

February 2016

Status of Open Access Institutional Digital Repositories in Agricultural Sciences: A Case Study of Asia

Bijan Kumar Roy

Dept. of Lib. & Inf. Sc., The University of Burdwan, West Bengal, India, bijankumarroy@yahoo.co.in

Subal Chandra Biswas

Dept. of Lib. & Inf. Sc., The University of Burdwan, West Bengal, India, scbiswas_56@yahoo.co.in

Parthasarathi Mukhopadhyay

Dept. of Lib. & Inf. Sc., The University of Kalyani, West Bengal, India

Follow this and additional works at: <http://digitalcommons.unl.edu/libphilprac>



Part of the [Library and Information Science Commons](#)

Roy, Bijan Kumar; Biswas, Subal Chandra; and Mukhopadhyay, Parthasarathi, "Status of Open Access Institutional Digital Repositories in Agricultural Sciences: A Case Study of Asia" (2016). *Library Philosophy and Practice (e-journal)*. 1329.
<http://digitalcommons.unl.edu/libphilprac/1329>

Status of Open Access Institutional Digital Repositories in Agricultural Sciences: A Case Study of Asia

Dr. Bijan Kumar Roy¹, Dr. Subal Chandra Biswas² and Dr. Parthasarathi Mukhopadhyay³

¹Assistant Professor, Dept. of LIS, The University of Burdwan, WB, Email: bijankumarroy@yahoo.co.in

²Professor, Dept. of LIS, The University of Burdwan, WB, Email: scbiswas_56@yahoo.co.in

³Associate Professor, Dept. of LIS, University of Kalyani, WB, Email: psmukhopadhyay@gmail.com

Abstract:

Paper highlights the current state of open access repositories (OARs) movement in Agricultural field of Asian countries. It describes their characteristics in terms of types, contents, disciplines, languages covered, technical and operational issues, and policy matters. Compares and evaluates repositories against selected parameters and makes some recommendations for the growth of agricultural repositories Worldwide. Also presents a unified interface that can harvest metadata from different OAI-PMH compliant agricultural repositories Worldwide.

Keywords: Open access, institutional repositories, agriculture, disciplinary repositories, metadata harvesting, self archiving policy

1. Introduction

Agriculture has become a major sector of the world economy especially in developing countries in terms of employment, Gross national product (GNP) etc. The importance of agricultural production in the context of global competition has occupied a significant place in the national development plan. So, technological progress for sharing and re-use of agricultural knowledge is crucial for the overall economic development of the country. Information and Communication Technology (ICT) specially World Wide Web (WWW) and Internet has made it easy to create and preserve digital objects and make them readily accessible globally. The rapid evolution of this technologies leads to the development of innovative agricultural repository system that provides numerous opportunities for providing global access to local agricultural research outputs with the aim of making agricultural research data available. The objectives of the study are to focus on the different open access (OA) agricultural repositories in Asian countries and compare all the repositories against selected parameters. Finally, presents a unified search interface that facilitates searching and browsing of OA resources of different OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) driven repositories worldwide. The key objectives of this paper are (i) to give the present status of agricultural OARs (Open Access Repositories) in Asian countries; (ii) to find out the strength and weakness of this agricultural OARs in compare to others domain-specific OARs; (iii) to suggest different parameters for evaluation of agricultural OARs as well as upcoming OARs in others domain; and (iv) to propose a metadata harvesting framework that will facilitate metadata extraction from any OAI-PMH compliant repositories.

2. Why Repositories in Agricultural Sciences

Agriculture has become an important field on which the majority of the rural population in developing countries depend. Agricultural information need to be shared and reused to reform economy. There is a growing demand for agricultural products and services and coordination among various agricultural research institutes. So, it is reasonable to have a digital repository particularly in

agriculture and allied sciences for sharing Scientific and scholarly researches related to Agriculture. This type of repository, not like multidisciplinary repositories, holds information on crop sciences, horticulture, animal sciences, agricultural engineering, fisheries, agricultural extension and agricultural education. The following are the main reasons for having a repository in this domain - *to share and widening access of research data on evaluations of agricultural technology; to acquire agricultural evaluation data sets for research; to explore the geographic dimensions of agricultural evaluation; to help to identify experts in the agricultural field; to provide inputs for developing regional policies, strategies, projects; to promote new and innovative techniques and systems in agriculture; and to establish regional and national networks on agricultural and allied disciplines.*

3. Agricultural Repository: Present Situation

Repository movement were initiated mainly in some developed countries like USA, UK, Germany but now it has become an area of research among academicians, scientists throughout the world. Now all the Continents are maintaining repositories on different subjects and objects and most of the repositories have been from Europe and North America. And, Asia emerges as the third largest contributor (OpenDOAR, 2015) only after Europe and North America. The first subject repository, arXiv, was established in 1991 by Dr Paul Ginsparg, a physicist then based at Los Alamos National Laboratories (LANL) in New Mexico to collect material for mathematics and physics.

The Registry of Open Access Repositories (ROAR) currently (January 2015) reports 3924 repositories of which 92 (2%) are from 'Agricultural' field. Asia ranks 1st position and contributes 34 repositories, 17 in the Europe, 16 from South America, 7 in the North America, 10 from Africa and 2 in the Oceania (ROAR, 2015). India and Indonesia jointly possesses 1st position worldwide as well as in Asia (Fig. 4 & Fig. 5). Another database, OpenDOAR (Directory of Open Access Repositories) (OpenDOAR, 2015) has recorded 2728 repositories and out of which 122 (4%) repositories are from 'Agriculture, Food and Veterinary'. Europe contributes 45 repositories, 26 in the Asia, 19 in North America, 15 in the South America and 13 repositories from Africa (Fig. 1). China being an Asian country possesses 3rd position having 6 repositories (Fig. 2). India having 4 repositories (3%) ranks 8th position worldwide (Fig. 2). But within Asian countries, India ranks 2nd position only after China possesses 6 repositories (Fig. 3).

There is a remarkable movement by SAARC (South Asian Association for Regional Cooperation) established SAC (SAARC Agricultural Centre) in 2007 with a mandate to promote agricultural research and development, technology dissemination for sustainable agriculture development and poverty alleviation in the region. As an individual country, India is not a good position. There is a steady growth of OARs since 2004 after taking call from *Budapest Open Access Initiative* (2002), *Berlin declaration* (2003) and *Bethesda Statement* (2003). The first repository started working in 2004 at Indian Institute of Science, Bangalore. After then, efforts are being made to make agricultural research publicly available globally. In 2006, the first AGRIS (International System for Agricultural Science and Technology) workshop on OA in agricultural sciences and technology held at ICRISAT (International Crops Research Institute for the Semi-Arid Tropics), Hyderabad. The first repository for agricultural sciences (specially for thesis) was initiated in 2008 under the name '*Krishiprabha*'. It holds all the doctoral dissertations submitted to various agricultural universities in India. In 2009, another important move in this regards is the establishment of OAR in agricultural sciences with the help of ICRISAT. Though there is no such activity on OA in Agriculture in India. The National Agricultural Research System (NARS) in India is the world's largest network of 97 agricultural research institutes established by the Indian Council of Agricultural Research (ICAR). Indian Agricultural Research Institute (IARI) established first repository, Eprints@IARI 2 in 2009. On the basis of the above mentioned research studies and other related studies, following key events (Table 1) are identified.

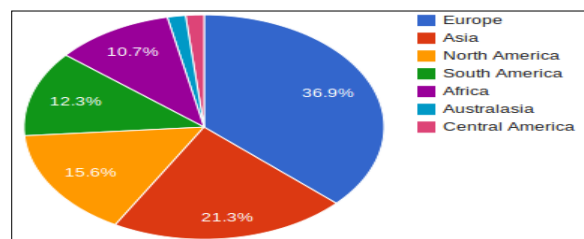


Fig. 1: Distribution of Agricultural Repositories – Continent-wise
Source: OpenDOAR Database

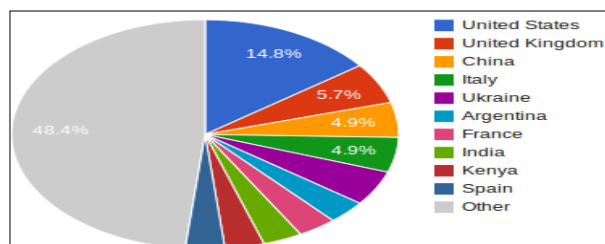


Fig. 2: Distribution of Agricultural Repositories – Country-wise
Source: OpenDOAR Database

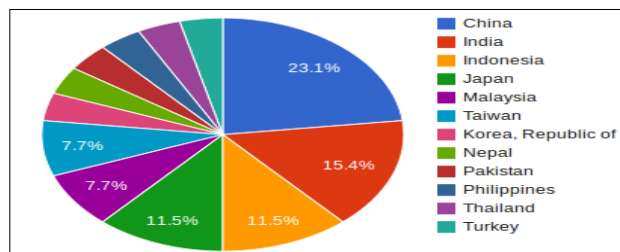


Fig. 3: Distribution of Agricultural Repositories – Country-wise (Asia)
Source: OpenDOAR Database

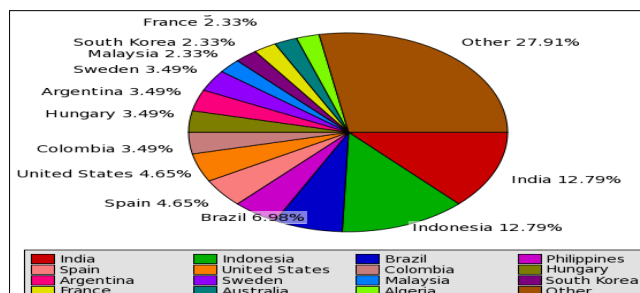
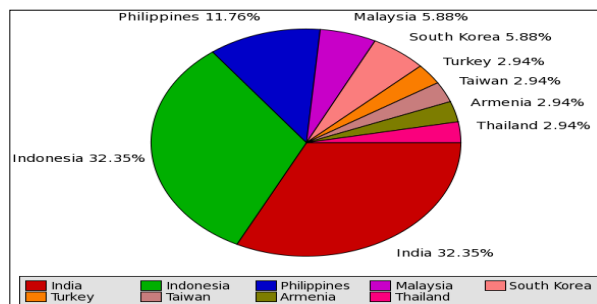


Fig. 4: Distribution of Agricultural Repositories – Country-wise (World)
Source: ROAR Database



Agricultural Repositories – Country-wise (Asia)
Source: ROAR Database

Fig. 5: Distribution of

Year	Events
1945	In 16 October, 1945, Food and Agriculture Organization (FAO)
1966	Global Forum on Agricultural Research (GFAR)
1971	Consultative Group on International Agricultural Research (CGIAR)
1979	International Service for National Agricultural Research (ISNAR)
1985	IRRI (International Rice Research Institute)
1990	In December, 1990, Asia Pacific Association of Agricultural Research Institutions (APAARI)
1996	GFAR (Global Forum on Agricultural Research)
2003	In October, 2003, AGORA (Access to Global Online Research in Agriculture)
2008	CIARD (Coherence in Information for Agricultural Research for Development)
2013	GODAN (Global Open Data for Agriculture and Nutrition)

Table 1: key events

4. Scope and Limitations of Study

This analytical study is limited to only agricultural OARs of Asian countries registered in OpenDOAR (31 OARs) and ROAR (37 OARs) databases. Repositories containing 'Agriculture' as one of the key subject have been considered. Though the field 'agriculture' as shown in OpenDOAR database covers three others broad subjects viz. *agriculture, food and veterinary science*. Whereas ROAR covers *plant culture, forestry, animal culture, aquaculture, fisheries, angling and hunting sports*. The study, after eliminating all common repositories, has finally selected altogether a total of 43 unique repositories from both the databases.

5. Methodology

The methodology for evaluation of agricultural OARs may be represented as below –

- Study of repositories listed in OpenDOAR and ROAR databases;
- Study of global recommendations and existing best practice guidelines;
- Identification and selection of criteria for evaluation of agricultural OARs; and
- Analysis and interpretation of results.

The details information about selected repositories under study have been provided in annex 1. The comparison of selected OARs (annex I) have been done below under section ten (10) headings that correspond to the evaluation criteria. The data has been collected up to January, 2015 from the above mentioned two databases viz. OpenDOAR and ROAR and analysis part has been done during February to August, 2015.

6. Parameters for Evaluation

For evaluating and analyzing agricultural OARs, the following ten (10) parameters (section 6.1 to section 6.10) have been selected on the basis of existing literature. All the OARs have been evaluated against selected criteria mentioned below -

6.1 Type of Materials

Generally, repositories archive various types of textual objects such as articles; conferences; theses;

books, project reports, annual reports etc (Roy, Biswas & Mukhopadhyay, 2011, 2012, 2013). All the repositories under study house same type of contents in general and there is a similarity between subject repositories and multidisciplinary repositories in content types. Generally objects are textual and only a few repositories hold special items like patents, software, multimedia, maps, newsletters, experiments and monographs etc.

6.2 Number of Objects

There is a vast difference amongst repositories in terms of number of digital objects uploaded. Only a few repositories have strong collections whereas majorities have uploaded minimum number of objects. The picture is too worse if we compare with other subject repositories (e.g. RePEc, ArXiv etc) or any other multidisciplinary repository registered in OpenDOAR and ROAR databases. Even, a few repositories have below 100 or 200 hundreds records (s.l.no. 35-39 of column VI of annex 1). Some repositories (s.l.no. 40-43 of column VI of annex 1) have not mention the total number of objects uploaded. It is found that repositories started functioning long ago have strong collections and have uploaded more objects than the novice repositories.

6.3 Countries-wise Distribution

Only 14 Asian countries are maintaining agricultural repositories and three (3) SAARC (South Asian Association for Regional Cooperation) countries have been enlisted (e.g. India, Pakistan and Nepal) in the list. Out of 43 repositories, India having 11 (25.5%) repositories stands 1st position. Indonesia possesses eight (8) (18.6%) repositories and ranks 2nd position after India. And, China having six (6) (13.9%) repositories stands 3rd position. Another three (3) countries (e.g. Japan, Malaysia and Philippines) jointly ranks 4th position and possess three (3) repositories each. Taiwan possesses two (2) repositories. Rest seven (7) countries possess only one (1) repository each. Picture differs if we compare countries in respect of percentage (%) of OAI-PMH compliant repository (see below in section 6.4).

6.4 Number of OAI-PMH Repositories

Finding OA resources information about different types of OA resources and searching on them separately is a difficult and time consuming task (Donaldson & Nelson, 2011). Here lies the demand for OAI-PMH compliant repositories which allow users to search resources in a single window interface. Out of 43 repositories, thirty (30) (69.7%) repositories are OAI-PMH compliant and only thirteen (13) (30.2%) repositories have not provided OAI-PMH base URL. Indonesia stands 1st position because all eight (8) repositories are OAI-PMH compliant. China having four (4) OAI-PMH compliant repositories stands 2nd position. India ranks 3rd position and only six (6) are OAI-PMH compliant.

6.5 Software used

Open source digital library packages are gaining popularity nowadays. The different repositories use different types of open source software (OSS). Six (6) different type of software have been used by forty three (43) different repositories under study. DSpace is the most popular software and is used by twenty four (24) (55.8%) repositories whereas EPrints is used by fourteen (14) (32.5%) repositories. Greenstone software is used by two (2) repositories each. Another three (3) software namely 'Drupal' 'OPUS' and 'Earmas' is used by obly one (1) repository each.

6.6 Subject Categorization and Access

Almost all the system has its own controlled vocabularies (in built) but it is not enough to represent

taxonomies of subject categories in a proper perspectives. So, ontology driven standard SKOS (Simple Knowledge Organization System) based subject access system is desirable from any OAR system (Roy, 2014; Roy, 2015). Here, three (3) popular control vocabulary tool viz. LC, DDC, AGRIS have been identified and only seven (7) (16.27%) repositories use such controlled vocabulary system in order to represent subject tree. LC is used by five (5) repositories (s.l.no. 2, 11, 22, 28 & 39) whereas DDC (s.l.no 36) and AGRIS (s.l.no. 21) is used by one (1) repository each. Rest of the repositories do not support any such subject access system.

6.7 Repository Policies

The importance of open access (OA) self archiving policies for the development of repository have been discussed in different context by many authors (Mark Ware Consulting, 2004; Barton & Waters, 2004–2005; Rieh et al., 2008; Shearer, 2005). Peter Millington made a study of OpenDOAR database and reported that about two thirds of OARs did not have publicly stated policies (Millington, 2006). Here picture has gone from bad to worse and this area has been neglected so far. A total of five common self archiving policies (Table 2) (e.g. Content, Metadata, Data Re-Use, Preservation & Submission policy) have been identified and several important issues relating to these policies have not been discussed in the literature. It is found that only nine (9) (20.9%) repositories have OA self archiving policy (at least one mentioned in Table 2) whereas thirty four (34) (79%) repositories have no clearly stated policy. Only four (4) repositories (s.l.no. 4, 12, 22 & 36) have all policies identified in the study. Some of the policies are still being developed and improved.

Name of the Repository	Policies				
	Content	Data Re-use	Metadata	Preservation	Submission
Udaya Repository (University of Surabaya Institutional Repository)	Y	Y	Y	Y	Y
Eprints@CMFRI (CMFRI Digital Repository)	Y	Y	Y	-	Y
UM Research Repository	Y	Y	Y	-	Y
International Crops Research Institute for the Semi-Arid Tropics	Y	Y	Y	Y	Y
ePrints Sriwijaya University	Y	Y	Y	Y	Y
MB IPB Repository	Y	Y	Y	Y	-
Eprints@IARI	Y	Y	Y	-	Y
ePrints@CFTRI	Y	Y	Y	Y	Y
Open Access Agricultural Research Repository (OpenAgri)	-	-	-	-	Y

Table 2: Repository Policies

6.8 Browsing and Searching

Information Retrieval (IR) in digital library environment has become more complex due to availability of resources in different form and format. All the system supports simple and advanced search (using Boolean operators). Theasuri, ontology, classification schemes are now available with a few repository systems and have been proven to be effective in standardizing the description of documents. This integrated subject access system allows users to search documents against a standard subject division/subdivision taken from DDC, LC or AGRIS.

6.9. Metadata Harvester System

Repositories provide searching, browsing and downloading scholarly research outputs for free of charge. But visiting different repositories and searching resources is a time consuming process and researchers find it difficult to manage the whole task. So, a unified search interface for browsing and searching different OA repositories worldwide can facilitate academicians by reducing the searching time and effort of different scholarly materials and OA repositories in the world. Liu et al. (2001) suggested for a unified searching interface that can address this issue by amalgamating different OA sources together and providing a unified interface to perform search queries. Here, 13 (30.23%) repositories have not provided OAI-PMH base URL (column IV of annex 1) and sometimes repositories having OAI-PMH base URL are not responding against a search term. As a result metadata could not be harvested as well as metadata index could not be updated.

Here, attempts have been made to acquire scholarly resources of OAI driven agricultural repositories using a prototype harvesting framework (i.e BURA-Burdwan University Research Archive) that provide global access through a unified interface using OAI-PMH driven metadata harvester. This framework (BURA) was developed as a part of the research work (Roy, 2014) and has been reported in another work (Roy, 2015). For the sample test, three OAI-PMH driven repositories have been selected from OpenDOAR database and organization and management alongwith searching and browsing of repositories have been shown through five screen snapshots (Fig. 6 to Fig. 10).



Fig. 6: Administrative Interface



Fig. 7: Repositories Harvested

The screenshot shows the 'Open Harvester Systems' search page. At the top, there is a navigation bar with links: HOME, ABOUT, USER HOME, BROWSE, SEARCH, and HELP. Below this, a breadcrumb trail shows 'Home > Search'. The main heading is 'Search'. On the right side, a 'USER' box indicates the user is logged in as 'ohsadmin' and provides links for 'My Profile' and 'Log Out'. The search form on the left includes several filters: 'All' (with a dropdown menu currently showing 'Plant culture'), 'Archives' (with a dropdown menu showing 'All Archives', 'Ubaya Repository', 'Institutional Repository @ UMS Library', and 'CAS OpenIR'), 'Abstract', 'Contributor', 'Coverage', 'Creator', and 'Date' (with 'From' and 'Until' date pickers). The 'All Archives' dropdown is currently open, showing the list of repositories.

Fig. 8: Searching all Repositories

The screenshot shows the 'Search Results' page. At the top, there is a navigation bar with links: MY PROFILE and Log Out. Below this, a breadcrumb trail shows 'REVISIT SEARCH'. The main heading is 'Search Results'. The search results are displayed in a list format. Each result includes a title, author, date, and links for 'VIEW RECORD' and 'VIEW ORIGINAL'. The results are as follows:

Title	Author	Date	View Record	View Original
UMS cadang majukan bukit jadi taman pokok natif Sabah	Larry Ralon,	2010-05-23	VIEW RECORD	VIEW ORIGINAL
Rancangan jadikan UMS universiti di dalam taman	Maryan Razan,	2010-05-07	VIEW RECORD	VIEW ORIGINAL
UMS closer to 'varsity in a garden'	Durie Rainer Fong,	2010-05-07	VIEW RECORD	VIEW ORIGINAL
Drying characteristics of unshelled kernels of candle nuts	Tiwan, Elieser; Prateepchaikul, Gumpon ; Yamsaengsung , Ram; Sirichote, Anchalee; Tekasakul, Perapong	2015-02-20	VIEW RECORD	VIEW ORIGINAL

1 - 4 of 4 items

Fig. 9: Display of Results

Record Details	
<div> My Profile Log Out </div>	
Drying characteristics of unshelled kernels of candle nuts	
Ubaya Repository VIEW ARCHIVE INFO	
FIELD	VALUE
Title	Drying characteristics of unshelled kernels of candle nuts
Creator	Tarigan, Elieser Prateepchaikul, Gumpon Yamsaengsung, Ram Sirichote, Anchalee Tekasakul, Perapong
Subject	SB Plant culture
Description	Candle nuts are cultivated in approximately 170000 ha. in Indonesia, and yield around 140000 tons of fruit per year. Prior to removing the shells, drying is an important process in the post-harvesting practice of candle nuts to obtain kernels as the final products. This paper gives a brief description of the efforts to obtain the basic drying characteristics of candle nuts, which is a pre-requisite for dryer design. The measurements were taken for unshelled kernels of candle nuts, for both fresh and stored samples, at temperatures of 40, 50, and 60 °C and drying air velocity of 0.67 m/s and 1 m/s using a forced convection dryer. The total drying time was substantially reduced with an increase in temperature, and the effect of drying air velocity was relatively small. Page's model

Fig. 10: Short Display of Records details

6.10. Ranking of Agricultural Repositories

Repositories can be ranked according to a number of variables to reflect their significance. The Ranking Web of World Repositories (<http://www.repositories.webometrics.info/about.html>) is an initiative of the Cybermetrics Lab, a research group belonging to the Consejo Superior de Investigaciones Cientificas (CSIC), the largest public research body in Spain. The institute is devoted to the development of cybermetrics techniques and quantitative analysis of the Internet and Web contents. The aim of this ranking (Table 3) is to support OA initiatives and therefore the free access to scientific publications in an electronic form and to other academic material. There is a need for Web metric ranking of any type of repositories for the following reasons -

- To measure the global visibility and impact of scientific repositories;
- To know the relative position of a particular IR; and
- To evaluate the present status of IR at the state level, national level and at the global level.

Name of the Repository	Ranking of Repositories	
	World	Country
IPB Repository (Bogor Agricultural University Repository)	89	02
UNDIP -IR (Diponegoro University Institutional Repository)	79	01
Institutional Repository of Institute of Geographic Sciences and Natural Resources Research, CAS (IGSNRR OpenIR)	1922	27
Ubaya Repository (University of Surabaya Institutional Repository)	762	23
Institutional Repository @VSL	847	16
Hasanuddin University Repository	356	09

ZXCKagoshima Academic Repository Network (KARN)	613	38
Eprints@CMFRI (CMFRI Digital Repository)	343	03
UMS Institutional Repository	622	13
HF-IR (Knowledge Repository of HFCAS	1608	20
UM Research Repository	480	08
International Crops Research Institute for the Semi-Arid Tropics	487	08
Institutional Repository of Research Center for Eco-Environmental Sciences, CAS (RCEES OpenIR)	1442	13
R-Space, Korea Rural Economic Institute	2062	10
Taiwan Agricultural Research Institute Institutional Repository (TARIIR)	869	17
ORION (Okinawa Repository Integrated Open-Access Network)	519	28
Tottori University research result repository	1006	73
Institutional Repository of Chengdu Institute of Biology, CAS (CIB OpenIR)	749	2
Institutional Repository of Institute for the History of Natural Sciences, Chinese Academy of Sciences(IHNS OpenIR,	1644	22
Knowledge@FSL (Armenian Research Academic Repository)	-	-
Thai Agricultural Research Repository	-	-
ePrints Sriwijaya University	734	21
Universiti Malaysia Kelantan Intitutional Repository	1096	17
SEAFDEC/AQD Institutional Repository	883	1
DSpace@GOP	2004	29
MB IPB Repository	1970	47
DSpace at IRRI	-	-
UPN JATIM Repository	1648	39
Knowledge Repository Open Network (KNoor)	1565	30
Scholarly publications from Indian Institute of Spices Research	-	-
Taiwan Agricultural History Digital Archives	555	09
National Science Digital Library	1326	24
Indian Institute of Horticultural Research	1984	36
Eprints@IARI	2085	39
POLNEP Repository	1677	41
ePrints@CFTRI	985	22
KRIBB Repository	2027	09
DSpace at Madan Puraskar Pustakalaya	-	-
eprints@NAARM	2129	41
Western Mindanao State University Repository	-	-
Institutional Repository of Institute of Soil Science, CAS (ISSAS OpenIR)	-	-
Open Access Agricultural Research Repository (OpenAgri)	-	-
AHKRC Digital Library	-	-

Table 3: List of Repositories and their Rank

Here, a blank cell in the table indicates that this value was not calculated due to insufficient data. Different indicators (such as size, visibility, rich files, scholar) were used by Cybermetrics Lab in ranking repositories (Table 3). Though this ranking may vary if methodology is changed and

additional indicators (i.e. infrastructure, number of permanent faculty members, number of students, number of publication of the staff members, student placement etc) are considered. Though it is not the scope of the paper. It is found that countries like Armenia, Nepal, Pakistan, Turkey do not represent any repository in this field. Though they are maintaining repositories in other disciplines.

7. Key Findings

There are 29 and 26 Asian countries have been recorded in OpenDOAR and ROAR databases respectively. But, not all Asian countries are maintaining OAR in agriculture fields as because of OAR smovement in this domain is still in early stages. Many more Asian countries seem to be in pipeline. All the SAARC countries (except India) are not maintaining agricultural repository and are not in a position to compare with other Asian counties in terms of number of repositories. The following are the key findings mentioned below - cumulative growth of Asian agricultural repositories per year is very low in compare to other developed countries or any other 'Multidisciplinary repositories'; number of objects uploaded is very low due to low submission in compared to other 'Multidisciplinary repositories'; a total of thirteen (13) repositories have not provided OAI-PMH base URL; a total of four (4) repositories (s.l.no. 40-43) have not mentioned number of records uploaded; altogether three (3) repositories (s.l.no.1, 33 & 37) do not provide full text access to its contents and items are restricted to only registered users; only one (1) repository provides link to DOAJ, DOAB, (s.l.no. 20); another one (1) repository (s.l. no. 32) provides free access to the e-books on different disciplines; user interface of some repositories are available in Thai (s.l.no. 21, 29) and in Chinese & Japanese (s.l. no. 31) other than English language; only one (1) repository (s.l.no 29) covers three language (e.g. Hindi; Arabic & Persian) other than default English language; another one (1) repository (s.l.no. 12) consults Sherpa/RoMEO database of publisher's policies regarding the self- archiving of journal articles; only one (1) repository (s.l.no. 12) provides link to OAIster, Scientific Commons, Bielefeld Academic Search Engine, Scirus & Google Scholar.

8. Conclusion

In the last ten years the number of repositories has increased constantly and the demand for subject repositories appears to continue to grow. But argicultural OARs could not achieve much success due to various problems and there are many unknowns in this area. The barriers are mainly three-fold (e.g. technical, non-technical and cultural) and derived from the different stakeholders (e.g. organization, funding body, publishers, users, academicians etc.). It is found that most of the repositories have no policies and several key issues such as content and collections organization and management, metadata schema, preservation format, multilinguality, workflow management etc are required to be properly discussed. So a roadmap in this regard is aspirational and national OA self archiving mandating policy based on global recommendations and best practices is required. This study shows that global visibility and impact of agricultural OARs are quite low and their rank (Table 3) are far behind in compare to other multidisciplinary or subjects repositories (Cybermetrics Lab, 2015). So attentions need to be given on mandatory archiving policy as well as quality of contents because success of any OAR depends on accessibility and usability of resources. For this purpose, collaborative efforts among different stakeholders (basically academicians, researchers) are required in creating awareness among academic and scientific communities about various benefits of OA self-archiving policies. And, there is a need of changing the mindset of researchers and policy-makers regarding the public-funded research and access to information (Arunachalam, 2008a, 2008b).

References

- Arunachalam, S. (2008a). Open Access to Scientific Knowledge. *DESIDOC Journal of Library and Information Technology*, 28(1), 7-14.
- Arunachalam, S. (2008b). Open Access in India: Hopes and Frustrations. *Proceedings of ELPUB Conference on Electronic Publishing* (June, 25-27, 2008, Toronto, Canada) (pp. 271 – 279). Retrieved June 11, 2014, from http://elpub.scix.net/data/works/att/271_elpub2008.content.pdf
- Barton, M. R., & Waters, M. M. (2004-2005). *Creating an institutional repository: LEADIRS workbook*. Cambridge, MA: MIT.
- Berlin Declaration of Open Access. (2003). *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*. Retrieved June 11, 2014, from http://www.zim.mfg.de/openaccessberlin/berlin_declaration.html
- Bethesda Statement. (2003). *Bethesda Statement on open access publication*. Retrieved February 11, 2014, from <http://www.earlham.edu/~peters/fos/bethesda.htm>
- Borrero, A., et al. (2007). Scholarly publishing initiatives at the International Rice Research Institute: Linking users to public goods via open access. *First Monday*, 12(10). Retrieved June 11, 2015, from <http://firstmonday.org/article/view/1955/1832>
- Budapest Open Access Initiative. (2002). *Read the Budapest Open Access Initiative*. Budapest, Hungary: Open Society Institute, Soros Foundation. Retrieved July 11, 2014, from <http://www.soros.org/openaccess/read.shtml>.
- Cybermetrics Lab. (2015). *Ranking Web of Repositories*. Retrieved from August 17, 2015, from <http://repositories.webometrics.info/en/world>
- Donaldson, R. L., & Nelson, D. W. (2011). *The 2012 Promise of Open Access Textbooks: Florida Virtual Campus*. Retrieved February 13, 2015, from <http://www.openaccesstextbooks.org/pdf/ModelDraft.pdf>
- Liu, X., et al. (2001). Arc: an OAI service provider for cross-archive searching. *Proceedings of the 1st ACM/IEEE-CS joint conference on Digital libraries* (June 24-28, 2001, Roanoke, Virginia) (pp. 65-66). Retrieved January 12, 2015, from <http://dl.acm.org/citation.cfm?id=379451>
- Mark Ware Consulting Ltd. (2004). *Publisher and Library/Learning Solutions (PALS): Pathfinder Research on Web-Based Repositories: Final Report*. Retrieved May 11, 2015, from http://www.ncsi.iisc.ernet.in/indest-ncsi-ir/resources/PALS_report_IR.pdf
- Millington, P. (2006). Moving Forward with the OpenDOAR Directory. Paper presented at the 8th *International Conference on Current Research Information Systems* (May 11-13, 2006, Bergen). Retrieved January 12, 2015, from <http://www.opendoar.org/documents/BergenPresentation20060512Handouts.ppt>
- OpenDOAR. (2015). *Directory of Open Access Repositories*. Retrieved January 22, 2015, from <http://www.opendoar.org/>
- Rieh, S. Y., et. al. (2008). Perception and Experiences of staff in the planning and implementation of IR. *Library Trends*, 57(2), 168-190.
- ROAR. (2015). *Registry of Open Access Repositories*. Retrieved January 23, 2015, from <http://roar.eprints.org/>
- Roy, B. K., Biswas, S. C., & Mukhopadhyay, P. (2011). An Analytical Study of Institutional Digital Repositories in India. *Library Philosophy and Practice*. Paper 692. Retrieved September 3, 2015, from <http://digitalcommons.unl.edu/libphilprac/692>
- Roy, B. K., Biswas, S. C., & Mukhopadhyay, P. (2012). Open Access Repositories in Asia: From SAARC to Asian Tigers. *Library Philosophy and Practice*. Paper 808. Retrieved September 12, 2015, from <http://digitalcommons.unl.edu/libphilprac/808>
- Roy, B. K., Biswas, S. C., & Mukhopadhyay, P. (2013). Global visibility of Indian Open Access Institutional Digital Repositories. *International Research: Journal of Library & Information Science*, 3(1), 182-194.
- Roy, B. K. (2014). *Designing Institutional Digital Repository for the University of Burdwan: A*

FLOSS Based Prototype. A PhD Thesis, Library and Information Science Department, The University of Burdwan, Burdwan.

Roy, B. K. (2015). *Institutional Digital Repository: From Policy to Practice*. Germany: LAP.

Shearer, K. (2005). *Institutional Repositories: The Evolution of Scholarly Communication*.

Retrieved from August 17, 2014, from [http://www.carl-](http://www.carl-abrc.ca/projects/institutional_repositories/ppt/CACUL2-Apr05.ppt)

[abrc.ca/projects/institutional_repositories/ppt/CACUL2-Apr05.ppt](http://www.carl-abrc.ca/projects/institutional_repositories/ppt/CACUL2-Apr05.ppt).

Wu, J., & Ochs, M.A. (2007). AGLINET, AGORA, et al: Enhancing Access to Information in Support of Research and Extension in the Developing World. *Information Development*, 23(1), 55-62.

Annex 1: List of Agricultural Repositories under Study

SL No	Name of IR	Country	OAI-PMH verbs	Software	Items	Subjects	Content	Language	Policy
1	IPB Repository (Bogor Agricultural University Repository)	Indonesia	http://repository.ipb.ac.id/oai?Identify?ListMetadataFormats	DSpace	61979 items (2015-01-19)	Multidisciplinary	Articles; Theses; Unpublished; Books	Indonesian	-
2	UNDIP -IR (Diponegoro University Institutional Repository)	Indonesia	http://eprints.undip.ac.id/cgi/oai2	EPrints	39582 items (2015-01-19)	Multidisciplinary	Articles; Conferences; Theses; Books; Learning Objects; Multimedia; Patents; Special	Indonesian ; English	-
3	Institutional Repository of Institute of Geographic Sciences and Natural Resources Research, CAS (IGSNRR OpenIR)	China	http://159.226.115.200/casirgrid-oai/request	DSpace	19959 items (2015-01-19)	Agriculture, Food and Veterinary; Ecology and Environment; Physics and Astronomy; Library and Information Science	Articles; Conferences; Theses; Books	Chinese; English	-
4	Ubaya Repository (University of Surabaya Institutional Repository)	Indonesia	http://repository.ubaya.ac.id/cgi/oai2	EPrints	19211 items (2015-01-19)	Agriculture, Food and Veterinary; Biology and Biochemistry; Mathematics and Statistics;	Articles; Conferences; Theses	English; Indonesian	C, D, M, P, S
5	Institutional Repository @VSL	India	http://vslir.iimahd.ernet.in:8080/oai/request?verb=Identify?Identify?ListMetadataFormats	DSpace	12247	Agriculture; Management, Organizational Behaviour; Business Policy; Economic;	Annual Reports ; Conference Proceedings; Question Papers; Thesis and Dissertations; Articles; Working Paper	English	-
6	Hasanuddin University Repository	Indonesia	http://repository.unhas.ac.id/oai/request	DSpace	12111 items (2015-01-19)	Agriculture, Food and Veterinary; Earth and Planetary Sciences; Ecology and Environment; Health and Medicine	Articles; Theses; Unpublished	English	-

7	ZXCKagoshima Academic Repository Network (KARN)	Japan	http://karn.lib.kagoshima-u.ac.jp/dspace-oai/request	DSpace	11893 items (2015-01-19)	Agriculture, Food and Veterinary; Health and Medicine; Technology General; History and Archaeology; Language and Literature; Law	Articles; Conferences; Unpublished	Japanese	-
8	Eprints@CMFRI (CMFRI Digital Repository)	India	http://eprints.cmfri.org.in/cgi/oai2?Identify?ListMetadataFormats	EPrints	9927 items (2015-01-19)	Agriculture, Food and Veterinary; Biology and Biochemistry; Ecology and Environment; Health and Medicine	Articles; Conferences; Theses; Unpublished; Books; Patents	English	C, D, M, S
9	UMS Institutional Repository	Malaysia	http://eprints.ums.edu.my/cgi/oai2	EPrints	9517 items (2015-01-19)	Multidisciplinary; Agriculture, Food and Veterinary; Biology and Biochemistry; Earth and Planetary Sciences; Ecology and Environment; Health and Medicine; Technology General;	Articles; Conferences; Theses; Unpublished; Learning Objects; Multimedia	English	-
10	HF-IR (Knowledge Repository of HFCAS)	China	NA	DSpace	9404 items (2014-07-16)	Agriculture, Food and Veterinary; Biology and Biochemistry; Physics and Astronomy; Computers and IT; Mechanical Engineering and Materials	Articles; Conferences; Theses; Unpublished; Patents	Chinese; English	-
11	UM Research Repository	Malaysia	http://eprints.um.edu.my/cgi/oai2	EPrints	9070 items (2015-01-19)	Multidisciplinary	Articles; Conferences; Multimedia	English	C, D, M, S
12	International Crops Research Institute for the Semi-Arid Tropics	India	http://oar.icrisat.org/cgi/oai2?Identify?ListMetadataFormats	EPrints	7849	Agriculture-Farming, Production, Technology, Economics; Food and Nutrition; Information Science; Soil Science; Genetics and Genomics etc	Thesis, Book, Conference or Workshop Item, Monograph, Book Section, Article	English	C, D, M, P, S
13	Institutional Repository of Research Center for Eco-Environmental Sciences, CAS	China	http://159.226.240.226/casir-grid-oai/request	DSpace	6430 items (2014-07-16)	Agriculture, Food and Veterinary; Chemistry and Chemical Technology;	References; Theses; Patents	Chinese	-

	(RCEES OpenIR)					Ecology and Environment; Geography and Regional Studies			
14	R-Space, Korea Rural Economic Institute	Korea, Republic of	http://rspace.krei.re.kr/dspace-oai/request	DSpace	6260 items (2013-11- 28)	Agriculture, Food and Veterinary	Articles; Unpublished; Learning Objects	Korean	-
15	Taiwan Agricultural Research Institute Institutional Repository (TARIIR)	Taiwan	http://ir.tari.gov.tw:8080/ir-oai/request	DSpace	5981 items (2014-04- 24)	Science General; Agriculture, Food and Veterinary; Biology and Biochemistry; Chemistry and Chemical Technology	Articles	Chinese; English	-
16	ORION (Okinawa Repository Integrated Open-Access Network)	Japan	NA	DSpace	4969 items (2015-01- 19)	Multidisciplinary; Agriculture, Food and Veterinary; Health and Medicine	Articles; Conferences	Japanese	-
17	Tottori University research result repository	Japan	NA	Earmas	4362 items (2015-01- 19)	Multidisciplinary; Agriculture, Food and Veterinary; Health and Medicine; Electrical and Electronic Engineering; Education	Articles	Japanese	-
18	Institutional Repository of Chengdu Institute of Biology, CAS (CIB OpenIR)	China	http://210.75.237.14/casirgrid-oai/request	DSpace	4214 items (2013-08- 22)	Agriculture, Food and Veterinary; Biology and Biochemistry; Ecology and Environment; Computers and IT	Articles; References; Conferences; Theses; Unpublished; Books; Patents	Chinese; English	-
19	Institutional Repository of Institute for the History of Natural Sciences, Chinese Academy of Sciences(IHNS OpenIR)	China	http://ir.ihns.ac.cn/casirgrid-oai/request	DSpace	4130 items (2013-11- 28)	Multidisciplinary; Science General; Agriculture, Food and Veterinary; Biology and Biochemistry; Chemistry and Chemical Technology; Earth and Planetary Sciences	Articles; Conferences; Theses; Unpublished; Books; Patents; Special	Chinese; English	-
20	Knowledge@FSL (Armenian Research Academic Repository)	Armenia	NA	Greenstone	4031 items (2014-12- 09)	Multidisciplinary	Articles; References; Books	Armenian	-

21	Thai Agricultural Research Repository	Thailand	http://anchan.lib.ku.ac.th/ag-net-oai/request	DSpace	3434 items (2015-01-19)	Agriculture, Food and Veterinary	Articles; References; Conferences; Unpublished	English	-
22	ePrints Sriwijaya University	Indonesia	http://eprint.unsri.ac.id/cgi/oai2	EPrints	3373 items (2015-01-19)	Agriculture, Technology, Medicine, Language and Literature, Social Sciences	books, tutorials, presentations, final project, theses, dissertations	Malay; Indonesian ; English	C, D, M, P, S
23	Universiti Malaysia Kelantan Institutional Repository	Malaysia	NA	EPrints	2294 items (2015-01-22)	Agriculture, Food and Veterinary; Earth and Planetary Sciences; Arts and Humanities General; History and Archaeology; Language and Literature; Business and Economics	Articles; References; Conferences; Theses; Books; Multimedia	English	-
24	SEAFDEC/AQD Institutional Repository	Philippines	http://repository.seafdec.org.ph/oai/request? ?Identify ?ListMetadataFormats	DSpace	2015	Fish culture, Shrimp culture,	articles, books, conference proceedings, annual reports	English	-
25	DSpace@GOP	Turkey	http://earsiv.gop.edu.tr/oai	DSpace	1986 items (2015-01-19)	Multidisciplinary; Agriculture, Food and Veterinary	Articles	Turkish; English	-
26	MB IPB Repository	Indonesia	http://repository.mb.ipb.ac.id/cgi/oai2?Identify?ListMetadataFormats	EPrints	1981	Multidisciplinary	Theses	English	C, D, M, P
27	DSpace at IRRI	Philippines	NA	DSpace	1345 items (2014-03-11)	Multidisciplinary; Agriculture, Food and Veterinary; Biology and Biochemistry	Articles; Theses; Multimedia	Turkish; English	-
28	UPN JATIM Repository	Indonesia	http://eprints.upnjatim.ac.id/cgi/oai2 ?Identify ?ListMetadataFormats	EPrints	1244	Science General; Agriculture; Technology; Medicine; Language & Literature Social Sciences	Article, Book, Patent, Thesis, Conference, research papers	English; Indonesian	-
29	Knowledge Repository Open	India	http://dspace.uok.edu.in/oai	DSpace	1007 items	Science General;	Articles;	English;	-

	Network (KNoor)		/request		(2014-08-18)	Agriculture, Food and Veterinary; Health and Medicine; Technology	Conferences; Theses	Hindi; Arabic; Persian	
30	Scholarly publications from Indian Institute of Spices Research	India	http://220.227.138.214:8080/dspace/dspace-oai ?Identify ?ListMetadata Formats	DSpace	783	Horticulture, Biochemistry, Soil Science, Crop Protection, Biotechnology	articles, book chapters, project reports, annual reports	English	-
31	Taiwan Agricultural History Digital Archives	Taiwan	http://tahda.lib.nchu.edu.tw/cgi-bin/g32/nchuoi.cgi ?Identify ?ListMetadataFormats	OPUS	673 items (2015-01-19)	Agriculture, Food and Veterinary; History and Archaeology; Language and Literature; Philosophy and Religion; Law and Politics	Theses; Books; Multimedia	Chinese; Japanese	-
32	National Science Digital Library	India	http://nsdl.niscair.res.in/dspace-oai ?Identify ?ListMetadata Formats	DSpace	579 items (2014-05-12)	agriculture,anthropology,biochemistry,botany,chemistry,geology, horticulture, industrial chemistry	Books	English	-
33	Indian Institute of Horticultural Research	India	NA	DSpace	486 items (2014-10-22)	Horticultural Sciences, Biotechnology	journal articles, conference proceedings, reports, theses, dissertations	English	-
34	Eprints@IARI	India	NA	EPrints	230 items (2013-10-03)	Agriculture, Food & Veterinary	Articles; Conferences; Theses; Unpublished	English	C, D, M, S
35	POLNEP Repository	Indonesia	http://repository.polnep.ac.id/oai/request ?Identify ?ListMetadataFormats	DSpace	140 items (2015-01-19)	Agriculture, Food & Veterinary; Civil, Mechanical, Electrical & Electronic Engineering; Materials; Business & Economics	Articles; Theses; Unpublished; Books	Indonesian	-
36	ePrints@CFTRI	India	http://ir.cftri.com/cgi/oai2 ?Identify ?ListMetadataFormats	EPrints	100	Social sciences; Natural Sciences, Mathematics; Technology; History	journal articles, dissertations, theses, student investigations	English	C, D, M, P, S
37	KRIBB Repository	South	http://repository.kribb.re.kr	DSpace	100	Multidisciplinary	Articles;	South	-

		Korea	8080/dspace-oai/request ?Identify ?ListMetadataFormats				Unpublished; Patents	Korean; English	
38	DSpace at Madan Puraskar Pustakalaya	Nepal	NA	DSpace	95 items (2010-01-25)	Multidisciplinary; Agriculture, Food and Veterinary; Philosophy and Religion; Education; Law	Special	Nepali; English	-
39	eprints@NAARM	India	NA	EPrints	78	Medicine; Agriculture; Technology; business management; rural sociology	technical bulletin, training manual, Hindi article, copyright documents, annual reports	English	-
40	Western Mindanao State University Repository	Philippines	http://scholar.google.com/citations?hl=en&user=ntBwn3QAAAAJ ?Identify ?ListMetadataFormats	EPrints	NA	Arts and Humanities General; Social Sciences General	Articles; Theses	English	-
41	Institutional Repository of Institute of Soil Science, CAS (ISSAS OpenIR)	China	NA	DSpace	NA	Agriculture, Food and Veterinary; Chemistry and Chemical Technology; Ecology and Environment	Articles; References	Chinese; English	-
42	Open Access Agricultural Research Repository (OpenAgri)	India	NA	Drupal	NA	Agriculture, Food and Veterinary	Articles; Conferences; Books	English (Multiple)	S
43	AHKRC Digital Library	Pakistan	NA	Greenstone	NA	Agriculture, Food and Veterinary; Ecology and Environment	Articles; Unpublished; Learning Objects; Multimedia; Special	English	-

Repositories are arranged as per total number of items uploaded (column VI of annex 1)