaled up, in large part
because the institutions that took up the IPGs did not subsequently develop the IPGs equally in all locations. Other stakeholders along the value chain that were essential to providing complementary support to smallholder farmers were sidelined; in some cases they were even seen as ‘part of the problem’.

**M&E in the context of technological and institutional innovation**

In response to these deficiencies, the SSA CP embedded research into a system of innovation in the mid-2000s with a goal to increase productivity gains in diverse rain-fed systems. The research was founded on the observation that not just knowledge inputs and technologies were missing, but also the institutions, infrastructure and processes necessary to make available both knowledge and the tools so as to turn that knowledge into action (Adekunle et al. 2014). These include a focus on issues such as field-level processes and institutional innovations (e.g. in markets and policies) and also outcomes (e.g. adoption of technologies, gender sensitivity and changes in knowledge about natural resources management). The Integrated Agricultural Research for Development (IAR4D), Sustainable Water Management Improves Tomorrow’s Cities Health (SWITCH), and other projects/programs were also designed according to this observation. During this period, M&E ensured issues on accountability and processes that were participatory and empowering were not compromised to ensure substantive benefits of the project outlive the project itself (Estrella and Gaventa 1998).

The inclusion of numerous stakeholders in the production and distribution of IPGs has also necessitated institutional innovations such as participatory monitoring and evaluation (PM&E) in designing instruments for reporting and auditing. Institutional innovations like PM&E strive to function as an internal learning process that enables people to reflect on past experiences, examine present realities, revisit objectives and define future strategies. This is by recognizing the different needs of stakeholders and negotiating their diverse claims and interests/demands (Guijt and Woodhill 2002). Different stakeholders, contexts and concerns make PM&E specific to each circumstance—thus there is no single blueprint for the process. Instead, each facilitator should take context (social, human etc.) into account as he/she fosters a PM&E process that is both creative and driven by stakeholder consensus. Many of the project documents we reviewed show that M&E frameworks are themselves a public good that can assist countries seeking to deliver IPGs.
Monitoring and evaluating IPGs within CGIAR Livestock and Fish program

The Livestock and Fish program was designed to respond to development challenges through a research-for-development trajectory that would generate more milk, meat and fish by and for the poor. The program has developed livestock value chains that enable smallholder producers to intensify and contribute to food security by increasing the availability of affordable animal source foods. The program develops and offers technology and innovations in animal health, genetics and feed to boost primary animal source food productivity among smallholders. Combined with a focus on transforming selected value chains and using multidisciplinary research teams, the program collaborates with research and development partners to build an evidence base to introduce and adapt innovations in an integrated way and achieve large-scale impact across value chain systems. Nine focal value chains have been selected: dairy (Tanzania, India), small ruminants (Burkina Faso, Ethiopia), fish (Egypt, Bangladesh), dual-purpose cattle (Nicaragua) and pigs (Uganda, Vietnam). These have been chosen for their potential to offer sustainable livestock solutions to food security through smallholder intensification and commercialization.

Livestock and Fish outputs satisfy the non-rivalry criteria of IPGs and include;

1. Tools and methods for research and/or development that have applicability beyond one nation’s borders;
2. Global and regional approaches to research coordination and facilitation services that involve more than one country;
3. Contributions to technological development (e.g. vaccines and feeds) that can be used effectively (and with only modest adjustments) for site-specific conditions in more than one country; and

M&E frameworks for the production and delivery of IPGs.

By working with ‘next users’ such as National Agricultural Research Systems (NARES), NGOs, civil society organizations and public and private service providers in countries outside the selected value chains, the program builds and strengthens institutions for accelerated downstream testing, adaptation and scaling up/out of research outputs. The program’s communication and dissemination strategy targets specific messages and channels to influence policymakers with an eye toward promoting a wider deployment of the program proven interventions. By improving international access to and use of program outputs, the program ultimately contributes to desired Intermediate Development Outcomes. The SSA CP identifies three elements that could lead to a failure to achieve anticipated outcomes and impacts described in the impact pathway and/or the theory of change (SSA CP 2008). These include:

1. External factors that may have an influence on the achievement of results;
2. Theory failure (value chains cannot deliver the expected outcomes/impacts);
3. Implementation failure (program implementation in the different intervention sites fails to implement the project in a prescribed manner).

M&E has evolved from solely tracking changes in technology to also considering issues such as the functionality of the institutions guiding the process of innovation up-scaling and out-scaling. In light of this, M&E within Livestock and Fish program should be used to serve three purposes;

1. A means to determine what works, what does not work, and why—not only within country-specific interventions or specific value chains, but also between sites and
value chains. It should also trace changes in attitudes, behaviour and practices of key stakeholders
2. Assess whether program/projects are on track to achieving sufficient and sustainable impact based on guiding principles outlined in the program implementation plans.
3. Take a participatory approach to M&E, where all project participants and other stakeholders participate in the formulation and selection of indicators and targets.

The proposed theory of change, assumptions and areas of inquiry for the Livestock and Fish program are further expounded in Annex 1.

Monitoring and evaluating systems should create an enabling environment that facilitate learning among both platform actors and non-platform actors; now commonly referred to as monitoring and evaluation for learning. The process uses a spiral of cycles of planning, acting, reflecting and then re-planning (Figure 1) to test and further improve the theory of change.

**Figure 1: Planning, Action, Observe, Reflect Cycle**

Analytical approaches in impact evaluation
Many disciplines have spawned literature concerned with estimating the causal effects of treatments, interventions or programs (Imbens and Wooldridge 2009). The evaluation design hinges on this fundamental question: What could the situation have been if intervention had not taken place? Answering this calls for the construction of an appropriate counterfactual or group of non-participants in the intervention program. The next section highlights some of the methods used in impact evaluation.

**Naïve approaches**
The naïve approaches are of three kinds:

1. The treated-untreated mean difference method;
2. The before-after mean difference method:
3. The double difference or difference in difference method:
When using these simple approaches to measurement, we cannot be sure whether the observed changes are due to program activities or were a consequence of secular change. The before versus after evaluation requires a very strong assumption that the indicators of interest would not have changed in the absence of program activities. When a control is used, there is also a danger that there could be differences between people in treated villages and people in control villages.

**Experimental approaches**

The experimental approach is used to determine the impact of an intervention on selected outcome variables. In applying this method, comparison sites are set up and failure to identify a credible control would compromise the accuracy of the impact evaluation. This implies confirming the delivery of the IPG in one area (intervention site), while guarding against spillover into other areas (control sites). One of the major challenges of this approach was that the program had no control over the activities of other donor projects that were also working in the control villages to reduce poverty and/or improve market integration. In addition, these surveys are costly, take time and require specialised analytical skills. There are also ethical concerns over depriving control villages of the project’s benefits.

**Using instrumental variables**

According to Rubin (1977), who pioneered this approach, it is less ambitious in the sense that it focuses on identifying and estimating the causal effects of the primary interventions or treatments of interest. There are usually only a very limited number of interventions of primary interest in any given impact assessment study; and in most cases there is only one. This narrow focus of the potential outcome approach allows the identification of the causal effects of a given intervention without having to identify and estimate the full structural functional relationship. It also allows for minimal, credible and more easily defensible statistical independence assumptions between the intervention or treatment variable and the finite number of potential outcomes that obtain for each value of the treatment variable (Abadie 2003). A critical assumption of the instrumental variable methods is the exclusion restriction, which in the local average treatment effect (LATE) framework requires that the instrument affects the outcome only through its effects on the instrument (Flores-Lagunes et al. 2010). Since this assumption is not testable, it is debatable in any application whether the instrument is valid.

**Most Significant Change**

Many of the CGIAR research programs are still in the implementation stage. However, the Aquatic Agricultural Systems program proposes to use the most significant change stories (MSC) to measure the impact of the program activities on project beneficiaries. MSC stories are purposively selected by partners or community members because something has changed as a result of participating in the project activities. However, there is selection bias of good MSC stories to portray a good and acceptable image of the program activities.
Conclusions

Understanding the production and delivery of IPG within the international agriculture research context is a growing subject. This has been catalyzed by the need to find answers to chronic problems facing smallholder farmers in sub-Saharan and Asia where agriculture systems are still underdeveloped. Three key strategies of delivering IPGs discussed are the passive, vertical and horizontal scaling and regional integration. The strategies demonstrate the need to work with diverse stakeholders along the research and development continuum in a targeted manner.

Monitoring and evaluation of IPGs in the CGIAR has evolved since 1970 when the first CGIAR centers were established. Initially M&E focused on the technologies produced before there was more clamor for participatory methods that allowed community engagement to fasten adoption. Lately M&E has shifted to not only focusing on technologies but also institutions, infrastructure and processes that are required to deliver the technologies. CGIAR research program on Livestock and Fish is an example of an institutional innovation that is working towards bridging the gap between the production of IPGs and their delivery along the research and development continuum.

In addition, M&E has developed from only serving as an accountability tool to both a tool that can allow accountability as well as provide the learning space in the theory of change implementation process. Choosing the right evaluation methods is key to establish the impact of the IPGs in a system where processes are not deemed only linear but also complex owing to diverse players and factors possibly influencing the observed change.
References


ICRISAT. 2013. *Together we increase incomes and improve livelihoods.* CORAF/WECARD and ICRISAT. India: ICRISAT.

Segone, M. 1998. *Democratic evaluation: A proposal for strengthening the evaluation function in international development organizations.* New York, USA: UNICEF.

Annex

Proposed theory of change

The theory of change depicted below is adapted from the Livestock and Fish program. The program uses a multidisciplinary research team with backgrounds in: animal health; genetics; feed and forages; social and gender sciences; and system analysis for sustainable innovation to develop research outputs that are packaged into international public goods (IPGs). By developing well established and targeted strategies, the IPGs are easily accessible to the national and international community. Once IPGs show promising usability, building the capacity of stakeholders operating in the value chains will enable further adoption and thus contribute to intermediate development outcomes. Monitoring the anticipated changes in behavior, attitude and practice in the stakeholders will reveal the impact of IPGs. Substantially documented impact on livelihoods will further advocate for the use of IPGs through advocacy and partnerships and consequently contribute to achieving the system level outcomes.
<table>
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<th>Country 1</th>
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<th>Country 3</th>
<th>VC A</th>
<th>Country 4</th>
<th>VC B</th>
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Key:

- Initial learning through direct program implementation
- Replication in other countries or value chains

VC Value chain
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<tr>
<th>Theory of change assumptions</th>
<th>Assumptions</th>
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<tr>
<td><strong>From program outputs to powerful strategies</strong>&lt;br&gt;The program uses a multidisciplinary research team with backgrounds in: animal health; genetics; feed and forages; social and gender sciences; and system analysis for sustainable innovation. This team works with development partners and investors to translate promising technologies into sustainable and visible IPGs.</td>
<td>Key assumptions underpinning efforts to generate IPGs:&lt;br&gt;The availability of resources, required skills and human/institutional capacity to implement the program activities;&lt;br&gt;The commitment of partners in the innovation platform, as well as the availability of resources and staff for conducting research;&lt;br&gt;Investment in the innovation process by NGOs and the private sector;&lt;br&gt;Favourable weather, macroeconomic conditions, policy regimes and socioeconomic/political stability; and&lt;br&gt;The availability of policy advocacy beyond the test environment.</td>
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<td><strong>From program activities to impact and intrinsic changes and connections</strong>&lt;br&gt;It is expected that program activities will have an impact on individual, public and private sector actors in the value chain. Anticipated changes include changes in attitude, mind-sets, visions, perceptions and beliefs regarding the IPG; the acquisition of new knowledge via use of the IPG; the development of new skills and behaviour required for the use and adoption of the IPG; and the emergence of social connections that are necessary for the platform to function (e.g. bonding and bridging social capital).</td>
<td>Key assumptions underpinning reach and reaction in sharing IPGs;&lt;br&gt;Research outputs are accessible by the international community;&lt;br&gt;The institutional and technological innovations promoted are applicable to other locations;&lt;br&gt;There is capacity in non-target countries and value chains to test the institutional and technological innovations via action research; and&lt;br&gt;Key stakeholder and policymakers in non-target countries and value chains have access to the relevant knowledge and possess functioning value chain platforms.&lt;br&gt;The Livestock and Fish program should therefore document and disseminate experiences on the operation of multi-disciplinary research teams for the international community.</td>
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<td><strong>From intrinsic changes and connections to adoption of the innovations</strong>&lt;br&gt;It is anticipated that program activities will lead to changes in public and political awareness and will lead to the introduction of policies that facilitate the adoption and consumption of the IPG. Changes are also anticipated in the business practices and service provision systems of private sector and civil society actors, and partnerships among all partners will become more collaborative in nature.</td>
<td>Key assumptions underpinning the adoption of IPGs:&lt;br&gt;That the research outputs on behavioural changes are relevant to non-target countries;&lt;br&gt;That national governments and the private sector have the desire to adopt and use the IPG;&lt;br&gt;That there is capacity in non-target countries and value chains to make the IPG fit into their specific cultural, socio-economic and institutional contexts;&lt;br&gt;That institutional innovations lower economic coordination risk and transaction costs.</td>
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<td><strong>From adopting innovations to delivering increased productivity</strong>&lt;br&gt;It is essential that the implementation of appropriate innovations promotes progress towards achieving expected outcomes. As stated in the project proposal, these will include sustainable food security, reduced poverty levels and improved nutrition and health among target populations.</td>
<td>Key assumptions underpinning scaling up:&lt;br&gt;Lessons on how the innovations work are available and appealing to international communities; and&lt;br&gt;Scientific impact studies are made available and convincing to the international community.</td>
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**M&E proposed areas of inquiry/indicators**

The Livestock and Fish program proposal lists the various indicators that need to be monitored and evaluated:

- The existence of inclusive and multiple actors with diverse capabilities, capacities and skills;
- A collective understanding of critical issues and possible options for addressing them;
- The research addresses key constraints and opportunities agreed on by the platform actors in the context of entire value chains;
- The existence of multiple-actor value chain system learning and action platforms;
- A research process that is multidisciplinary and participatory;
- Institutional and human capacity building in which all the actors and stakeholders can effectively participate and;
- Relevance of the pro-poor technologies to the target populations.

Tools and indicators for M&E should be documented and packaged for the consumption of the international community.

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<th>Level of M&amp;E</th>
<th>Areas of inquiry</th>
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<td>M&amp;E multi-stakeholder value chain platforms</td>
<td>M&amp;E will answer the following questions:</td>
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<td>The Livestock and Fish program uses multi-stakeholder research teams to produce and/or deliver the IPG. It is therefore important to monitor the functioning of the research team</td>
<td>How well are the platforms functioning?</td>
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<td>What are the platforms’ outcomes? For example, what has changed in terms of knowledge, functionality and purpose?</td>
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<td>What is the nature, usefulness and inclusivity of the research and development activities of the platform?</td>
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<td>To what extent is the research team facilitating both action and learning?</td>
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<td>To what extent are the challenges being dealt with clear to every member of the platform?</td>
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<p>| M&amp;E of program level activities and processes     | M&amp;E will answer the following questions:                                         |
| At the program level, it is important to monitor activities aimed at solving a given problem. | What are the technologies and innovations being promoted?                        |
|                                                  | What is innovative about them? How are these innovations responding to markets, increasing productivity and addressing natural resource management issues? |
|                                                  | What are the methods and approaches being used?                                 |
|                                                  | What is innovative about them?                                                  |
|                                                  | What policies are supporting or inhibiting the process?                         |
|                                                  | At this stage, the purpose of M&amp;E is largely to document the nature of the IPG being generated or promoted. It is also important to develop evaluation criteria or indicators to determine the relevance, effectiveness, efficiency and impact of the IPG, as well as what people like about the innovation and what they do not like. |</p>
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<td>It is important to periodically monitor expected and observed changes in the behaviour of farmers, platform actors, government officials, private sector participants and other organizations involved in multiple actor platforms. It is necessary to develop indicators to measure outcomes generated through project activities. Such indicators include: changes in mind-sets among interdependent actors in terms of knowledge, understanding discourse, vision, attitude, emerging relationships and linkages developed.</td>
<td>What factors are influencing positive and negative behavioural changes? What factors are promoting desired changes? What is contributing to undesirable changes in behaviour? What other changes demonstrate the achievement of progress indicators?</td>
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<tr>
<th>M&amp;E of program activities and processes driving productivity</th>
<th>M&amp;E will answer the following questions:</th>
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<td>M&amp;E of program activities and processes driving productivity</td>
<td>Who is using the innovations? What is the number of households; types of households (female-, male- or child-headed) and what is their scale of use? How has access to these innovations changed for households? How has it changed for male and female farmers? What are farmers’ perceptions of the innovations? To what extent are the achievements of changes/outcomes influenced by external contexts and other factors?</td>
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<th>M&amp;E of farmer/field level processes and outcomes</th>
<th>M&amp;E will answer the following questions:</th>
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<td>At this stage, M&amp;E should focus on the knowledge generated and behavioural outcomes at the household, community and market levels.</td>
<td>Changes resulting from the use of innovations (productivity, profitability); Increased returns on investments; Changes in technical and allocative efficiency of agricultural production; Evaluation of the technical efficiency of the different innovations and the advantages/disadvantages of the innovations in different regions and countries, as well as the adaptability of those innovations to different contexts; Capacity building initiatives (such as training) evaluated in terms of number of training programs carried out, usefulness of trainings, timelines of trainings and their reach (e.g. by gender); After-action reviews should be undertaken to examine what has been achieved, what was done well, what did not go well and what changes should be made to ensure that the process functions effectively in the future; A review of the extent to which the overall theory of change has been effective in bringing about lasting change; The impact the project has made on people’s lives (e.g. who it has benefited, how it was beneficial, and whether these impacts were relevant to beneficiaries’ needs); The extent to which the project contributed to the achievement of local, national and international policies, conventions and targets (such as the Millennium/Sustainable Development Goals) as well as whether there have been changes in the policies, practices and attitudes of decision makers and</td>
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policymakers that benefit the project’s target groups.
To effectively evaluate field level outcomes, it is important to establish (via surveys) baseline and endline conditions and to describe the characteristics of the target beneficiaries.

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<th>M&amp;E during the scaling out of the IPG</th>
<th>M&amp;E will answer the following questions: The desirability and feasibility of the IPG outside the test environment; Factors (political, social, economic, institutional and cultural) that support and/or inhibit successful scaling up and out; How the IPG is impacting natural resources; and which knowledge works and which does not work in the new geographic location.</th>
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<td>None of the documents reviewed showed how to monitor uptake or how to evaluate the performance of project or program activities outside the test environment. In some projects (such as the SSA CP) there is a strong claim that IAR4D is spreading. However, there is no structured way of monitoring whether the IAR4D in non-target countries and value chains is based on uniform principles, nor is there a stated means of evaluating its performance outside the target environment.</td>
<td></td>
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