Experiences of Outcome Monitoring in the CGIAR
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Summary
Monitoring the outcomes of CGIAR research was part of the Performance Measurement System (PMS) that was experimented with in the CGIAR between 2005-2010. An outcome indicator was designed to (i) encourage Centers to invest in monitoring and documenting outcomes across their entire research portfolio; and (ii) characterize annually a limited number of outcomes resulting from Center research. In 2008, the Independent Review of the CGIAR[2] found the outcome cases to be a rich, still evolving, set of data, worth further analysis. This paper presents a summary of the characterization and analysis of the observations and results over the five years of the PMS when outcome cases were recorded. Lessons are drawn from the PMS experience for designing monitoring of results of the CGIAR Research programs (CRP). Examples of outcome cases that received high scores in the CGIAR Science Council's (SC) assessment are given. During the PMS process, 367 acceptable outcome cases were submitted that spanned the main areas of CGIAR activity and were representative of the diverse research portfolios of the Centers. The outcome cases were assessed by the SC. While the scores of the cases improved over the years, in the final year of the PMS nearly half of the cases were still judged by the SC to be poor to mediocre, and the evidence supporting the cases was largely anecdotal rather than based on studies conducted by the Centers to document outcomes. It is, however, noteworthy that both the outcome cases and the impact studies submitted for the PMS were similarly distributed across the CGIAR research areas, which reflects intent to monitor short- and longer-term results across the research portfolios. It appears that the requirement for outcome reporting may have provided certain discipline for Centers to orient their planning better towards outcomes.

In the reformed CGIAR, monitoring becomes a responsibility of management and it is increasingly focused on the outcomes, and intermediate and long-term impacts resulting from research activities. For outcomes, it can be concluded that a single common annual indicator for all types of research is not optimal. A narrow definition of the variable to be reported (here outcome), and strict instructions for the reporting may divert Center or program attention from accumulating evidence for outcomes along the impact pathway of their key activities. They may, instead, report cases of merely anecdotal value to satisfy the reporting requirement. Not all research leads to outcomes, and no standard reporting requirement will fit all research. For germplasm improvement, early outcomes are difficult to define in a meaningful way but variety adoption and productivity increases are relatively easy to monitor and document. In contrast, for NRM research, for instance, which often is done in partnership with users, it is easier to monitor outcomes at the early pilot-like stages of research while subsequent adoption, particularly of scale, is more difficult to gauge. It is also important to note that an indicator which cannot measure outcomes, but is only an approximation, cannot replace well conducted studies that document the volume and significance of actual outcomes. More attention is needed, in terms of resources and methodology development, for stimulating high quality studies to document use and adoption of research and the subsequent changes towards impacts.

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[2] CGIAR Independent Review Panel. 2008. Bringing Together the Best of Science and the Best of Development. Independent Review of the CGIAR System. Report to the Executive Council. Washington, DC.

Attention to outcomes

Outcomes, which for the PMS purpose were defined as the use and adoption of research results by the intended clients and influence from the results, are the first critical step on the path towards achieving longer-term impacts. Outcomes confirm the relevance of research. They can be enhanced by involving most appropriate partners in the research and development activities and by strengthening capacity for research, institutions, policy and national ownership.

In the new CGIAR, those engaged in research—and those funding it—have declared a shared responsibility for managing toward outcomes and to documenting them, i.e., the uptake of outputs resulting, ultimately, in longer-term improvements of the livelihoods of end-users. High importance is given to impact pathways that set targets for delivering results and present the theory of how the research results lead to longer term impacts on CGIAR's strategic goals. In a culture that focuses on impacts, there is an obligation to monitor outcomes—including near term changes—and to document them. Good outcome documentation conveys qualitative information about the crucial interface of successful research and the use of the results by their intended users.

The CGIAR's new research programs are governed by performance contracts and outcome monitoring remains an essential part of monitoring and evaluation. However, all research does not lead to outcomes. It is the nature of research that it doesn't always succeed or give the results expected. Outcomes may take a long time to accumulate and, alternatively, there may be unexpected outcomes through serendipity. In several areas of research (for instance research deliverables with highly complex or long impact pathways or high dependency on individual circumstances, such as results from policy or environmental research), outcomes and early impacts may be the most feasible stage at which to predict potential long-term impacts which themselves may be difficult to quantify and attribute.

Lessons from outcome monitoring in the CGIAR

In the past few years, planning for outcomes became more explicit in the Centers' Medium-Term Plans (MTP) than it had been before. Reporting outcomes became a requirement in the CGIAR's Performance Measurement System (PMS) launched in 2005. The outcome indicator, designed by the CGIAR's Science Council (SC), integrated the characterization of a certain number of outcomes annually (not all theoretically possible outcomes) and an obligation for Centers to invest in monitoring and documenting outcomes across their research agenda. [3] The outcome cases submitted by the Centers were assessed by the SC for the clarity of the case attributing the outcome to the research done; for the significance of the case for potential impact, and for the strength of evidence supporting the case.

In analysing the submissions and results of the past PMS exercise for outcomes, and linking them with the results of the impact culture indicator, the aim was to present a synthesis of (i) how well the outcome reporting requirement was applied across the research portfolios; (ii) the differences existing between different research areas; (iii) the consistency of the findings on outcome cases with what then could be concluded from the impact reporting; (iv) examples of cases of "good" outcome reporting under this scheme; and (v) lessons to be drawn for future outcome monitoring.

[3] For the purpose of indicator reporting and assessment, outcome was defined as "use, adoption or influence of research results", not the consequential changes in state or behaviour, which became part of the impact indicator.

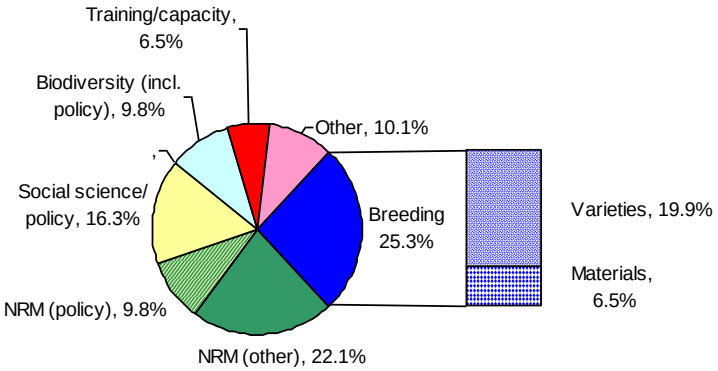
The outcome indicator was created to stimulate the Centers to identify carefully the intended users and beneficiaries of their research results and to orient the research accordingly; to determine how technologies and other research output are used; to analyse which conditions influence the use and adoption of the results; and, to determine what role the Center has in the uptake process *vis a vis* its partners. Tracking successful outcome cases was considered as a reasonable measure of outcome performance that reflects progress in that part of the impact pathway for which Centers and their partners can be held accountable. It was intended to provide useful results-based assessment that integrates research outputs with other activities still under the control of the Center, such as capacity strengthening, partnership management, advocacy etc. for increasing the plausibility of impact. There was anecdotal feed-back to the PMS that some research leaders found the focus of this indicator helpful. In some of the CRP proposals reference has been made to the outcome indicator as a potentially useful measure and practice to follow. However, in the PMS, the definition of what counts as an outcome case was very narrow in order to place emphasis on specific, easily tractable interventions rather than a larger body of research, and to differentiate uptake and adoption from early impacts. Furthermore, outcomes were expected at equal intervals, annually, from all kinds of research. Thus there was the criticism that the definition was too narrow—discriminating against cases where major uptake of results may take several years. A mechanism of external design and review also detracted from developing monitoring as part of the management process and responsibility.

Results from outcome tracking

Distribution of outcome cases across activity areas

Centers were encouraged to submit outcome cases that covered all or most of their research activities presented in the MTPs, such as crop improvement, natural resource management (NRM), policy and capacity building. The distribution of outcome cases across activity areas is shown in Figure 1.

Figure 1. Distribution of outcome cases across activity areas (2006-2010)



Over the period 2006-2010, the CGIAR Centers submitted 367 acceptable outcome cases (93% of all cases submitted) that span different research areas[4].

Outcome areas by Center

The recommendation for Centers to monitor adoption, use and influence of their results across the project portfolio is reflected by the diversity of outcome cases submitted over the years by each Center (Table 1). The outcome cases submitted by CIP, ICARDA, ICRISAT, IRRI and IWMI, in particular, represent well the spread and balance of the Centers' research and training activities. Some Centers placed a heavy emphasis on their main research area leaving other areas with less attention. Such areas were, for instance, capacity building and genetic resources activities that several Centers had invested in and included in their plans but they didn't include any outcomes for those areas in their submissions. Among the Centers with major plant breeding programs, a large majority of the outcome cases submitted by CIMMYT and IITA related to plant breeding activities. In addition to IFPRI, several other Centers reported outcomes on policy (CIFOR and IWMI on natural resources policy, Bioversity on genetic resources policy and ILRI on livestock-related policy). Nearly all Centers reported some outcomes based on NRM research.

Table 1. Center reporting of outcome cases on main activity areas (% of cases)

	Breeding	Training/ capacity	NRM	NRM-policy	Social science/ policy	Genetic resources (incl. policy)	# of cases*
Africa Rice	52.9	23.5	-	-	11.8	-	17
Bioversity	4.3	-	4.3	-	-	82.6	23
CIAT	40.7	-	18.5	-	22.2	3.7	27
CIFOR	-	4.3	21.7	60.9	8.7	4.3	23
CIMMYT	67.9	10.7	10.7	-	7.1	-	28
CIP	16.0	20.0	20.0	-	16.0	12.0	25
ICARDA	37.5	4.2	29.2	-	12.5	8.3	24
ICRISAT	40.0	4.0	28.0	16.0	-	4.0	25
IFPRI	-	7.1	-	-	85.7	-	28
IITA	62.1	3.4	3.4	-	13.8	3.4	29
ILRI	-	3.7	18.5	7.4	40.7	3.7	27
IRRI	42.3	7.7	19.2	3.8	-	15.4	26
IWMI	-	4.3	56.5	30.4	-	-	23
World Agroforestry	4.8	9.5	57.1	19.0	-	9.5	21
WorldFish	-	-	57.1	19.0	9.5	4.8	21

* Includes 10% of cases in other than these major areas. Total excludes 30 cases that the SC did not accept as outcomes.

Activities to enhance outcomes

Outcomes may accrue as temporal events. There are many ways that Centers can pursue to ascertain that the research results will more likely be useful and used leading eventually to impacts. Some form of such outcome enhancement or "embedding" was described in two thirds of the cases. The most common forms of embedding were collaboration with intended users during the research process; demonstration, promotion and advocacy of the research

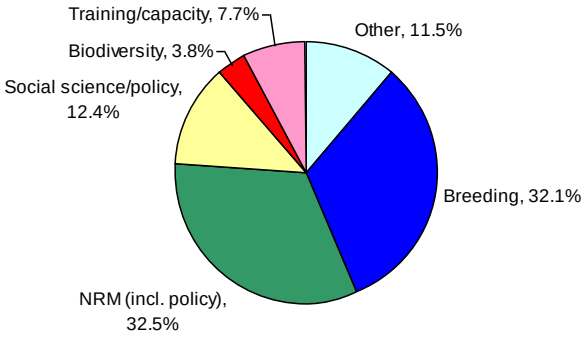
[4] An outcome database was compiled by the ISPC Secretariat and characterized by type of research that led to the outcome and whether there was some form of embedding the research (collaboration or participatory research with those intended to use the results; promotion, advocacy, facilitation, demonstrations or training directed to the intended users).

results; and training of the targeted users of research, including farmer field schools. Embedding was more often linked to cases where the outcome was reported for a single or a few individual countries rather than when the outcome was global by nature. For instance, IRRI, when working on the alternate wetting and drying technology, for which outcome was reported in three Asian countries, trained NARS in the technology and operated through networks of participatory research, which also developed extension materials. ILRI's outcome on networks distributing forage planting materials documented in two East-African countries involved collaboration with the national programs, provision of seeds and cuttings, training and promotion.

Outcome cases compared to impact studies

Comparing the distribution of outcome cases across different areas of activity with the distribution of impact studies tells us something about the commitment to and consistency of monitoring results across all areas of research. Figure 2, based on the studies accepted by Standing Panel on Impact Assessment (SPIA)[5] as impact studies, shows a rather similar distribution as for outcome cases in the same period[6].

Figure 2. Distribution of SPIA accepted impact studies across activity areas in Center PMS submission (2006-2010; N=234)



Breeding and NRM (including policy) were the predominant research areas also among impact studies. Social science/policy, training and capacity building, and genetic resources were less common topics among impact studies than among outcome cases. Centers appear to have attempted to cover their research portfolio both in selecting outcome cases for the PMS and in conducting studies on impact. It is, however, worth noting that about 30% of all the impact studies submitted by Centers were not accepted by SPIA (as they were not judged to be about *ex post* impact). Centers may have been influenced by the donors' desire to receive impact reports on short-term, bilaterally funded projects, and this kind of tendency should be discouraged. In the recent Social Science Stripe Review that covered social science activities across all the CGIAR Centers, the Centers were criticized for producing large

[5] Standing Panel on Impact Assessment (SPIA) is a sub-group of the ISPC (previously of SC) focusing on *ex post* impact assessment of CGIAR research. SPIA was responsible for designing and managing the impact culture indicator of the PMS.

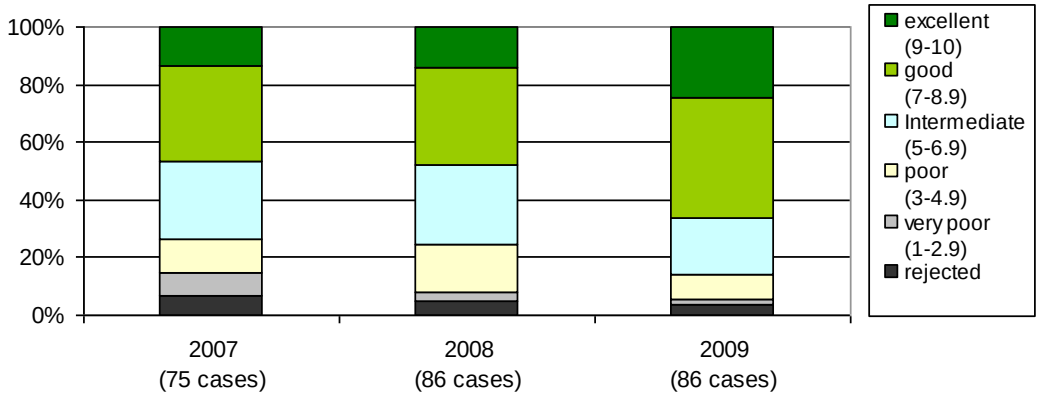
[6] The impact culture indicator emphasised commitment to monitoring and documenting impacts achieved. For one component of the indicator Centers listed their impact studies for the reporting year. During 2006-2010 Centers also identified a total of 58 "best" impact studies that were scored for rigor through peer review. Figure 2 reflects the primary areas of reported impact.

numbers of poor quality impact studies, which in SPIA's judgement would not even qualify as impact studies. An underlying assumption in designing these indicators for outcomes and impact culture was that a strong commitment to document results, i.e. outcomes and impacts *ex post*, is likely to be correlated with actual impact of a Center. However, it is not possible to conclude how well these result on outcome and impact cases reflect *actual* impacts and the scale of those impacts towards the CGIAR's longer-term goals. Neither indicator attempted to quantify or assess the volume and significance of outcomes and impacts along the impact pathway. That is a task for rigorous, purposefully designed and scheduled studies.

Assessment of outcome cases and results

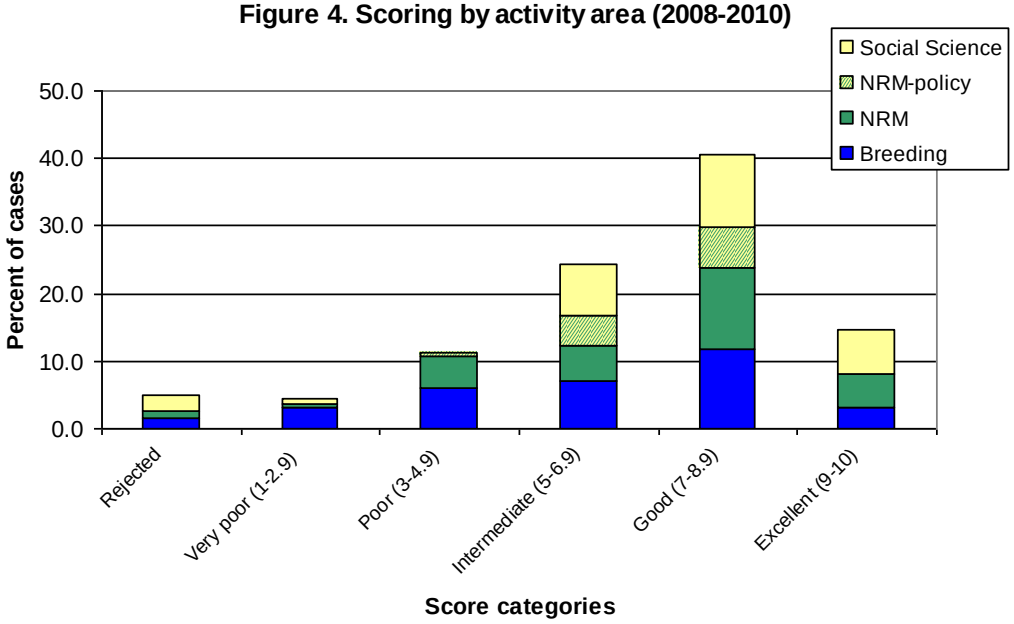
To assess the quality of the outcome cases, the Science Council developed a 10-scale scoring system that focused on the following aspects: linking the reported outcome to Center research described in the MTPs; specificity of the output and its use/adoption; clearly documenting both the outcome and the outputs that the outcome resulted from; significance of the outcome; and international public goods nature of the research in terms of broad applicability of the results across locations. Center feed-back and experiences from the initial years of the PMS were taken into account. This scoring was applied only in 2008-10 and therefore it is not possible to show 5-year trends for the outcome indicator scores. Centers were also given a possibility to replace an outcome case judged unacceptable. Figure 3 illustrates how the quality of the outcome cases evolved over three years as reflected by the scoring.

Figure 3. Change in outcome scores (2008-2010)



Although there was some improvement in the outcome scores over the years (Figure 3), the SC in its annual commentary on the results concluded that the cases in general were not based on studies to explicitly assess and document outcomes and progress along the impact pathway. In many cases the evidence was anecdotal. The SC also observed that the cases were a mixture of mainstream research and somewhat marginal activities and varied a great deal in scope and scale. Nearly half of the cases in 2008-10 were judged to be intermediary or poor in quality or unacceptable. This suggests that outcome monitoring was not seen fully as part of an explicit monitoring and evaluation plan of research. In the CRPs this should change, and outcome monitoring should be planned in concert with program planning, systematically conducted and sufficiently resourced. Reporting should be based on rigorously conducted studies that give a credible estimate of outcomes including their significance and volume, lack of them, or unexpected outcomes.

Figure 4. Scoring by activity area (2008-2010)



The scores reveal some differences between the main areas of research (Figure 4); breeding, NRM (including policy) and social science. Less than a third of the excellent cases (score 9-10) were related to breeding while breeding cases accounted for nearly 60% of those given low scores (0-4.9). This relatively poorer quality of the outcomes cases related to breeding is likely explained by the fact that breeding results, adoption and uptake follow often from a long-term pipeline activity and it is difficult to determine a clearly identifiable research intervention that led to the outcome. Thus it reflects a weakness of the indicator. In the PMS, the outcome indicator was very narrowly described for three reasons: to make it unambiguous; equally applicable for all Centers; as well as discreet from components of the Impact culture indicator that was based in part on assessment of impact studies conducted. SPIA's quality assessment of the impact studies that were submitted did not reveal similar differences, although the majority of the rejected cases were on NRM.

The best outcome cases that scored well in the peer-assessment can be used for demonstrating success (by the Center and *de facto* by the System) and for learning lessons for designing outcome pathways in future programs. However, only studies conducted at a sufficiently long interval after the research intervention can show the potential scale of the desired changes and reveal trends of adoption and de-adoption, which also may occur. The obligation to make outcome reports public and subject to donor consideration in and of itself is likely to improve the care with which outcome cases are monitored and documented and, more importantly, how research is planned for outcomes, and lessons are learnt.

Examples of outcome cases across activities in the CGIAR

The best outcome cases provide likely success stories from the CGIAR System and are candidates for leading to major impacts. In 2008-2010, 55 % of all the cases submitted were judged as good or excellent. These cases were well documented with clear output-outcome linkage and evidence of the outcome. They can be considered credible success cases across the Centers. The following 12 cases extracted from Center PMS submissions were judged as excellent and represent outcomes related to different activity areas.

Creating value for cassava farmers through a public-private partnership

The research that led to the outcome was planned in CIAT's Medium-Term Plan 2005-2007. CIAT's research was aimed to generate and confirm high and low amylase content in roots from selected clones. This led to the discovery of amylase-free starch mutant in cassava (*J. Agric. Food Chem.* 2007**,** 55:7469-7476). This generated interest in national and multinational cassava starch producing companies for industrial uses. The collaborative agreement between CIAT and a USA-based company has led to further research and evaluation of the new cassava type. The aim is to create new uses for cassava as a cash crop with added economic value to benefit cassava farmers. The company involved has a track record for developing nature-based ingredients for food and beverages and on contracting country farmers for producing the raw-material. Through the collaboration agreement, use of cassava starch will be broadened to applications currently dominated by maize. The case was judged to represent an early outcome from a novel research output with potential for wide-spread impact.

Towards a sustainable seed system for orange fleshed sweetpotato in Mozambique

CIP's research was designed to address constraints observed over recent years to massively and sustainably disseminate planting material for orange fleshed sweetpotato (OFSP). The output target, described in MTP 2008-2010 was to determine sweetpotato growers' willingness to pay for OFSP vines through feasibility studies. It was part of the Reaching End User project of the Harvest Plus Challenge Program aimed at scaling out dissemination of OFSP in Mozambique. The research results were used by World Vision International to establish a more sustainable seed system for OFPS. The research showed that farmers are willing to pay for sweetpotato planting materials if they can be sure of the high quality of the material. This in turn can create incentives for private vine multipliers and thus makes large scale production of high quality planting material possible. Subsequently World Vision's introduced a "purchase only" policy option, which resulted in over a third of targeted beneficiaries paying on average 25% more than was the subsidised price for centrally produced vines. The research results and experience can be used in other countries, initially particularly in the region where World Vision works. A recent publication provides more information (*British Journal of Nutrition 2011, Oct 10:1-14*). The case was judged to show clearly the link from CIP's research combining policy and sweetpotato biology to the outcome with an international partner organization.

Wide adoption of Pearl Millet Hybrid "HHB 67 Improved" developed through marker-assisted breeding

The research that led to the outcome was part of ICRISAT's Mega-Project of Improving Agriculture in the Asian Semi-Arid Tropics. The output described in the MTP 2006-08 was described to be advanced breeding lines and hybrid parents of pearl millet with high grain and stover yield, downy mildew resistance and adaptation to diverse agro-ecologies. Pearl millet is grown for grain and stover in the hottest and driest areas of Africa and South Asia. ICRISAT, together with its partners, developed a pearl millet hybrid 'HHB 67 Improved' through marker-assisted breeding. The variety was released in 2005. The new hybrid has 5-10% higher grain yield than the original and is more resistant to downy mildew disease, which is the most important pearl millet disease. In 2008 large-scale seed multiplication of 'HHB 67 Improved' was taken up in one state in India and the figures on the demands of the parent lines and the hybrid seed suggest that the area under cultivation in several states is rapidly increasing. The case was judged to be clear description of novel research, fast development of the new variety and evidence of adoption which is taking place in India already in reasonable scale.

Development and use of Cowpea Genomic Resources

IITA, together with its partners, expanded the expressed sequence tags (ESTs) resources for cowpea by sequencing ESTs from drought-stresses and non-stressed drought tolerant and susceptible cowpea lines. The research contributed to an output described in IITA's MTP 2005-07: *Biotechnology tools developed and applied for germplasm management and crop improvement*. The ESTs are a valuable resource for research laboratories for developing new tools for cowpea biotechnology research. The sequences were submitted into GenBank, the US National Institute of Health genetic sequence database, which is an annotated collection of all publicly available DNA sequences. The EST dataset has been used for research on cowpea genetics. For instance, cowpea gene expression under stress of the parasitic weed, Striga, has been analysed. Other genomic tools developed with help of the IITA generated ESTs have been used for genotyping drought breeding germplasm in African cowpea breeding programs, and reference sets from IITA's global cowpea collection. The data that can be generated is important for research on cowpea genetic resources and breeding for drought tolerance. The case was judged as showing early outcome from accurately referenced output of international public goods nature.

Alternate wetting and drying adopted in South and Southeast Asia

IRRI's research on alternate wetting and drying (AWD) of land under rice production dates back to late 1980s. Systematic research with partners in the Philippines, and subsequently in China and Australia was described in IRRI's MTP 2003-05 under an Output of: *Potential for water savings of three technologies (raised beds, alternate wetting and drying, and aerobic rice) assessed,* and subsequently in MTP 2006-08: *Synthesis of advancements in development of water saving irrigation technologies.* The research involved in-depth understanding of water x nutrient interactions under AWD, optimising AWD scenarios, role of policies and infrastructure and farmer adoption patterns. Farmer participatory and adaptive research in target regions in Asia led to positive results for safe AWD where 15-30% of irrigation water is saved without significant yield loss. Training was organised through the Irrigated Rice Research Consortium, and extension materials were developed. In many countries, R&D programs were started on AWD and an expanding number of agencies with extension and dissemination mandates became involved. Throughout 2005-2010 large scale diffusion of AWD occurred through extension and new partners taking up the technology and incorporating it into their outreach activities. Additional information is available at: http://www.knowledgebank.irri.org/watermanagement/index.php/coping-with-water-scarcity/alternate-wetting-and-drying-awd. The ISPC judged this as a mature case with good underlying research and collaborative validation, and results spread in different countries.

Supporting water accounting methodologies and frameworks through the Spatial Data and Knowledge gateway Project (IWMIDSP)

The Data Storehouse Pathway (IWMIDSP) was described as a milestone in IWMI's MTP 2004-06 Project *Integrated Water Management for Agriculture*, and released to the public in 2004. This pathfinder received a Special Achievement in CGIAR award from the Environmental System Research Institute. It gives researchers access to state-of-the art data on land and water resources for river basins, nations, regions and the world. The use of this pathfinder is demonstrated by the large number of its registered users from more than 80 countries and the good rating it has received in user surveys. Some examples of the uses of the IWMIDSP include: water balance computation in Ethiopia, basemaps for hydrological studies in Ghana, redelineation of Indo-gangetic Plain in South Asia, climate data to stimulate food security and climate change scenarios in Jamaica, generation of tsunami rapid action maps in Sri Lanka, practitioner and university training. Recently IWMI has launched the

Water Data Portal (http://waterdata.iwmi.org), for comprehensive access to data including the IWMIDSP. This case was rated high because of the creative use of GIS in a unique research efforts, the convincing evidence of the outcome with clear linkage to the research and the breadth of application opened to users.

Contribution of research on biodiversity and logging to the science underlying ITTO/IUCN Guidelines

The outcome resulted from CIFOR's research output in MTP 2007-09 of *Identification of best practices, regulations, and criteria that will help to encourage the use of sustainable forest management (SFM) practices that are not currently widely adopted*. The research was used as basis for the revision of the guidelines of The International Tropical Timber Organization and The International Union for Conservation of Nature for the *Conservation and sustainable use of Biodiversity in Tropical Timber Production Forests.* CIFOR's research shows that under proper management, tropical production forests can be a major resource for conservation and complement protected areas. The earlier guidelines were nearly 20 years old and both conservation biology and status of local people and communities had changed thus making revision of such international guidelines necessary. CIFOR's main contribution to the guidelines was its synthesis of biodiversity-related concepts and implementation advice based on the Center's field experience in different parts of the tropics. The revised guidelines can be found at ITTO Web site http://www.itto.int/policypapers_guidelines/. This case was judged to represent significant international influence of CIFOR core research with strong international public good nature.

Population-Level Indicators of the Quality of Infant and Young Child Feeding Practices

The outcome resulted from IFPRI's research described over several MTPs, including Project on Diet Quality and Health of the Poor in MTP 2005-07 (Output target: *Develop and validate indicators of diet quality and of food security, which include measures of micronutrients adequacy in addition to energy adequacy*). It responded to the lack of guidance on standard indicators for measuring infant and young child feeding practices beyond breastfeeding. Lack of such guidance hampered progress in measuring and improving feeding practices, which constrained improvements in infant and young child nutritional outcomes. Five years of collaborative research led to development of a set of indicators of child feeding practices for global use in large-scale data collection exercises at the population level. These indicators were validated through a research-based, collaborative and consultative process and published in a WHO-endorsed publication. The indicators have been used by USAID, and by the Demographic and Health Surveys funded by it, and by several NGOs. WHO has incorporated the indicators into its Nutrition Landscape Information System. The case was judged to show clearly emerging international use and wide potential of indicators that resulted from important research.

Influence on revised EU novel Food Regulation

The European Union Regulation on Novel Foods that came to force in 1997 was found to present a non-tariff barrier for the importation of traditional food products. Scientifically based food safety evidence was required for minor species to be authorized in EU member countries and subsequently traditional products considered novel were withheld or confiscated at EU borders despite consumer interest. Bioversity's research addressed the risk that this situation could lead to diminishing biodiversity in markets and diets and hinder income generation. The output target in MTP 2008-2010 was *Strategies to enhance market competitiveness of at least 5 neglected/underutilised species developed and disseminated to partners*. The potential negative impacts were described in a journal article (*Food Policy 2009, 34:*

499-507). Bioversity's research resulted in a discussion paper that became much used in the subsequent policy debate. Bioversity also joined partner organizations and engaged in advocacy which eventually led to amendments to the regulation in 2010, which accommodate developing country concerns. These include redefinition of what is covered under novel foods and recognition of traditional foods as a distinct category where safety assessment is based on history of safe food use in the country of origin. This outcome case was judged to represent international public good and reflect Bioversity's unique strength combining knowledge of genetic resources and neglected or underutilized crops with international advocacy role.

Developing capacity in the application of biotechnological tools

ICARDA has responded to a demand in its mandate countries to increase the capacity of national programs to use biotechnological research tools. Activities have included targeted training, scientist-to-scientist exchanges and collaborative research programs. They contributed to an output described in the MTP 2007-09 of *Enhanced research capacity of human resources through training, workshops and conferences*. In 2007-2009 there were nearly 250 direct beneficiaries including young researchers, students, junior level scientists and technicians from 30 different countries. The capacity building has resulted in increase in the use of biotechnology tools, such as molecular characterization and diversity analysis, marker-assisted breeding, doubled-haploid techniques and tissue-based propagation protocols. The increase in capacity and research is shown in the number of journal articles and other scientific publications that report the results from research in national programs. The case was judged to be a good example of well targeted capacity building in important new technologies and careful monitoring by ICARDA of how the capacity is put to use.

Capacity building on animal genetics

The collaborative training program between ILRI and the Swedish University of Agricultural Sciences (SLU) was first described in ILRI's MTP 1998-2000. The outputs have included application of the animal genetics training resource (AGTR) developed by ILRI and SLU to strengthen and build the capacity of trainers in animal breeding from several developing countries in Asia and Africa. The program engaged in capacity building on AGTR by training trainers, national university lecturers and researchers in developing countries with the aim of helping countries to re-design their training courses and ultimately influence their national livestock policies and develop breeding programs for livestock improvement. Since 2000, some 140 university lecturers and researchers across 12 countries in Central and West Africa, 18 countries in Eastern and Southern Africa, 10 countries in South East Asia and 6 countries in South Asia have been trained by the project team. Feedback from participants in the courses and various institutions within developing countries indicates that several research organizations and higher education institutions across Africa and Asia are now utilizing new knowledge and skills from the programme and the Animal Genetics Training Resource. Examples include: new breeding policy in Tanzania, beef cattle improvement program in Malaysia, Dairy research program in Ethiopia, revised curricula in animal genetics in some universities; FAO guidelines for formulation of breeding policies for sustainable use and development of indigenous livestock. The most recent version of the training resource is available at http://agtr.ilri.cgiar.org/agtrweb/. The case was judged to have been built over a sufficiently long period for evidence to accumulate on capacity building outcomes.

Unilever and partners upscale the Novella initiative to promote the growing of improved Allanblackia germplasm by smallholder farmers in Ghana and Tanzania

Commonly found in the moist African rainforests, the Allanblackia tree has been used by villagers for centuries for cooking oil, medicine and timber. Two output targets in World

Agroforestry Center MTP 2006-08 addressed Allanblackia species: *Characterization of genetic structure and diversity of Allanblackia*, and *Technical manuals on locally adapted tree propagation and management techniques published*. The research included characterization of the genetic diversity, identification of superior traits and individuals, development of vegetative propagation methods, and strategies for multiplication of Allanblackia planting material. The Center became involved in a partnership in the novella project with Unilever and its international and national partners, including organizations engaged in nature conservation. The research has led to expansion of the planting of Allanblackia by small farmers. Unilever estimates that there will be sufficient product demand for planting 25 million trees by 2015. More information on *Allanblackia* and the novella project is available at: http://www.worldagroforestry.org/projects/allanblackia/pub.html. This case was considered a clearly described and documented case of an outcome that resulted from the Center's core research, innovative partnership (business and farmers) and use of appropriate indigenous knowledge. The business seems to respect need for smallholder development but makes the wide out-scaling very probable.