Scholarly Publishing Initiatives at the International Rice Research Institute:
Linking Users to Public Goods via Open Access

Albert Borrero, Mila Ramos, Anna Arsenal, Katherine Lopez, and Gene Hettel
International Rice Research Institute
Los Baños, Laguna, Philippines

Abstract

Scientists at the International Rice Research Institute (IRRI), based in the Philippines, generate a huge volume of research results emanating from multi-donor-funded projects on rice and rice-related subject matter. In rice research, as in other fields, there is a strong push to provide free open access to these vital information resources in a variety of modes that are convenient to researchers located in both the developing and developed world. The main objective is to disseminate, as widely possible, the results of IRRI's research on rice, a crop, which feeds nearly half of the world's 6.6 billion inhabitants.

Currently, some instruments for open access are already in place at IRRI, such as links to full-text publications posted on the institute's Web site (**www.irri.org**), especially via the Library branch site (**http://ricelib.irri.cgiar.org**), the Rice Knowledge Bank (**www.knowledgebank.irri.org**), and publications catalog (**www.irri.org/publications/catalog**). The joint initiatives of the Library and the Institute's main science publishing units, particularly the Communication and Publications Services and the Training Center, typify a convergence of practices in information and publishing management to overcome hurdles that both activities face.

This paper demonstrates how the links between these two fields in the middle of the scholarly publishing chain can bridge the gap between public goods (knowledge about rice in this case) and the intended primary users, namely researchers and extensionists in the national agricultural research and extension systems (NARES) in the developing countries that IRRI serves.

This paper also discusses the publishing processes and models in a donor-driven international research organization that delivers public goods. To meet their missions, organizations such as IRRI must seek a range of demand and supply models for the scholarly publications in their supply chain. Open access publishing is one model—among others—to adopt. But first, the onus is to overcome obstacles such as intellectual property rights, dwindling funds, and connectivity to name just three major ones.

Donors, IRRI's NARES partners, governments, and finally rice farmers and consumers expect public institutions such as IRRI to create and share information for the common good. Public institutions are currently caught up in an information delivery transition from traditional paper to electronic files over the Internet. Even though we are in the digital age, not everyone is connected. Information that will provide impact to IRRI's constituent clients must be delivered to them through whatever open access form that is appropriate and useful, being it "cutting edge" digital versions or traditional "books-on-the-shelf" hard copies. This paper addresses this dilemma and will hopefully encourage thinking to optimize the enabling power that can be provided by open access publishing.

Introduction

Rice is the staple food for majority of the world's population, especially in developing nations. As the single largest source of food, employment, and income for millions of poor people, it is the most important economic activity on earth. It is because rice impacts on so many lives, especially in Asia, that the Ford and Rockefeller Foundations saw it prudent to create an international institute for rice research.

The International Rice Research Institute (IRRI) was organized in 1960 in Los Baños, Philippines, as a nonstock, nonprofit corporation (IRRI 1960. It was established at a time when there was fear of famine across Asia where most rice eaters are located. Compounding the threat of widespread hunger were (1) a rampant increase in the world's population – then projected by the United Nations to double from 2.8 billion in 1958 to 6 billion in 2000 – and (2) the steady depletion of land area suitable for rice growing.

Mandated to engage in international research and training, IRRI's mission was then—and is now—*to improve the well-being of present and future generations of rice farmers and consumers, particularly those with low incomes.*

IRRI and the Green Revolution

IRRI's first rice variety, IR8, with its high yield potential under correct management, together with the modern wheat varieties created by Norman Borlaug and his associates at the **International Maize and Wheat Improvement Center (CIMMYT)** in Mexico, constituted an agricultural breakthrough, which caused the great wave of optimism in the mid- and late 1960s about the ability to feed the hungry millions in the less developed countries. These developments were popularly hailed as the Green Revolution, the miracle that transformed agriculture (Chandler 1992)

Due to wider propagation of yield-improving technologies and intensified use of fertilizer, irrigation water, and other farming inputs, poor people throughout Asia and Latin America have had better access to less expensive food and today experience improved livelihoods (Maclean et al 2002).

Beyond "miracle seeds" and better techniques, however, the real driver of productivity was knowledge. Output was greater because of wider distribution of information and adoption of agricultural practices that had already been tested and fine-tuned by farmers in more developed countries. As such, the Green Revolution is, perhaps, one of the finest examples of the "knowledge for development" equation.

The importance of "knowledge capital" in development

In its 1998-99 World Development Report, "Knowledge for Development", the World Bank explained that poor countries suffer not only from insufficient financial capital but also from lack of knowledge. Specifically, there are two forms of knowledge-related problems that have affected many developing countries:

- *Knowledge about technology*: Also called "technical knowledge" or "know-how," insufficient knowledge about technology results in "knowledge gaps."
- *Knowledge about attributes*: To build an effective market, knowledge about attributes is also essential. What makes HYVs better than the seeds farmers are now using? Why

should extension workers be believed or trusted? Without such inputs, "information problems" will arise and may dissuade farmers from adopting new technology.

The Green Revolution is a good case in point. Developments in agriculture were taking place but limited to industrialized nations. Without organized efforts or the means to share any lessons or best practices with the less developed communities, there were knowledge gaps between and within countries.

When information was made available, localized, and then, adopted on a wide scale, yields increased, farmers' livelihoods improved, and crops such as rice became more accessible and affordable. The report also claimed that productivity gains would have been even higher had other knowledge-based problems been identified and addressed substantially at the time. As an example, it referred to a study that found an average loss of 400 percent in potential farm income due to ineffective implementation of HYV seeds and techniques.

The World Bank report also stressed the importance of training, research and development, and assistance from both international and national institutions. Indeed, the Green Revolution succeeded because of collective action among funding agencies, national governments, nongovernmental organizations, and nonprofit research and training institutions. Furthermore, the public nature of funding allowed the HYV seeds, information, and technologies to be distributed as common goods.

Knowledge as a global public good

HYV technology spread well and fast because of its nature as a public good – the same practices that were being taught in the farms of India were also being acquired by farmers in the Philippines (*nonexcludability*); successful application of techniques in one area did not take away from implementation in another location (*no-rivalrous consumption*). Because of this, the full advantages were captured by society at large and not just by the instigators of the Green Revolution – like IRRI, as the developer of IR8, for example – or by those who can afford to use it, had it not been freely available.

While seeds were provided free of charge, there was still a cost involved in the distribution of information about the new varieties and farming techniques. And because the Green Revolution was not a profit-driven venture, not much private funding was available for meeting the need and demand, especially in far-flung rural fields. It therefore necessitated the creation of a new link in the chain.

Once HYVs and related technologies proved feasible, many countries in poor regions set up national agricultural research and extension systems (NARES) dedicated to the pursuit of agricultural development (World Bank 1999). These agencies were tasked to disseminate seeds, varieties, and methodologies and to adapt them to local conditions by working directly with farmers and farmer organizations. In effect, NARES helped bridge the gap between knowledge producers and consumers.

How IRRI delivers knowledge for impact

Today, to a certain extent, IRRI's value chain utilizes the same hub-and-spoke structure that was fashioned during the Green Revolution (Porter 1985). Because of the scope of the organization's work – where a single program can be located in multiple countries – its research-to-delivery process (IRRI 2001) will be most effective by engaging donor institutions, NARES partners, advanced research institutes (ARIs), and other collaborators (Box 1).

In terms of total dollar investment, this business model for international centers and organizations has been shown to generate positive returns (Raitzer 2003). At IRRI, the formula has worked especially well in three key areas:

1. *Assessing user needs*: Without the assistance of local partners that have a direct line to their constituents, IRRI would be unable to determine the real needs of farmers and then, derive the appropriate technologies and tools to develop through research.

Box 1 - Delivering knowledge for impact

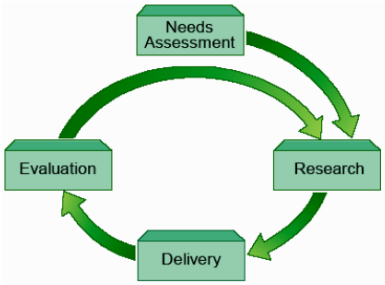


Figure A. Basic/Strategic/Applied/Adaptive activities
(from *Delivery for Impact: The Dissemination of Rice-Related Knowledge and Technology, 2001*)

1. **Needs assessment**. IRRI staff defines the research problem with local scientists and farmers. It is important at this stage to recognize problems, even symptoms of problems, and the needed interventions or research. This occurs at the national and field levels.
2. **Research**. The appropriate research activities are designed and conducted, after identifying knowledge gaps and solutions.
3. **Delivery**. Research information and technology are delivered, in collaboration with trainers and local knowledge experts. IRRI also derives feedback from the intended beneficiaries. The delivery mode combines content, process, and local knowledge. It involves the relevant stakeholders – content experts, process facilitators, and personnel experienced in the local system of knowledge.

Figure B. Information components of IRRI's delivery framework

4. **Evaluation**. IRRI seeks feedback, follows up with the project participants, and measures output, to determine the success of the initiative.

2. *Assessing user needs*: Without the assistance of local partners that have a direct line to their constituents, IRRI would be unable to determine the real needs of farmers and then, derive the appropriate technologies and tools to develop through research.
3. *Research and development*: To make sure it conducts research that is relevant, IRRI's processes must be inclusive and consultative.
4. *Delivering knowledge and evaluating impact*: For market efficiency, a producer should deliver its offering directly to its users. IRRI simply does not have the funds, manpower,

and other resources required to do so. Intermediaries like NARES and ARIs are indispensable players in this task.

Rice agriculture in the information age

Today, more than 75 percent of the world's poorest people still depend on rice. As the earth's population continues to rise, next-generation technologies are again needed, not only to increase yield, but to counter the effects of climate change and environmental deterioration. Moreover, globalization is breaking down national barriers and is changing not only the makeup of institutional structures but also the production and marketing dynamics in countries that grow and consume rice.

Three major upheavals in the last 10 years alone will impact how IRRI does its work:

1. *Cutting-edge developments in molecular biology and genetics*: With the publication of the rice genome sequence in 2005, IRRI scientists and their collaborators may soon be able to identify specific genes that can increase productivity, protect against disease; resist drought, and tolerate submergence; improve general human health and address specific nutritional deficiencies; and develop new cultivars and varieties. The finished genome sequence is also providing insights and serving as the blueprint for research on other major crops.
2. *Almost unlimited storage capacity for data*: Data management capacity will be progressively more important as the volume of rice-related research grows with time. Increased storage capabilities will allow the Institute to capture, manipulate, and manage the large amounts of data accumulated within its repositories, and perform complex computations and analyses needed for complex problems.
3. *New and improved technologies*: Information and communication technologies (ICT) are becoming more affordable and available to a bigger percentage of the world's population. Because of the distributed nature of IRRI's work – with offices in Asia and Africa and partners from all over the world – such advancements translate into more opportunities to communicate and disseminate information and creative ways to collaborate.

A new strategic plan for IRRI

Clearly, IRRI's research environment has changed since the Green Revolution broke out in the last century. Faced with a new development paradigm, in 2006, IRRI developed a new strategic plan (IRRI 2006) and retooled its corporate mission: *to reduce poverty and hunger, improve the health of rice farmers and consumers, and ensure environmental sustainability through collaborative research, partnerships, and strengthening of national agricultural research and extension systems.*

Towards this end, IRRI has identified five strategic goals for the next 9 years (2007-15):

Goal 1: *Reduce poverty through improved and diversified rice-based systems.*
Goal 2: *Ensure that rice production is sustainable and stable, has minimal negative environmental impact, and can cope with climate change.*
Goal 3: *Improve the nutrition and health of poor rice consumers and rice farmers.*
Goal 4: *Provide equitable access to information and knowledge on rice and help develop the next generation of rice scientists.*
Goal 5: *Provide rice scientists and producers with the genetic information and material they need to develop improved technologies and enhance rice production.*

Strategic Goal 4 – Bridging the knowledge gap in rice research

To provide equitable access to information and knowledge on rice and help develop the next generation of rice scientists – Goal 4 in IRRI's new strategy – by 2015, IRRI will strive to:

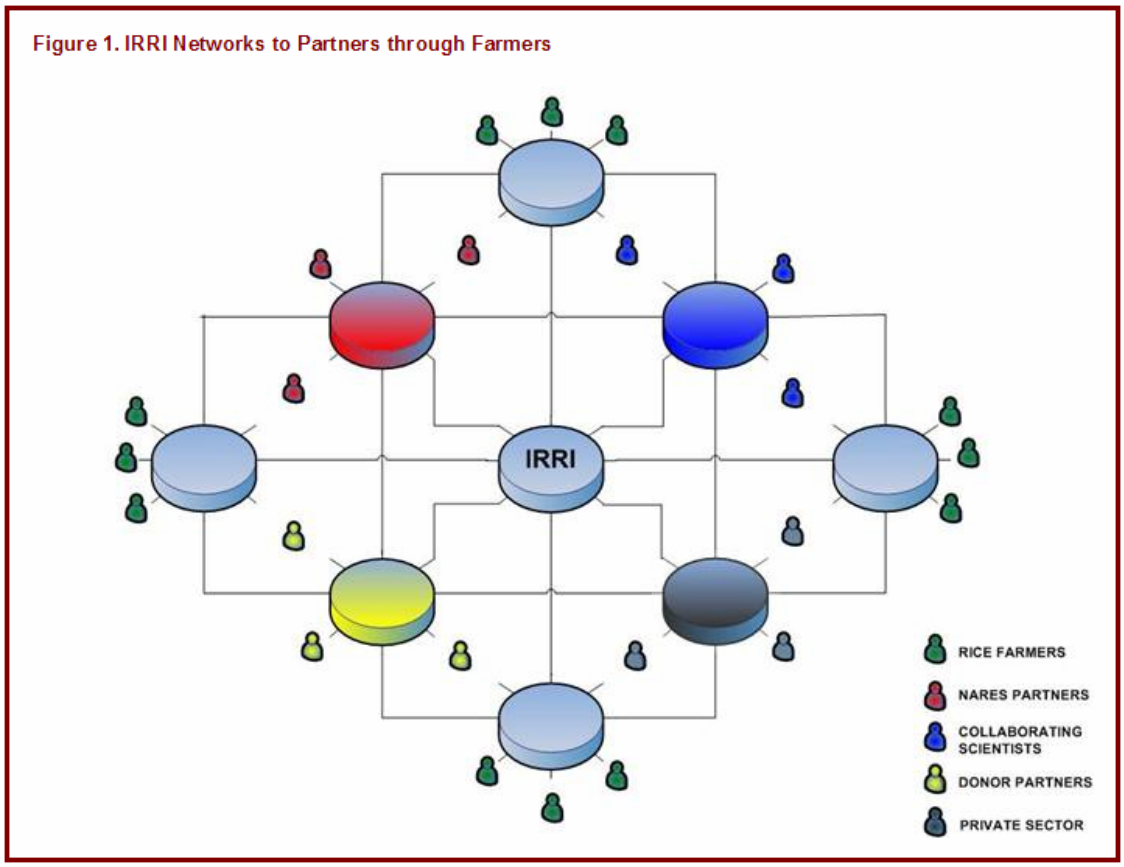
1. Provide optimum stewardship of, and access to, data, information, and knowledge about rice to help improve the lives of poor rice producers and consumers;
2. Serve as the convener of dialogues about rice science and development through a global hub for rice information; and
3. Build the next generation of rice scientists able to access and use appropriate information and technologies.

These three objectives seek to reach and benefit a wide range of beneficiaries – from crop scientists, development specialists, extension workers, farmers, and processors to policymakers, educators, students, and consumers. As the World Bank report pointed out, this long roster of stakeholders may translate to an even longer list of knowledge gaps and information problems.

On the other hand, the programs designed to execute Goal 4 can also pick up on the report's lessons. To increase the probability of success, the implementation program will leverage three of IRRI's strongest competitive advantages (Figure 1):

- *ICT infrastructure and capacity,*
- *Robust research and development through partnerships,*
- *Delivery of knowledge through scholarly communication and publishing.*

Figure 1. IRRI Networks to Partners through Farmers



Changes in IRRI's research paradigm: the role of partnerships

With the altered landscape, IRRI needs to be dynamic and flexible as an organization and its plans and programs more product and impact oriented. A change in paradigm becomes even more urgent, as the institution struggles to meet its mission with reduced donor funding, leaner manpower, and fewer resources.

Considering these, IRRI's research portfolio will now focus on next-generation technologies:

- Many research and extension agencies, especially those in Asia, now implement their own programs, often in cooperation with IRRI. Through training and technology transfer, the Institute will gradually devolve work on mature technologies to its NARES partners.
- As the environmental threat increases, IRRI will shift its attention from general farming system issues to rice diversification and climate change concerns.

Partnerships will be an increasingly important component of IRRI's strategies:

- Multinational corporations have already been investing in basic and applied agricultural research, especially on hybrid rice, and now enjoy higher yield gains through market-based approaches. IRRI is exploring opportunities to work with the business sector.
- IRRI collaborates with various networks and consortia, like the **Challenge Program for Water and Food (CPWF)**, the **Consortium for Unfavorable Rice Environments (CURE)**, **the Generation Challenge Program (GCP)**, the International Network for Genetic Evaluation of Rice (INGER), the **Irrigated Rice Research Consortium (IRRC)**, and the **Rice-Wheat Consortium**.
- IRRI is currently working with **CIMMYT** in three Alliance Programs - Crop Research Informatics Laboratory (CRIL), Intensive Rice-Based Systems in Asia, and Development of a Cereal Knowledge Bank.
- While it continues to work extensively on rice-related issues in Asia, in 2006, IRRI opened two satellite offices in Africa (Mozambique and Nigeria) and is looking to coordinate more closely with the **Africa Rice Center (WARDA)**.

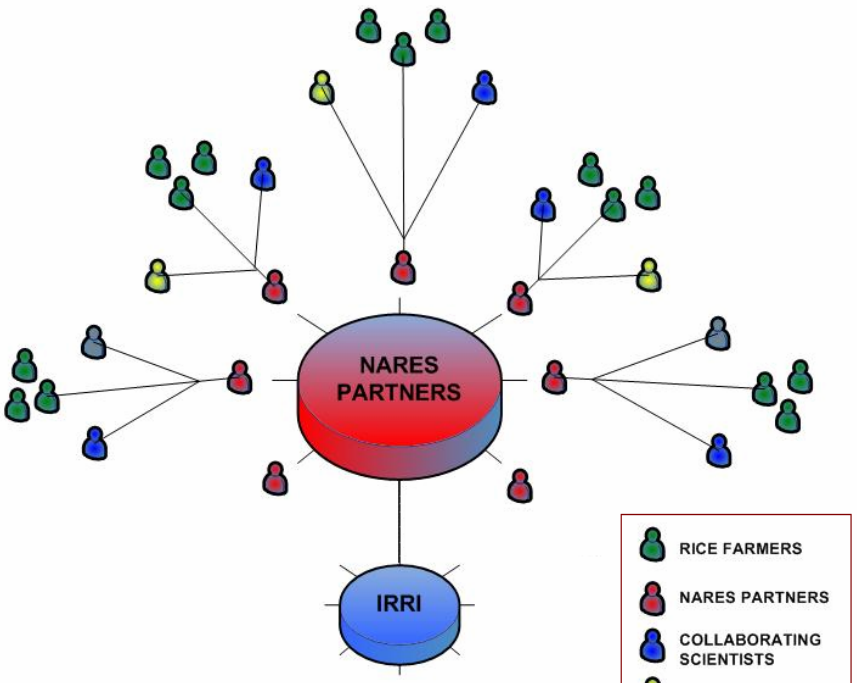
As the hub in multiple collaborations (Figure 2), IRRI increases its reach and becomes more efficient in disseminating technologies. This distributed structure seeks to empower national administrators, local scientists, and extension workers to assume a stronger sense of "ownership" over the project. It also allows the Institute to share with its NARES counterparts the responsibility and accountability for research initiatives.

NARES partners are vital players in the research-to-delivery value chain, acting as the direct link between headquarters and the various Goal 4 stakeholders. In turn, IRRI must strive to help these national agencies address the rice-related concerns in their respective countries. To do so, it must continue to push the latest research findings through the network via *scholarly communication and publishing* and, at the same time, distill and transfer skills, methods, and technologies through *training and capacity building*.

The importance of scholarly communication and training in IRRI's new strategic plan

Scholarly communication – defined as a set of "formal and informal processes by which the research and scholarship of faculty, researchers, and independent scholars are created, evaluated, edited, formatted, distributed, organized, made accessible, archived, used, and transformed (Cornell 2007)" – is an intrinsic component of the practice of scientific research. At IRRI, it

Figure 2. Rippling Networks Emanating from IRRI's NARES Partners



results in the dissemination of various knowledge products and services, which ultimately get into the hands of farmers as production packages.

IRRI has always recognized the value of "getting the message out". Even when the organization was first established, its incorporators had already recognized the need to:

- publish and disseminate research results,
- collect the world's literature on rice in a library for scientists and scholars,
- train promising young scientists.

These formed part of the organization's primary objectives (IRRI 1960). Today, these functions are well integrated into IRRI's research-to-delivery process, as well as in its corporate structure, by way of three organizational units:

- *Communication and Publications Services (CPS)*: CPS is IRRI's publishing arm. Tasked to disseminate the Institute's findings, it works closely with staff in the research units to develop various information products. To date, CPS has published almost 1,000 books comprising more than 150,000 total pages.
- ***Library and Documentation Services (LDS)***: LDS holds the largest collection of rice-related literature in the world. Located in IRRI's Los Baños headquarters, the Library is frequented by both local and international researchers and students.

- ***Training Center (TC)***: Through the TC, IRRI is able to enhance the research-to-delivery capacity of its NARES partners, especially through interactive dynamic learning, by distilling information from IRRI's research. Training and capacity building are essential in spreading technologies to improve rice production.

Scaling up IRRI's communication and training efforts through electronic delivery

As the backdrop of rice research changes, the needs of IRRI's beneficiaries will continue to expand and be increasingly intricate. They will require a wider range of delivery modalities and more appropriate channels for access. In fact, in 2005, when IRRI surveyed a sample of its stakeholders to better define its strategic position for the coming decade, the results showed that majority of the respondents supported the Institute's role to generate and disseminate rice-related knowledge and technology to help enhance national rice research systems. Most of the participants also believed that IRRI should expand its use of ICT for publishing, knowledge sharing, and training.

To enhance service delivery, CPS, LDS, and TC have each developed Web-based offerings for information dissemination:

- Most of the books published by CPS are available in the *Rice Publications Archive* (**http://rice-publications.irri.org/**) for free download as Adobe® portable document format (PDF) files. Thousands of rice-related photos are available, as well, as JPG files through the *Photobank* (**www.ricephotos.org**).
- Through the *Library Internet site* (**http://ricelib.irri.cgiar.org/**), researchers from all over the world may access online most of LDS' information and references.
- The TC manages the *Rice Knowledge Bank* (RKB; **www.knowledgebank.irri.org**), which serves the needs of IRRI's audiences in the extension sector. The Center also maintains a separate online presence (**www.training.irri.org**) for general users.

These three sites have only been online for about five years now but they have already been accessed by an impressive number of users. The RKB alone recorded more than 1 million hits on the site within the same year of its 2002 launch.

IRRI joins the open access publishing community

To facilitate even further the free exchange of rice-related information, in October 2006, IRRI changed its copyright policy from the original "all rights reserved" to "some rights reserved" using appropriate Creative Commons license deeds.

The adoption of an open access policy serves to strengthen IRRI's position s a producer of global public goods (GPG). It effectively removes any old encumbrances that may have kept users from enjoying the full benefits of the Institute's research. All publications, photos, training modules, software, and other knowledge products are available to the public through Creative Commons license deeds and similar types of open access mechanisms. For example, see what IRRI states on its photo bank site at **www.ricephotos.org/terms.htm.**

To some, this may seem like a token gesture; prior to the shift, a good part of the organization's research resources were already freely available. In practical terms, however, the change will significantly affect the way that IRRI goes from research to delivery. After the policy pronouncement last October, much work has been under way to define clearly the parameters of implementation. Certainly, it is impacting most, if not all, activities in the value chain, from donor

relationship management and germplasm distribution to copublishing practices and scholar support and assistance.

In any case, the policy change has driven CPS, LDS, and TC to review their current strategies and operations, to be able to determine how open access (OA) can help them meet their aims under the Goal 4 program.

Operationalizing open access in IRRI: the experiences of LDS and CPS

IRRI generates a great volume of rice-related information resulting from externally funded research. The largest knowledge generators in IRRI are its scientists, especially those who published the results of their research. And with the change in copyright policy, the pressure is on LDS and CPS – as primary agents for the capture, collection, and dissemination of scholarly material – to facilitate making all of IRRI's research output available via OA.

Are IRRI's researchers ready for OA?

To better gauge staff awareness and readiness to support OA initiatives at the Institute, in June 2007, CPS and LDS conducted a quick survey on OA publishing. Garnering responses from 71 staff in the IRRI headquarters, here are some results:

- More than half were not familiar with OA publishing or Creative Commons.
- When asked whether they will participate in OA publishing initiatives in the Institute, the majority expressed support. They were also worried about lack of information about and funds for an OA program.
- Participants expressed the need for CPS and LDS to (in decreasing order of priority): maintain an institutional repository, facilitate access to online resources, promote rice research to IRRI's target audiences, build up content, provide access to rice research literature and journal articles, and publish an OA journal.
- Some respondents suggested additional OA-related roles for CPS and LDS (in no order of priority): get management support, train staff, promote OA, use open source systems, integrate institutional efforts, provide advice/information on legal and commercial aspects, and provide OA-related facilities for staff on the intranet portal.

Together, CPS and LDS are now planning next-step activities to press on with IRRI's OA agenda, based on the results of the survey.

LDS: granting access to the world's biggest collection of rice-related literature

When LDS was set up back in 1960 (as the Library and Documentation Center), its immediate mandate was "to make available to scientists in developing countries any articles that they were unable to get in the libraries of the institutions where they were working (Chandler 1992)." With a collection of 62,500 books and monographs and 2,600 periodical and serial titles (Wedgeworth 1986). LDS served users' needs using traditional print-based media.

Today, the Library boasts of almost 150,000 publications in its collection (IRRI 2007), earning recognition as the largest collection of rice-related literature in the world. With ICT, LDS should be able to disseminate much larger volumes of scholarly information faster through the Internet – especially with cheaper hardware and software, more flexible publishing media and formats, and now, growing acceptance of OA. In fact, even before the policy change, LDS had been one of the early adopters of free access in IRRI. Today, it promotes OA uptake by:

- Developing a freely accessible online database of technical literature about rice;
- Digitizing rice technical literature (e.g., pre-prints and post-prints) for wider sharing and preservation;
- Generating metadata and linking to the full text of electronic journals and monographs;
- Cataloging electronic resources, whether free or licensed, to further populate the online public access catalog (OPAC) and the rice database;
- Providing public access to OA resources related to rice;
- Linking through its Internet site (**http://ricelib.irri.cgiar.org**) to OA facilities such as the Directory of Open Access Journals (**www.doaj.org**), the Public Library of Science (**www.plos.org**), the Scientific Electronic Library Online (**www.scielo.org**), the Free Full Text site (**www.freefulltext.com**), etc.;
- Providing a listing on its Internet site of freely available journals;
- Promoting use of free online resources to IRRI staff on campus;
- Collaborating with partner libraries via the CGIAR Libraries and Information Services Consortium, which enables access to several additional e-journal titles;
- Contributing content to the CG Virtual Library, a platform for access to free full-text publications of the CGIAR.

LDS open access campaign marred by "serials and permissions crises"

While there is a general lack of awareness and understanding, the staff survey cited earlier indicates that IRRI staff members would support OA. The benefits of OA publishing appealing most to respondents were faster and wider dissemination, free access, and online availability.

The obstacles to implementation, however, go beyond the willingness of staff to participate. For example, earlier this year, LDS studied publishing trends at IRRI and found that journal articles have mostly been submitted to commercial journals such as ***Field Crops Research***, ***Theoretical and Applied Genetics***, ***Euphytica***, and ***Agronomy Journal***. Only one open access journal, *Breeding Research*, made it to the top five.

Subscription charges to commercial journals, according to Van Orsdel and Bom (2006), have increased by more than 37 percent since 2002. With rising journal costs effectively restricting access, many nonprofit libraries are now plagued by a "serials crisis." At IRRI, LDS' acquisition costs of journals related to IRRI's research program – 174 titles, 104 of which are available online – rose by an average of 38 percent in 2006-07. Table 1 shows the average prices and price changes of journals in subjects that are most likely to be used by IRRI scientists.

Commercial publishers also impose complex license agreements and copyright restrictions on journals, despite the already high fees paid by libraries. Labeled by Suber (2003) as the "permission crisis," this serves as another obstacle to free access.

CPS publishing strategy: addressing business problems through customer orientation

CPS, the Institute's publishing arm, was created specifically to fulfill a key mandate: to publish and disseminate the results of its work (IRRI 1960). In practice, this mandate comes from IRRI's project donors that prescribe publication as a key performance indicator. As such, every product emanating from CPS – almost 1,000 titles published to date – is the direct output of research, subsidized by project funds.

With this *product orientation* – as a result of the direct correlation between IRRI's financial health/project portfolio and the production output of CPS – the publishing business is impacted

Table 1. Average prices/price changes of journals in scientific disciplines relevant to IRRI.

Subject	*Average Price 2005 (US$)*	*Average Price 2006 (US$)*	*% of price changes (2001-2005)*	*% of price changes (2002-2006)*
Agriculture	799.00	890.00	37	41
Biology	1,494.00	1,548.00	37	42
Botany	1,109.00	1,238.00	36	41
Chemistry	2,868.00	3,254.00	34	34
Engineering	1,683.00	1,756.00	38	35
Food science	1,107.00	1,292.00	35	44
Technology	1,460.00	1,560.00	38	35
Zoology	1,053.00	1,259.00	28	29

directly when financial problems affect the Institute. In effect, availability of funds – or the lack of it – tend to overtake the needs of the customers.

A review of CPS operations in 2003 revealed two problematic trends:

- *Decline in annual publication output*: From a high of 50 books in 1998, the average annual lineup dropped to seven starting in 1999.
- *Distribution and inventory management problem*: About USD$400,000 worth of products (mostly scientific books) was stored in the CPS warehouse.

To revitalize IRRI's publishing business, in 2004, CPS developed a new strategy to be able to fulfill a more *customer-oriented* mission: to promote innovative and responsive communication and marketing solutions for clients/markets that fulfill critical needs of IRRI stakeholders, constituents, and publics.

Open access in IRRI publishing: beyond getting the message out

The 2003 CPS study also showed that many publications were distributed free, particularly to researchers, libraries, and students in developing countries. At the same time, CPS' ability to subsidize free dissemination was severely limited by budget constraints.

To continue to fulfill its mandate to publish and disseminate IRRI's research, CPS launched the digital *Rice Publications Archive* (**http://rice-publications.irri.org/**), a Web site where most IRRI publications could be downloaded electronically at no cost. Through this Web site, IRRI's research became more widely available.

However, still covered by a strict copyright policy, content could not be easily appropriated by researchers for their own publishing needs. To use a photo, illustration, data table, text, or any other material from an IRRI publication, permission had to be secured directly from CPS and then, covered by a legal material transfer document.

Considering this, the change in copyright policy is an important breakthrough towards real dissemination and *actual appropriation*. Now that IRRI publications are available through OA, nothing should stop a Web-enabled rice researcher anywhere in the world from acquiring

information? With a simple desktop publishing setup and Internet connection, anyone may now obtain, repurpose, distribute, and even modify content.

Free from the old restrictive policy and unwieldy procedure, CPS now encourages such forms of "self-service publishing" and only requests the user to provide proper attribution and to adopt the same Creative Commons license (**http://creativecommons.org/licenses/by/3.0)**, such that other users may enjoy the same privileges.

IRRI Training Center: building capacity through open access

Studies show that farmer cooperators experience higher yield than noncooperators, due to progressive knowledge and techniques acquired through interaction with researchers and extension workers (Balasubramanian et al). As such, capacity building at IRRI, led by the TC, is an indispensable component of its research-to-delivery framework.

Since it was created, TC's business model has combined "training, train-the-trainer, and devolution of information and technical knowledge" in its development of national systems (IRRI 2001)."By design, therefore, the competitive advantage of TC comes from its strong collaborative relationship with NARES partners.

To increase impact and reach, in 2002, TC added computer-aided distance education to its list of training offerings, by way of the Rice Knowledge Bank (**www.knowledgebank.irri.org**). Envisioned as a "virtual university," the RKB is an OA facility that offers Web-based decision support tools, data sheets, e-learning modules, and other capacity building products.

The RKB has been a resounding success, if based on the number of site hits. In June 2007, it surpassed the 3.2-million mark and has been viewed by almost 250,000 unique visitors. It supplements classroom-based group training. With more than 13,000 learning sessions to date, face-to-face training is still an essential feature in the TC portfolio.

Localizing the RKB: NARES partners "take over"

C.R. Rajendran, director of the Asian Development Bank's (ADB) Agriculture, Environment, and Natural Resources Division for the Mekong, admits there are advantages and disadvantages to the use of ICT in bridging the knowledge gap in agriculture. According to Mr. Rajendran:

> "ICT offers powerful new ways to capture, present, and disseminate the wealth of knowledge available…However, most poor and small-scale farmers are unable to access such information available through ICT due to language barriers, lack of tools, and lack of knowledge about existing information. Also, they may be overwhelmed and intimidated by ICT (ADB 2004)."

With these considerations, in 2004, ADB approved a USD$1-M grant from the **Japan Fund for Information and Communications Technology** (JFICT) to support an ICT project targeting poor rice farmers in the Mekong Region. The project aimed to adopt materials from the main RKB site and localize them to suit the local rice-related conditions in Cambodia, Thailand, and Vietnam and the needs of their extension workers and collaborators. By using country-specific, relevant, and targeted content, transfer of appropriate technology can be faster and wider, creating and measuring impact at the grassroots level.

Localization could also create a sense of "ownership" that helps foster sustainability. Wider availability of technology-based services will help demystify ICT, encourage farmers to use its tools, and perhaps, even compel government to fund development of the necessary infrastructure and systems in the countryside.

With increased use of the RKB, IRRI can validate not just the "virtual university" model but, more importantly, the soundness of the proffered methods and practices. Country sites (see **www.knowledgebank.irri.org/regionalSites/bangladesh/default.htm** for example) assist the Institute through devolution, by shifting to the ultimate beneficiary – the NARES collaborators and their stakeholders – the more complex and resource-intensive task of creating capacity, developing new content, testing technologies, transferring knowledge to rice farmers, and maintaining the local site.

Benefits can also cross organizational and country borders. The main RKB site, serving as a portal, showcases techniques and tools of different groups and localities. As such, OA promotes partnership between IRRI and its NARES collaborators, as well as between national systems.

Open access towards equitable access to IRRI's global public goods

The success of TC with the JFICT-funded project aptly demonstrates the practical advantages of OA. By allowing free and immediate access to the results of IRRI's research, the RKB has been able to enhance information delivery, increase knowledge sharing, and facilitate wider exchange of best practices in research, training, and extension. As a result, OA has benefited national, even regional, stakeholder groups.

On the other hand, as the experiences of LDS and CPS illustrate, there still are other obstacles to overcome before the benefits of OA can be redistributed fully. Both organizational units are undertaking projects under Goal 4 to conquer the problems.

Hurdling copyright controls by creating an information repository at IRRI

Bailey (2006) suggested self-archiving as a way to preserve and ensure open and perpetual access to scholarly material. To encourage the practice in IRRI, LDS is pushing for the creation of an institutional repository. To be able to do this, the Library has suggested the need for:

- Management commitment to fund, staff, and operate digital repositories and archives, to allow sustainable access to vital institutional information sources.
- A sustained campaign among IRRI scientists and scholars, to encourage them to populate the repository with their scholarly works and to acts as reviewers and editors.
- Increased involvement of LDS in the digitization and indexing of scholarly literature, as well as in related promotional initiatives.
- Meaningful and continuing collaboration among IRRI staff to sustain the institutional repository.

In the repository, LDS seeks to capture, among others, a key group of publications: research articles published by staff in subscription-based journals. While commercial publishers impose strict intellectual property control over journal submissions, there are some – such as Elsevier (**www.elsevier.com**) – that now allow authors to self-archive their version of the paper (i.e., preprints).

The Rice Thesaurus: developing a "universal language" for rice researchers

To promote the Institute's scholarly publishing agenda, LDS is working closely with CPS in the creation of a Rice Thesaurus. The project is building a living database of rice-related vocabulary terms based on internationally accepted standard metadata element sets and terminologies. The metadata profiles for the Rice Thesaurus are derived from and will form part of the FAO/CGIAR Agricultural Metadata Element Set (AGMES).

CPS initiated and later engaged LDS in the Rice Thesaurus project, after it had converted IRRI's historic publications (more than 90,000 pages across nearly 500 titles) and photos into digital format (some 5,000 images initially). Initially, CPS used off-the-shelf software to provide staff access to the digital products. It later opted for open source solutions when proprietary products did not prove to be flexible and scaleable enough for the needs of the Institute and the public.

To test the Rice Thesaurus terms and improve the usability of the database, the project is tagging the digitized publications and photos in preparation for OA. LDS and CPS hope this will not only help improve the searchability of IRRI's research on the Internet, but also increase opportunities for use and citation by other researchers, one of the more important benefits of OA to staff author-scientists.

Democratizing ICT: the true new frontier for knowledge dissemination

By reducing its distribution expenses, making IRRI publications available online has helped CPS address an operations issue (for example, see *Rice is life: scientific perspectives for the 21st century* at **www.irri.org/publications/wrrc/index.htm**). However, the Rice Publications Archive was created to serve a *strategic* purpose – to provide real and unfettered access to IRRI's rice research – and not just to address transactional problems. Therefore, CPS must review and rework its approach to make the publications facility more effective and robust.

One important consideration is the profile of IRRI's customers. For example, most rice producers and consumers are located in developing regions where ICT infrastructure is poor to non-existent. Table 2 shows the pertinent statistics for countries where IRRI maintains a local office. Except for Korea – where the Internet is available to 66.5 percent of the population – a majority of the IRRI country sites do not even serve 1 percent of the local connectivity needs. The impact is surely greater in the rural areas, where many in the agricultural community reside.

Since the required technology is not available, how can IRRI's knowledge products reach the right users at the right time? As the success of the JFICT-RKB project has illustrated, CPS must be able to work through partners in the middle of the value chain – "impact channels" – that have direct access to both the technology and the customers groups. These would include NARES partners, especially those in the knowledge management and development communication disciplines.

To achieve this, the Rice Publications Archive must allow CPS' channels to easily acquire, transmit, repurpose, and transform the information, to suit the needs of the end users. Based on the average penetration rate in Table 2, it is likely that in many cases, the medium must adapt to the least common denominator: analog publishing.

Since the early 2000s, when CPS first created the Adobe® PDF files currently in the Archive, there have been great advancements in digital technology. Developments such as open source

Table 2. Total population vs. Internet-enabled population at IRRI country sites.[a]

Country	*Population (2007 Est.)*	*Internet Users Dec (2000)*	*Internet Users, Latest Data*	*Percent Population (Penetration)*	*Users in Region (%)*	*Use Growth (2000-07)*
Bangladesh	137,493,990	100,000	370,000	0.3%	0.1%	270.0%
Cambodia	15,507,538	6,000	41,000	0.3%	0.0%	583.3%
China	1,317,431,495	22,500,000	144,000,000	10.9%	35.2%	540.0%
India	1,129,667,528	5,000,000	40,000,000	3.5%	9.8%	700.0%
Indonesia	224,481,720	2,000,000	20,000,000	8.9%	4.9%	900.0%
Korea	51,300,989	19,040,000	34,120,000	66.5%	8.3%	79.2%
Lao PDR	5,826,271	6,000	25,000	0.4%	0.0%	316.7%
Myanmar	54,821,470	1,000	300,000	0.5%	0.1%	29900.0%
Nepal	25,874,519	50,000	225,000	0.9%	0.1%	350.0%
Nigeria	162,082,868	200,000	5,000,000	3.1%	15.0%	2400.0%
Philippines	87,236,532	2,000,000	7,820,000	9.0%	1.9%	291.0%
Tanzania	38,870,348	115,000	333,000	0.9%	1.0%	189.6%
Thailand	67,249,456	2,300,000	8,420,000	12.5%	2.1%	266.1%
Vietnam	85,031,436	200,000	15,760,702	18.5%	3.8%	7780.4%
Total	3,402,876,160	53,518,000	276,414,702	8.1%	24%	516%
World total	6,574,666,417	n/a	1,133,408,294	17.2%	100.0%	214.0%

[a] Internet Statistics taken from **www.internetworldstats.com/stats.htm**. Africa Internet Statistics were updated on June 10, 2007. Asia Internet Statistics were updated on 14 June 2007.

platforms, Web 2.0 tools, and e-commerce engines, which allow for greater flexibility, are now being explored to improve dissemination and reduce download issues.

If required, to convert the information back to traditional media without risking the inventory management and funding problems that CPS had to deal with, the impact channels can turn to desktop printing, CD/DVD, video, and other emerging on-demand technologies.

Conclusion: Creating a global portal for rice knowledge

As the experiences of CPS, LDS, and TC demonstrate, OA is necessary to meet the objectives of IRRI's Goal 4. By removing the layer of copyright restriction, access to the results of rice research serves to lubricate IRRI's value chain.

In due course, IRRI hopes to convene the players in the chain via a *World Rice Community Portal*, one of the major outputs of IRRI's new strategy. It is designed to provide a single interface or dashboard from which users can access all ICT-based initiatives in IRRI, including those that are discussed in this paper – the Rice Publications Archive, the information repository for self-archiving, and RKB country sites. It will also provide access to two other outputs of the strategic plan: a Crop Science Information Resource site and a Crop Systems Knowledge Bank

(CSKB) for rice, maize, and wheat. As more global public goods are created by the Portal community, other rice-related sites are expected to link to the Portal.

As a first step, IRRI must develop strong links upstream and downstream by promoting OA adoption to all potential users, generators, and channels of the Portal. Any break or gap – the inability, unwillingness, or lack of understanding to impart IRRI's knowledge freely and immediately – may weaken the model.

As the stewards of scholarly communication and publishing in IRRI, the onus is on CPS and LDS to advance open access. In the near-term, any points for convergence should be investigated to be able to develop more seamless processes. In the coming year, next-step options to explore could include the following:

- Undertaking additional research to validate and investigate further into the results of the June 2007 survey, to create a more solid baseline.
- Consulting with Management and staff to clarify the parameters for implementing the copyright change policy, in relation to scholarly communication and publishing.
- Ascertaining the requirements of full OA adoption in scholarly communication and publishing and determine availability of resources.
- Launching an information campaign among IRRI staff.
- Evaluating and measuring the level of readiness for OA adoption in scholarly communication and publishing across the value chain.

Ultimately, by co-developing a robust strategy, CPS and LDS will be better equipped to champion the OA agenda in IRRI.

References

ADB. 2004. Project promoting ICT to boost rice production in three GMS countries. Manila (Philippines): Asian Development Bank. **www.adb.org/media/Articles/2004/5504_GMS_ict_to_boost_rice_production/**

Bailey CW. 2006. Open access and libraries. Last viewed April 17, 2007 **www.digital-scholarship.com/cwb/OALibraries2.pdf**.

Balasubramanian V, Bell M, Sombilla M. (No year indicated). Yield, profit, and knowledge gaps in rice farming: Causes and development of mitigation measures. Los Baños (Philippines): International Rice Research Institute. 15 p.

Cornell. 2007. Cornell University Scholarly Communications Council. Charter and Goals for 2007. **http://janusconference.library.cornell.edu/?p=90**

Chandler RF. 1992. An adventure in applied science. A history of the International Rice Research Institute. Los Baños (Philippines): International Rice Research Institute. 240 p

IRRI (International Rice Research Institute). 1960. Articles of Incorporation of the International Rice Research Institute, Inc. Los Baños (Philippines): International Rice Research Institute. 8 p.

IRRI (International Rice Research Institute). 2001. Delivery for Impact: The dissemination of rice-related knowledge and technology. Los Baños (Philippines): International Rice Research Institute. 21 p.

IRRI (International Rice Research Institute). 2006. Bringing hope, improving lives: Strategic plan, 2007-15. Los Baños (Philippines): International Rice Research Institute. 61 p. **www.irri.org/BringingHope/ImprovingLives.pdf.**

IRRI (International Rice Research Institute). 2007. Annual report of the Director General, 2006-07. Los Baños (Philippines): International Rice Research Institute. 206 p. **www.irri.org/science/progsum/prog2006.asp**

Maclean JL, Dawe DC, Hardy B, Hettel GP. 2002. Rice almanac, 3rd ed. Wallingford (UK): CABI Publishing. 253 p.

Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2006 Revision and World Urbanization Prospects: The 2005 Revision, **http://esa.un.org/unpp**.

Porter ME. 1985. Competitive advantage: Creating and sustaining superior performance. New York (USA): The Free Press.

Raitzer DA. 2003. Benefit-cost meta-analysis of investment in the international agricultural research centres of the Consultative Group on International Agricultural Research (CGIAR). Science Council. 45 p.

Suber P. 2003. Removing the barriers to research: an introduction to open access for librarians. Unabridged online ed. of the printed. in College & Research Libraries News 64:92-94. Feb. Available at **www.earlham.edu/~peters/writing/acrl.htm**.

Van Orsdel LC, Born K. 2006. Journals in the time of Google. Library Journal April 15. Available at **www.libraryjournal.com/article/CA6321722.html**.

Wedgeworth R. 1986. ALA World Encyclopedia of Library and Information Services. Chicago (US): American Library Association. 895 p.

World Bank. 1999. World Development Report 1998/1999: Knowledge for Development. New York (USA): Oxford University Press, Inc. 181 p.

List of Acronyms

ADB = Asian Development Bank
AGMES = Agricultural Metadata Element Set
ARIs = advanced research institutes
CGIAR = Consultative Group on International Agricultural Research
CIMMYT = International Maize and Wheat Improvement Center
CPS = Communication and Publications Services (IRRI)
CPWF = Challenge Program for Water and Food
CRIL = Crop Research Informatics Laboratory

CSKB = Crop Systems Knowledge Bank
CURE = Consortium for Unfavorable Rice Environments
GCP = Generation Challenge Program
GPG = global public goods
HYV = high yielding variety
ICT = information and communication technology
INGER = International Network for Genetic Evaluation of Rice
IRRC = Irrigated Rice Research Consortium
IRRI = International Rice Research Institute
JFICT = Japan Fund for Information and Communications Technology
LDS = Library and Documentation Services
NARES = national agricultural research and extension systems
OA = open access
OPAC = online public access catalog
RKB = Rice Knowledge Bank, IRRI
RWC = Rice-Wheat Consortium
TC = Training Center (IRRI)
WARDA = Africa Rice Center