



PEER-REVIEWED JOURNAL ON THE INTERNET

Prospects of open access to
Indian agricultural research:
A case study of ICAR

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Abstract

Historically, agricultural research and education in India have been in the public domain. The Indian Council of Agricultural Research (ICAR) was established as an apex organization for effective research coordination among institutions and promotion of agricultural research in the country. Funds for public sector research institutes were channeled through the ICAR from the central government. For the dissemination of research output, the research journals publishing in India have been, for long, primarily a public funded activity and done mostly by Government agencies. In case of agricultural research, the journals are being published by ICAR and by respective professional societies. Many of these societies are receiving financial assistance partly from ICAR. Each discipline of agriculture is represented by some sort of professional society and for some disciplines, and each society publishes a peer-reviewed research journal. Though many of these journals are distributed for international indexing, full-text database services are very poor. Many of them are not even in the ISI Master Journal list for impact factor or science citation index analysis. The main objective of each author is to have more impact, visibility and readership for their work. These journals publish quality articles after stringent peer review process, but the time lag from submission to publication of an article or production of issue is long. There are instances where the articles sent for review were not returned back due to various reasons. The infrastructure for publishing online is also not available for these journals. Recently, a portal (<http://www.indianjournals.com>) had started providing free online access of some journals being published by professional societies. Under the National Agriculture Innovation Project (NAIP), ICAR is investing in making available of some fee-based online journals along with all open access journals. Now the time has come to think about the wider availability of scientific journals without any restrictions. The availability of open source software for the transformation of traditional journals into open access journals and the establishment of open archive online repositories for archiving research will eventually make agricultural research to much larger audiences. This will increase the visibility of research output and eventually lead to an enhanced impact factor for many Indian journals.

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Introduction

India is a very vast country with 1.13 billion (Anonymous, 2008a) people comprising of approximately one-sixth of the world's population of which about 70 percent of the labour force is engaged in agriculture. Thus, reaching individuals involved in agriculture and related

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areas across 20 agro-ecological zones (Gajbhiye and Mandal, 2008) — in an estimated total geographical area of 3.3 million square kilometres (Anonymous, 2008b) — is a herculean task. However, publicly funded research in India will ultimately bring considerable change to the livelihoods of farmers contributing to 26 percent of the GDP, providing 60 percent of employment. Technological progress in agriculture is crucial for the overall economic welfare of the country. In India's National Agricultural Research System (NARS), ICAR — a national apex body — is a major player in agricultural research and education management in the country. The ICAR, with its headquarters in New Delhi, comprises of five national institutes, five national bureaus, 48 central research institutes, 12 project directorates in crop sciences and animal sciences, 32 national research centres, 75 all-India coordinated research projects and about 4,000 agricultural scientists (DARE/ICAR, 2007). All of the research projects in ICAR (except a few) are publicly funded with a mission for sustainable growth of Indian agriculture by interfacing education, research and extension initiatives complimented with efficient and effective institutional, infrastructure and policy support. Ultimately they will create a proper fit between humanity and its environment in India. Therefore, the research output must be applied to achieve broader developmental objectives of society which will result in public accountability of research.

The dissemination of research is a major challenge. Until it is known to the world, this research has no meaning. Hence, scholarly journals serve as vehicles for the dissemination of scientific information. In India, various professional societies were formed to advance the interests of specific disciplines in agriculture, with scholarly journals. ICAR also provides financial support for journal production. As the output of researchers is measured in terms of the number of research papers published in various national and international journals, the impact factor (IF) of their work is high with oft-cited and well recognized international journals. Unfortunately, Indian researchers may not find their research published in many of these international journals because their research does not fit the scope of these journals and the agrarian situation is different in various countries.

Access to many of these high-impact journals is often fee-based with copyright restrictions. Copyright to published research in these journals is frequently transferred to the publisher. In some cases, authors are not allowed to archive their research in any electronic form. Few journals distribute reprints freely so limited reprints can be shared among peers. Hence, journals published by scholarly societies in ICAR institutes should play a key role in removing barriers to access, in turn accelerating research, enriching education and sharing knowledge as widely as possible. thus making the literature as useful as it can be, and lay foundation for uniting humanity in a common intellectual conversation and quest for knowledge. This functionality of research is often called open access (OA). According to Suber (2004), OA literature is digital, online, free, and without many copyright and licensing restrictions. OA gives readers the ability to find and make use of relevant literature. It gives authors vast and measurable visibility, readership, and impact. In this paper, we analyze the system of publication and dissemination of scientific literature by professional societies working in various ICAR institutes and the prospects of open access for Indian agricultural research.

Methodology

ICAR is an apex organization at the national level, promoting science and technology programmes in agricultural research and education. This paper will analyze journals being published by professional societies housed in various ICAR institutes. As there is no database available for these societies, data collection was mainly completed with the use of Google. The CAB Abstracts list of serials from CABI portal (<http://www.cabi.org/>) and Thomson Reuters Master Journal list (<http://science.thomsonreuters.com/cgi-bin/jrnlist/jloptions.cgi?PC=master>) were consulted for journals published in agricultural and related sciences to locate their ISSN (International Standard Serial Number), periodicity and publishers' addresses. For detailed information about the professional societies, the Indian Journals portal (<http://www.indianjournals.com>) and the portals of ICAR (<http://www.icar.org.in>) and IARI (<http://www.iari.res.in>) were consulted, confirming addresses. We also checked to see if these journals were being evaluated by the Science Citation Index (Thomson Reuters) or included in the Directory of Open Access Journals (DOAJ; <http://www.doaj.org>).

Results and discussion

Interestingly, many of the professional societies under review are located at the headquarters of the Indian Agricultural Research Institute (IARI) with a few housed in the National Societies Block

of the newly built National Agricultural Science Complex (NASC). Most institutes under ICAR host a professional society, leading to about 50 professional societies in agriculture and related sciences. In a few cases, there is more than one society working in the same discipline. Some of these organizations have been functioning for many years, some for more than 60 years. All these societies publish peer-review scholarly journals (Tables 1 and 2). Additionally, these organizations hold national seminars or symposia with the assistance of ICAR.

An analysis of professional societies' presence on the Internet indicated that only 23 out of 51 journals are available on the Web (Table 2). Only a few of the societies provide information about forthcoming or current issues. Only two journals — the *Indian Journal of Agronomy* and the *Agricultural Economics Research Review* — are available as full text but delay access. Hence we may argue that these societies are not embracing the latest technological innovations in information technology.

Twenty journals were found in the Thomson Reuters Master Journal List and considered for evaluation in the Science Citation Index. All of these journals were rated by National Academy of Agricultural Sciences (NAAS) on scale of 1 to 10. A number of criteria were adopted by the Academy for rating journals. For non-impact factor journals, marks from 1 to 6 were assigned — corresponding to grades ranging from 'D' to 'B+' — as suggested by the NAAS Fellowship and finalized by the Journal Rating Committee of the Academy. For journals with an impact factor, they were assigned a place from 6.1 to 10. In the Thomson Reuters Impact Factor (2007 Index) analysis, only four of the surveyed journals are in the range of 0.122–0.414 (Table 2) and the highest is for the *Journal of Plant Biochemistry and Biotechnology* (0.414). There are efforts by NAAS and ICAR to revamp the functioning of various professional societies and to raise the quality of all publications.

Table 1: List of agriculture and related journals created by societies in ICAR institutes and their impact factors and rating.

Notes: * Impact factor by Thomson Reuters.
 **Rating by NAAS according to IF-JCR 2006.
 ***Listed in Thomson Reuters Master Journal List.

Sl. No.	Journal title	ISSN	IF-JCR 2005*	IF-JCR 2006	IF-JCR 2007	NAAS**
1	<i>Agricultural economics research review</i>	0971-3441				6.0
2	<i>Agricultural engineering today</i>	0970-2962			N.A.	
3	<i>Agronomy digest</i>	0972-6381				N.A.
4	<i>Animal nutrition and feed technology</i>	0972-2963				4.0***
5	<i>Annals of agricultural research</i>	0970-3179				1.0
6	<i>Annals of arid zone</i>	0570-1791				3.0
7	<i>Annals of plant protection sciences</i>	0971-3573				2.0
8	<i>Indian journal of agricultural sciences</i>	0019-5022	0.084	0.106	0.122	7.2***
9	<i>Indian journal of agroforestry</i>	0972-0715				3.0
10	<i>Indian journal of agronomy</i>	0537-197X				6.0***

11	<i>Indian journal of animal nutrition</i>	0970-3209				4.0***
12	<i>Indian journal of animal sciences</i>	0367-8318	0.090	0.064	0.116	6.8***
13	<i>Indian journal of entomology</i>	0367-8288				4.0***
14	<i>Indian journal of extension education</i>	0537-196X				4.0
15	<i>Indian journal of fisheries</i>	0970-6011				4.0***
16	<i>Indian journal of genetics and plant breeding</i>	0019-5200				4.0***
17	<i>Indian journal of horticulture</i>	0972-8538				4.0***
18	<i>Indian journal of nematology</i>	0303-6960				3.0
19	<i>Indian journal of plant genetic resources</i>	0971-8184				4.0
20	<i>Indian journal of plant physiology</i>	0019-5502				4.0***
21	<i>Indian journal of plant protection</i>	0253-4355				2.0***
22	<i>Indian journal of poultry science</i>	0019-5529				4.0***
23	<i>Indian journal of pulses research (Journal of food legumes)</i>	0970-6380				3.0
24	<i>Indian journal of small ruminants</i>	0971-9857				2.0
25	<i>Indian journal of sugarcane technology</i>	0970-3233				1.0
26	<i>Indian journal of veterinary research</i>	0971-4251				4.0
27	<i>Indian journal of veterinary surgery</i>	0254-4105				4.0***

28	<i>Indian journal of virology</i>	0970-2822				4.0***
29	<i>International journal of oil palm</i>	0972-5806				2.0
30	<i>Journal of agricultural engineering</i>	0256-6524				4.0
31	<i>Journal of arid legumes</i>	0973-0907				1.0
32	<i>Journal of horticultural sciences</i>	0973-354X				N.A.
33	<i>Journal of oilseeds research</i>	0970-2776				1.0
34	<i>Journal of ornamental horticulture</i>	0972-0499				2.0
35	<i>Journal of plant biochemistry and biotechnology</i>	0971-7811	0.338	0.316	0.414	7.4***
36	<i>Journal of plantation crops</i>	0304-5242				3.0***
37	<i>Journal of rice research</i>	N.A.				N.A.
38	<i>Journal of root crops</i>	0378-2409				3.0
39	<i>Journal of soil and water conservation in India</i>	0022-457X				3.0
40	<i>Journal of the Indian Fisheries Association</i>	0971-1422				3.0***
41	<i>Journal of the Indian Society of Agricultural Statistics</i>	0019-6363				5.0
42	<i>Journal of the Indian Society of Soil Science</i>	0019-638X				4.0
43	<i>Journal of the Inland Fisheries Society of India</i>	0379-3435				3.0
44	<i>Journal of veterinary parasitology</i>	0971-6157				4.0
45	<i>Journal of water management</i>	0971-6076				4.0
46	<i>Journal of spices and aromatic crops</i>	0971-3328				2.0

47	<i>Oryza</i>	0474-7615				4.0
48	<i>Pest management in horticultural systems</i>	0971-6831				2.0
49	<i>Pesticide research journal</i>	0970-6763				2.0***
50	<i>Potato journal</i>	0970-8235				3.0***
51	<i>Seed research</i>	0379-5594				3.0***

Table 2: Professional societies and their journals in ICAR institutes.

Sl. No.	Society	URL of society	Journal of society
1	Agricultural Economics Research Association	http://www.geocities.com/aeraindia/	<i>Agricultural economics research review</i>
2	Indian Society of Agronomy	http://isa-india.in/index.htm	<i>Agronomy digest</i>
3	Animal Nutrition Association	http://www.anft.org/html/home.htm	<i>Animal nutrition and feed technology</i>
4	Indian Council of Agricultural Research	http://www.icar.org.in/dipa/journal.html	<i>Indian journal of agricultural sciences</i>
5	Indian Society of Agronomy	http://isa-india.in/	<i>Indian journal of agronomy</i>
6	Animal Nutrition Society India	http://www.nutrisocietyindia.com/	<i>Indian journal of animal nutrition</i>
7	Indian Council of Agricultural Research	http://www.icar.org.in/dipa/journal.html	<i>Indian journal of animal sciences</i>
8	Horticultural Society of India	http://www.hsi1942.in/	<i>Indian journal of horticulture</i>
9	Nematological Society of India	http://www.nemaindia.com/	<i>Indian journal of nematology</i>
10	Indian Society of Plant Physiology	http://www.ispp-online.org/index.html	<i>Indian journal of plant physiology</i>
11	Indian Poultry Science Association	http://www.ipsa-carl.org/	<i>Indian journal of poultry science</i>
12	Indian Society for Sheep and Goat Production and Utilization	http://www.issgppu.org/	<i>Indian journal of small ruminants</i>
13	Indian Association for the Advancement of Veterinary Research	http://www.laavr.org/	<i>Indian journal of veterinary research</i>

14	Indian Society for Veterinary Surgery	http://www.isvs.org/	<i>Indian journal of veterinary surgery</i>
15	Indian Virological Society	http://virologysociety.org/	<i>Indian journal of virology</i>
16	Society for the Promotion of Oil Palm Research and Development	http://nrcop.ap.nic.in/sopoprad.htm	<i>International journal of oil palm</i>
17	Indian Society of Water Management	http://www.iswam.in/index.html	<i>Journal of the Indian Society of Water Management</i>
18	Indian Society for Root Crops	http://www.isrc.in/index.php	<i>Journal of root crops</i>
19	Soil Conservaton Society of India	http://www.solicsi.org/index.htm	<i>Journal of soil and water conservation in India</i>
20	Indian Society of Soil Science	http://www.jsssi-india.org/	<i>Journal of the Indian Society of Soil Science</i>
21	Inland Fisheries Society of India	http://www.ifsii.in/	<i>Journal of the Inland Fisheries Society of India</i>
22	Association of Rice Research Workers	http://crrri.nic.in/arrw/index.htm	<i>Oryza</i>
23	Society of Pesticide Science India	http://www.spsindia.co.in/index.html	<i>Pesticide research journal</i>

The publishing system for these journals is a traditional process (Figure 1). Authors submit their manuscript in two hard copies to an editor. These manuscripts are initially distributed to an editorial committee; upon approval of the committee, the manuscript is distributed for peer review. Reviewers send comments to an editor: based on these comments a given paper may be rejected or returned for revision. Upon revision, authors re-submit their manuscript in electronic form along with the reviewers' comments. At this point, the manuscript may finally be accepted for publication. The whole process of submission and communication takes place by post in most cases. In this process, there is a considerable delay from submission to acceptance and final publication, up to one to two years. There is no mechanism to track and check the status of a given manuscript during this process. Hence, the current publication process has a number of disadvantages, largely in communication delays. This process makes some research results obsolete by publication. To overcome some these problems, electronic publishing, using open source software and the Internet, is certainly an option.

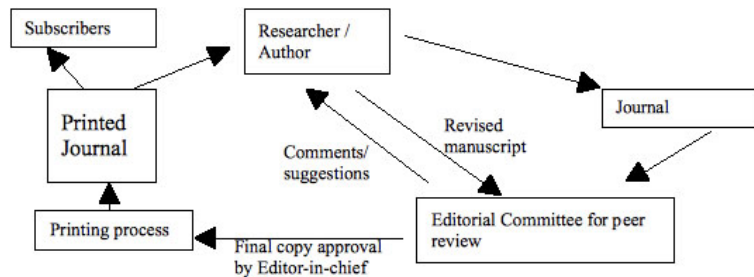


Figure 1: Traditional Journal publishing in India.

Recently, a New Delhi-based portal — <http://www.indianjournals.com> — developed a proposal to host journals being published by scientific societies online. This portal provides only the abstracts freely and one free sample online issue, with full text upon payment. There is another portal with similar name — <http://www.indianajournals.com> — but this site requires subscription or registration. Another portal from Jodhpur, <http://www.indianperiodicals.in>, also proposed to host journals which are published by various scientific societies. It has also a list of journals on its site but all are fee-based. The prices ranges from Rs. 500/- to Rs. 3000/- per year for both print and online.

The Internet could provide enormous benefits to agriculture in India. There are already some success stories such as ITC's e-Choupal (<http://www.itcportal.com/rural-development/echoupal.htm>); M.S. Swaminathan Research Foundation's (MSSRF) Information Villages of Pondicherry; Hewlett-Packard's i-Community; Nagarjuna's ikisan.com (<http://www.ikisan.com/>); and, Madhya Pradesh's Gyandoot (<http://www.dhar.nic.in/GYANDOOT.htm>).

Open access to Indian agricultural research could create an unprecedented public good. For researchers, open access to their work could result in higher citations (Eysenbach, 2006). For the larger communities of farmers and others, open access could make research more readily available for immediate use. Efforts such as the Open Journal Systems (OJS) of the Public Knowledge Project (pkp.sfu.ca/ojs/) and the Open Archives Initiative (<http://www.openarchives.org/>) provide readily available tools for digital publication and archiving.

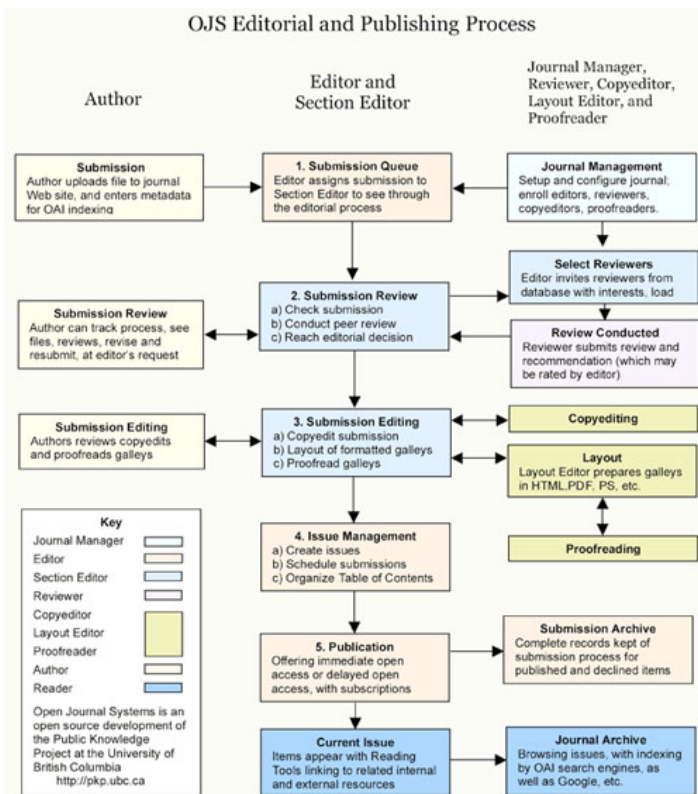


Figure 2: OJS publishing system. Source: Public Knowledge Project.

OJS is open source software for the management of scholarly journals, developed by the Public Knowledge Project to expand and improve access to research. It is freely available as a means to make open access publishing a viable option for more journals. Another important vehicle for making research available is OA archives or repositories. OA archives or repositories simply make their contents freely available in the absence of peer review. These repositories may contain unrefereed preprints, refereed post prints, lecture notes, data files, and other scholarly work. When archives comply with various harvesting protocols of the Open Archives Initiative, their contents are more readily accessible to scholars anywhere. With open source software for building and maintaining these archives, many universities and research centers throughout the world are actively planning the implementation of institutional repositories. Such planning entails policy, legal, educational, cultural, and technical components, most of which are interrelated and each of which must be satisfactorily addressed for each repository to succeed.

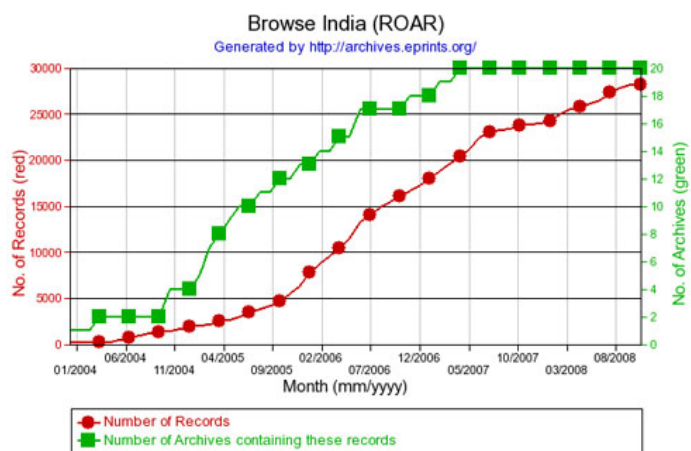


Figure 3: Registry of open access repositories.

As in the Registry of Open Access Repository Material Archiving Policies (ROARMAP; <http://www.eprints.org/openaccess/policysignup/>), institutions like the National Institute of Technology, Bharathidasan University and the National Knowledge Commission have adopted a mandate for institutional repositories in India. According to the Registry of Open Access Repository (ROAR), there are about 40 institutional repositories; the number of archives and records in those archives are increasing (Figure 3).

Conclusion

Open accessible scholarly journals make peer reviewed contents freely available to the world. There are some costs for peer review, manuscript preparation, and server space. OJS in particular can be locally installed and controlled. Editors can configure OJS as they see fit, in order to manage editorial review and development of content to indexing, publication and finally notification to readers. OJS assists with every stage of the publishing process, from submissions to online publication and indexing. Embracing open source software and resources, many Asian journals are now online. Asian Journals Online (AsiaJOL; <http://www.asiajol.info/>), harvests information about journals published in Bangladesh, Nepal, The Philippines, Vietnam, Sri Lanka and Indonesia.

The ICAR Institutions are producers of refereed research output about agriculture and related subjects, and are funded by the public. Authors can assist in the development of open access by insisting that their work be made available in their institutional

repositories. Alternatively there could be a central ICAR repository like the National Informatics Centre's repository OpenMED@NIC (<http://openmed.nic.in>) for the medical and allied sciences. In such a central repository, each institution could have their collection with respective metadata editors. For example, the College of Veterinary Science and Animal Husbandry of Anand Agricultural University has about 52 deposits of various research articles and un-refereed masters and doctoral thesis in OpenMED@NIC repository.

NAIP, with its Consortium for e-Resources in Agriculture (CeRA), is providing access to e-resources to 126 libraries in ICAR institutes and agricultural universities. Additionally, there is an effort to develop a Science Citation Index Facility at IARI for the evaluation of scientific publications. This is a very welcome effort to bringing e-resources to scientists. Now the time has come to think about wider and more open access to truly transform Indian agricultural journals. ICAR needs to take a first step towards open access by adopting an open access policy for Indian agricultural research. With the support of Open Knowledge Society (OKS; <http://www.oksociety.in/>) in India, the Medicinal and Aromatic Plant Association of India — a newly formed scientific society at the Directorate of Medicinal and Aromatic Plants — launched the *Open Access Journal of Medicinal and Aromatic Plants* (OAJMAP; <http://www.ojs.oksociety.in/index.php/oajmap/login>). If all of the professional societies in the ICAR institutes embrace open access, indeed another green revolution can be achieved. **FM**

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