

Webometric Analysis of Websites of Digital Repositories of Agricultural Sciences in Asia on a Global Scale

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Abstract

This study investigates 88 open-access digital repositories of agricultural sciences in Asia. The webometric methods are used to assess the web performance of these repositories as represented by worldwide visibility and highlights the diverse link architectures and online presence using webometric indicators via the Google search engine. According to the results, the Fundamental Science Library of the NAS, Armenia is ranked first with 391000 web pages, 149000000 In-Link web pages, and 381.0741688 RWIF. Regarding the WISER index value of IDR websites, Taiwan Agricultural Research Institution occupied the first rank with 20.56, followed by the Science and Technology Development Center of the Ministry of Education of the People's Republic of China and the Tea Research Institute Repository, Sri Lanka. This study also shows a comparative study between IDRs regarding their Application Data Management values and mapping these IDS with a WebCrawler, i.e., SocScibot4. As a result of this study, information professionals, researchers, and students will better understand the high-quality websites of agricultural repositories in Asia that meet their information demands.

Keywords: Digital Repository, Web Impact Factor, Agricultural Repositories, Open Access

Introduction

The Agricultural Revolution began in Great Britain in the 18th century. It spread throughout Europe and America by the 19th century, with new

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farming techniques and inventions in Europe increasing crop productivity and labor and land productivity, resulting in a massive increase in food production.

Therefore, agriculture is the backbone of the economic system and plays a critical role in economic growth in many nations throughout the world, providing food and raw materials and job possibilities to a considerable number of the people. In this sense, agricultural output in Asia has held an important place globally for its national development; information about the agricultural sector plays a vital transferable and reusable function. Through digital repositories, ICT has facilitated world wide access to these information resources. The Open Access (OA) movement began in the twenty-first century with the Budapest Open Access Initiative (BOAI) further promoted opening of agricultural knowledge to all.

All academic institutions and research organizations made their research output available for anyone to access through their institutional digital repository websites. Several research organizations play a critical role in distributing their research output throughout the world in this context.

According to open Directory of Open Access repositories (DOAR) and Registry of Open Access Repositories (ROAR), a total of 88 agricultural research institutes provide their research output via digital repositories based on their websites. As a result, the web presence of these digital archives was evaluated and analyzed using various webometric indicators with different search engines. The impact of websites of agricultural digital repositories may be measured using webometric indicators. Furthermore, different web impact factors of their websites fall under webometric study. It can assist in monitoring different users' activities and helping to redesign the repositories' websites. The goal of this study is to investigate and assess the present situation of open access digital repositories in agricultural sciences in Asian countries to measure worldwide exposure and web presence, which may lead to the provision of effect on the organization's research ranking. Most of the repositories have developed in Europe, North

America, and Asian countries. Furthermore, Europe emerges as the first most significant contributor (Open DOAR and ROAR, 2019) in the world in the agricultural field.

Scope and Limitations of the Study

The present study investigates agricultural repository websites that have been selected from ROAR and Open DOAR. After removing all similar repositories, a total of 88 different agricultural repositories have been selected. Agriculture is described in the Open DOOR and ROAR as "agriculture, food, and veterinary science, plant culture, forestry, animal culture, aquaculture, fisheries, fishing, and hunting.

Literature Review

The quantitative study of the web is known as webometrics. Webometrics Development, Web Content Analysis, Web Link Analysis, Web Technology Analysis, and Web Impact Factor are only a few examples of Webometric Analysis, including Web measurements and Web-effects analysis. Various authors have undertaken several studies (Bjorneborn & Ingwersen, 2001, 2004; Thelwall et al., 2002 and 2008) to establish the idea of the webometric study. Jalal, Biswas, and Mukhopadhyay (2009) examined the websites of 13 Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs) to determine the progress of Webometrics from bibliometrics. They discussed the application areas of Webometrics research, the methods used for data gathering, web analytic methodologies and tools, and issues faced in web research. Web Content Analysis is one of the parameters of webometric analysis, and several writers (Thelwall, 2003 & 2004a) have used it in many fields. Thanuskodi (2012) examined the websites of important national libraries in Indian institutions and used bibliometric methods to evaluate the contents, link structures, and another study topics. Web Link Analysis is another basic method for webometric research, and many authors use it (Rousseau, 1997a; Thelwall, 2001a; Aguillo, 2007; Jalal, Biswas, & Mukhopadhyay, 2010a; Shukla & Poluru, 2012).

According to a study by Sujithai, Maria, Jayshankar, and Jayasankar (2013), external link web pages are more important than other link pages. Web Technology Analysis is another key component of webometric research, and several writers (Vaughan, 2004b; Vaughan & Zhang, 2007; Bar-Ilan, 2008; Thelwall, 2008b) analyzed the APIs of Google, Live Search, and Yahoo to determine the consistency and inconsistency of these three search engines. The web Impact Factor is a quantitative indicator invented by Peter Ingwersen in 1998, and other writers have examined the web Impact Factor of websites in various fields. Islam and Alam (2011) performed research on 44 private institutions in Bangladesh to determine the influence of websites and their Webometrics indicator.

Objectives

The main objectives of this study is to:

- To analyze the selected open accesses digital repositories of agricultural sciences in Asia based on their websites' activity;
- To explore the web presence and calculate various web impact factors of websites of the selected digital repositories of agricultural sciences;
- To use WISER (Web Indicators for Science, Technology and Innovation Research) ranking method to know the visibility and connectivity of the open access digital repositories of agricultural sciences on the web;
- To identify the web linking between the open access digital repositories of agricultural sciences based on the ADM count summary and generates link network diagrams of the open access agricultural repositories in Asia.

Research Methodology

In this present study, survey and observation methods have been used. Data were collected from selected open access digital repositories of agricultural sciences using Google. Personal web crawler SocSciBot4 (available at <http://socscibot.wlv.ac.uk>) has been used for creating network

diagrams of agricultural repositories websites to extract key summary statistics.

Data Collection through searching:

Google's search engine was used for an approximate number of different link pages from the websites of selected agricultural repositories of Asia during 01-20 December 2020. The following search statements or syntax are used to collect data:

- **Site: url**-this will extract the total number of WebPages to the websites under the url.
- **Link: url**- this will retrieve the total number of WebPages linking to the websites i.e. hyperlink pages.
- **Link: url AND NOT site: abc** - it will provide a complete report of several web pages not under the websites which provide links from the other websites i.e, External-Link pages.
- **Link: url NOT site: abc** - For a complete report of several links incoming from other websites.

The calculation of WIF is as follows

- | | |
|---------------------------|--|
| 1. Simple-link WIF = | <u>Total number of Simple-link web pages</u> |
| (SLWIF) | Total number of web pages (NWP) |
| 2. External-link WIF = | <u>Total number of external-link web pages</u> |
| (ELWIF) | Total number of web pages (NWP) |
| 3. InLink / Revised WIF = | <u>Total number of in-link web pages</u> |
| (ILWIF / RWIF) | Total number of web pages (NWP) |

Where A=Total no of WebPages of a given site; B=Total no of external backlinks to a given site; C=Total no of self-link of a given site; D=total no of links to a given site.

Calculation of WISER Index Value

The activity of agricultural digital repositories is multi-dimensional, which is reflected in its web presence. The WISER Ranking value is calculated through the combination of these four indicators i.e. the number of links or external links, the number of WebPages, the number of rich files in a web domain, and the number of publications in the Google scholar database based on the following formula where each one has a different weight:

Aguillo, et al. (2008) has given the formula for WISER ranking as:

$$\text{WISER ranking} = \log (\text{Visibility } 50\%) + \log (\text{Size } 20\%) + \log (\text{Rich files } 15\%) + \log (\text{Scholars } 15\%).$$

Data Analysis and Interpretation

The WIF for each agricultural digital repository is calculated based on a formula given in three different ways. These are Simple Link WIF, External Link WIF, and In-Link WIF, which reflect the level of influence of domain spaces in WWW. A matrix can represent the calculation of WIF of different web spaces as shown in Table 1.

Table-1: Different Web Link Impact Factors of Agricultural Repositories Websites

S.No.	ASIAN Repositories	NWP (A)	NLP (B)	SIMLF (B/A)	External LP (D)	ExtIF (D/A)	No of IN- P(E)	RWIF (E/A)
1	Academia Sinica IR	618000	550000	0.88996764	1040000	1.682848	652000	1.055016
2	AHKRC Digital Library	1800	971	0.53944444	1220	0.677778	939	0.521667
3	Baskent University Open Access System	34100	41200	1.20821114	51100	1.498534	49700	1.457478
4	Bogor Agricultural University Repository	218000	185000	0.84862385	435000	1.995413	389000	1.784404
5	CapSU Tapaz Aklatan Repository	5	5	1	6	1.2	5	1
6	ChungNam Institute	614000	490000	0.7980456	981000	1.59772	993000	1.617264
7	Coconut Research IR	782000	536000	0.685422	615000	0.786445	673000	0.860614
8	DR of Warmadewa University	9010	5340	0.59267481	114000	2.516556	76600	1.690949
9	Diponegoro University IR (UNDIP-IR)	45300	34700	0.76600442	5660	0.628191	4870	0.540511
10	DSpace at IIRRI	17400	9	0.00051724	32600	1.873563	32700	1.87931
11	DSpace@GIPE	55900	15600	0.27906977	16900	0.302326	16700	0.298748
12	DSpace@GOP	10200	9700	0.95098039	9700	0.95098	8530	0.836275
13	E-Library Universitas Brawijaya	99900	143000	1.43143143	161000	1.611612	135000	1.351351
14	ePrints Sriwijaya University - UNSRI Online IR	12200	9580	0.7852459	14100	1.155738	9490	0.777869
15	ePrints Sriwijaya University - UNSRI Online Repo	13200	9370	0.70984849	14900	1.128788	9110	0.690152
16	ePrints@Bangalore University	20300	9780	0.4817734	1280	0.063054	220000	1.896552
17	ePrints@CFTRI	27400	47300	1.72627737	17000	0.620438	948	0.0467
18	Eprints@CMFRI	39600	15700	0.39646465	4010	0.101263	16300	0.594891
19	Eprints@IARI (Indian Agricultural Research Inst.)	29100	14100	0.48453608	15900	0.546392	3710	0.093687

20	eprints@NAARM	28400	28700	1.01056338	39200	1.380282	3710	0.127491
21	EPRINTS@UNAIR - REPOSITORY UNAIR	116000	205000	1.76724138	253000	2.181034	28400	1
22	ETD of UAS Dharwad	13200	5790	0.43863636	4940	0.374242	3880	0.293939
23	FÄ±rat University Instit. OA	68300	72900	1.06734993	98900	1.448023	107000	1.566618
24	Hasanuddin Univ. Rep.	109000	94100	0.86330275	107000	0.981651	76900	0.705505
25	Hector Kobbekaduwa Agrarian Res. & Training IR	35900	39000	1.08635098	35000	0.97493	35800	0.997214
26	HF-IR (the Library of Hefei Ins. of Physical Science)	89900	4290	0.04771969	1860	0.02069	1310	0.014572
27	Igdir Universitesi Acik Erisim Sistemi	9840	8230	0.83638211	11600	1.178862	9000	0.914634
28	IR@VSL	349000	224000	0.64183381	223000	0.638968	195000	0.558739
29	IR of Chengdu Institute of Biology, CAS	2300	928	0.40347826	84	0.036522	549	0.238696
30	IR of Inst. for the Hist. of Natural Sci. (IHNS OIR)	14100	33100	2.34751773	1850	0.131206	6080	0.431206
31	IR of Institute of Geographic Sciences and Natural Resources Research, CAS	180	304	1.68888889	281	1.561111	98	0.544444
32	IR of Research Center for Eco-Env. Sciences, CAS	188	441	2.34574468	414	2.202128	143	0.760638
33	IR of the Chittagong Vete. and Animal Scie. Univ.	3880	73	0.01881443	228	0.037134	5320	0.86645
34	IR@NEERI - IR@NEERI	6140	6550	1.06677524	6000	0.911854	5360	0.81459
35	IR@NEIST OAIR	6580	5490	0.83434651	7	0.001804	5	0.001289
36	Kagoshima Academic Repository Network	240000	184000	0.76666667	242000	1.008333	230000	0.958333
37	KNOWLEDGE REPO. OPEN NETWORK (KNooR)	33000	33800	1.02424242	36800	1.115152	40800	1.236364
38	Knowledge@FSL Fundamental Sci. Lib of the NAS	391000	44900	0.11483376	14400000	36.82864	1.5E+08	381.074

39	Koya University Eprints - Koya University Eprints	5340	5130	0.96067416	5120	0.958801	5070	0.949438
40	KREi Repository	76500	38400	0.50196078	941000	12.30065	33300	0.435294
41	KRIBB Repository	11400	11100	0.97368421	18600	1.631579	20500	1.798246
42	KRISHI Publications and Data Repository	215000	322000	1.49767442	451000	2.097674	290000	1.348837
43	Krishikosh	351000	147000	0.41880342	129000	0.367521	86700	0.247009
44	Madan Puraskar Pustakalaya	55900	19500	0.34883721	12400	0.221825	12700	0.227191
45	MB IPB Repository - MB IPB Repository	109000	92000	0.8440367	113000	1.036697	95000	0.87156
46	Mugla Sıtkı Kocman University Open Archive Repo.	36000000	21200000	0.58888889	95900000	2.663889	1.26E+08	3.5
47	NARO Institutional Repository	70700	87800	1.24186704	270000	3.818953	180000	2.545969
48	National Science Digital Library at NISCAIR	6550	14200	2.16793893	4300	0.656489	4440	0.677863
49	NIPGR Digital Knowledge Repository (NDKR)	70700	45000	0.63649222	64500	0.912306	42900	0.606789
50	OA Repository of ICRISAT - OAR@ICRISAT	28400	33000	1.16197183	28700	1.010563	6600	0.232394
51	Obihiro Uni. of Agriculture and Veterinary Medi. AR	7840	6720	0.85714286	10400	1.326531	9630	1.228316
52	Open Access E-Repository @ IIHR	15800	11500	0.7278481	18100	1.14557	15300	0.968354
53	Open Access: Agriculture Research Rep.	29200	26500	0.90753425	54200	1.856164	27100	0.928082
54	openagri	41300	32400	0.78450363	32200	0.779661	31100	0.753027
55	ORION	117000	101000	0.86324786	115000	0.982906	85200	0.728205
56	POLNEP Repository	6350	2940	0.46299213	3000	0.472441	2330	0.366929
57	PSNZIR: Perpustakaan Sultanah Nur Zahirah IR	2000000	1190000	0.595	1430000	0.715	1590000	0.795
58	Rep. University Muhammadiyah Jember - Test Repo.	10800	3990	0.36944444	4690	0.434259	4530000	91.8864

59	Repository of Medan Area University	49300	1290000	26.166329	4050000	82.1501	2950	0.273148
60	Rice Knowledge Management Portal	43700	14900	0.3409611	17500	0.400458	16200	0.370709
61	R-Space, Korea Rural Economic Institute	20000	16700	0.835	8990000	449.5	239000	11.95
62	Rubber Research Institute Repository	198000	120000	0.60606061	174000	0.878788	170000	0.858586
63	SAUL Archive	5890	4060	0.68930391	3570	0.606112	3460	0.587436
64	Scholarly publications from Indian Institute of Spices Research, Kozhikode (Calicut), INDIA	161	128	0.79503106	100	0.621118	276	1.714286
65	Science paper OST Development Center of ME of the People's Re. of China	221000	1.6E+08	723.9819	5760	0.026063	4090	0.018507
66	SEAFDEC/AQD IR	30100	18600	0.6179402	17500	0.581395	14600	0.48505
67	Sirnak University Institutional Repository	4350	19900	4.5747126	4980	1.144828	8080	1.857471
68	TAGEM Open Access System	64100	226000	3.525741	21300	0.332293	18200	0.283931
69	Taiwan Agricultural History Digital Archives	31300	31300	1	33400	1.067093	4490000	0.485931
70	Taiwan Agricultural Research Institute Inst. Repo.	9240000	3570000	0.38636364	6330000	0.685065	30100	0.961661
71	Tea Research Institute Repository	2370000	2110000	0.89029536	3210000	1.35443	2550000	1.075949
72	Thai Agricultural Research Repository:	35800	30800	0.8603352	33700	0.941341	31800	0.888268
73	Tokyo Seiei College Repositories	81700	83600	1.02325581	9	0.00011	75900	0.929009
74	Tokyo University of Agriculture and Tech. Repo.	1590000	966000	0.60754717	1130000	0.710692	1300000	0.81761
75	Tottori University Research Result Repository	59000	36000	0.61016949	33700	0.571186	31500	0.533898
76	Toyama Science Museum Repository	44600	8	0.00017937	25300	0.567265	25100	0.56278
77	Ubaya Repository	12600	15200	1.20634921	27200	2.15873	20500	1.626984
78	UM Research Repository	406000	457000	1.12561576	597000	1.470443	400000	0.985222

79	UMS Institutional Repository	43300	51100	1.18013857	85200	1.967667	55100	1.272517
80	Unika Repository	101000	96800	0.95841584	139000	1.376238	124000	1.227723
81	Unitri Repository - Unitri Repository	5480	4750	0.86678832	5570	1.016423	5190	0.94708
82	Univ. HKBP Nommensen	15200	17300	1.1381579	463000	30.46053	404000	26.5789
83	Universitas Muhammadiyah Sidoarjo	11600	1070	0.09224138	1700	0.146552	1430	0.123276
84	Universiti Malaysia Kelantan Intititutional Repository	10200	9540	0.93529412	9540	0.935294	5420	0.531373
85	UPN JATIM DIGITAL LIBRARY	68400	23600	0.34502924	32300	0.472222	1430	0.020906
86	UPN JATIM REPOSITORY	14900	5360	0.35973154	6620	0.444295	3850	0.258389
87	Western Mindanao State University Repository	54600	45800	0.83882784	454000	8.315018	199000	3.64469
88	Yamagata Univ. Academic Rep.	27900	24500	0.8781362	61700	2.21147	36900	1.322581
Note: NWP=No. of Web Page, IWL P=In-Link Web Page, RWIF=Revised Web Impact Factor								

Impact Factor

Table1 exhibits the rank distribution of the 88 Open Access Agricultural digital Repositories. Based on their Simple Link IF Science paper Online @ Sci. and Tech. Development Center of Ministry of Education of PRC ranked the first position with 723.9819005 SIMIF, followed by Repository of Medan Area University (26.166 SIMIF) and IR of Sirnak University (4.574 SIMIF). According to their External Link IF R-Space, Korea Rural Economic Inst. (449.5 EXTL IF) ranked the first position, followed by Repository of Medan Area University (82.1501 EXTL IF) and Fundamental Scientific Library of the NAS, i.e., Knowledge@FSL (36.82864). Based on their revised or In-Link web impact factor (RWIF), calculated by putting the following formula i.e., Revised Web Impact Factor= E/A , where E =Internal Link Web Page and A =Number of Web Page. Fundamental Scientific Library of the NAS i.e., Knowledge@FSL, ranked first with 391000 Web Pages and 149000000 in-link web pages and 381.074 RWIF; followed by Repository of Medan Area University with 49300 Web Pages and 4530000 InLink Web Pages and 91.88 RWIF. University HKBP (Huria Kristen Batak Protestant) Nommensen Institutional Repository (Indonesia) occupied 3rd position with 26.57 RWIF. Though Mugla Sitki Kocman University Open Access Repository and Taiwan Agricultural Research Institutional Repository have a maximum number of InLink Pages (i.e. 126000000 & 4490000) compared to all Digital Repositories, stood at 6th and 66th position due to their less impact factor.

WISER Ranking

To determine the visibility and connectivity of Asia's open access agricultural repositories throughout the world, the WISER Ranking Method is employed, which is derived using the following formula as recommended by the World Webometrics Group for ranking academic institutions:

WISER Rank = $\log(\text{Visibility } 50\%) + \log(\text{Size } 20\%) + \log(\text{Rich Files } 15\%) + \log(\text{Scholar } 15\%),$.

Table-2: Ranking of Agricultural Repositories based on WISER INDICATOR

Name of Asian Repositories	NWP (S)	ELP (V)	Rich Files				GS	WISER VALUE	RANK
			No of PDF	No of PPT	No of DOC	No of PS			
Taiwan Agricultural Research Inst.IR	9240000	6330000	1070000	6	1640	82	1071728	2580	20.560962
SP Online at STDCME of the PRC	221000	5760	16500000	719	18800	3	16519522	55600	18.42007
Tea Research Institute Repository	2370000	3210000	255000	8	2030	211	257249	275	18.083122
Perpustakaan Sultanah Nur Zahirah IR	2000000	1430000	236000	138	701	58	236897	379	17.761747
REPOSITORY UNIVERSITAS MEDAN AREA	49300	4050000	149000	65	648	146	149859	2300	17.189895
Coconut Research IR	782000	615000	186000	108	756	806	187670	747	17.18098
Bogor Agricultural Univ. Repo.	218000	435000	29900	59	205	224	30388	16100	17.018656
UM Research Repository	406000	597000	85900	54	208	74	86236	1510	16.851348
Mugla Sitki Kocman University Open Archive Repository	36000000	95900000	59	30	952	55	1096	0	16.754023
KRISHI Pub and Data Repo.	215000	451000	39900	39	366	1	40306	1770	16.19214
Krishikosh: Home	351000	129000	4810	0	5	1	4816	28800	16.150158
KREi Repository	76500	941000	9290	1	22	2	9315	3370	15.706246
EPRINTS@UNAIR - REPOSITORY UNAIR	116000	253000	8600	2	87	1	8690	7960	15.659694
Knowledge@FSL Fundamental Scientific Library of the NAS	3,91,000	14400000	4430	4	42	0	4476	70	15.59871
Tokyo Univ. of Agri. And Tech. Repo.	1590000	1130000	268000	62	130	129	268321	3	15.512434

Diponegoro University (UNDIP-IR)	45300	114000	14100	5	64	0	14169	12600	15.316895	16
The Academia Sinica IR	618000	1040000	119000	71	521	250	119842	7	15.083911	17
Rubber Research IR	198000	174000	41000	72	105	45	41222	326	15.017744	18
Hasanuddin University Repository	109000	107000	6200	4	98	1	6303	5960	14.993786	19
Unika Repository	101000	139000	6580	1	7	2	6590	4000	14.920464	20
Institutional Repository @VSL	349000	223000	68400	16	163	40	68619	48	14.760998	21
E-Library Univ. Brawijaya	99900	161000	15800	9	307	8	16124	261	14.182687	22
UPN JATIM DIGITAL LIBRARY	68400	32300	13000	9	114	1	13124	2190	14.154951	23
Chung Nam Institute	614000	981000	54300	35	151	19	54505	1	13.868456	24
OAR@ICRISAT	28400	39200	4790	0	7	0	4797	1930	13.365314	25
ePrints@CFTRI	27400	17000	3810	0	21	0	3831	5720	13.36109	26
Ubaya Repository	12600	27200	947	0	3	0	950	25700	13.274779	27
Kagoshima Academic Repo. Network	240000	242000	21200	3	43	16	21262	0	13.267722	28
UMS Institutional Repository	43300	85200	15800	4	23	5	15832	123	13.208551	29
SEAFDEC/AQD IR	30100	17500	9170	1	29	1	9201	1270	13.141426	30
NIPGR Digital Knowledge Repository	70700	64500	3460	0	28	0	3488	386	13.140325	31
Eprints@CMFRI	39600	4010	14000	1	6	0	14007	2480	13.093819	32
Tottori Univ. Research Result Repo.	59000	33700	7300	4	65	1	7370	220	12.860555	33
MB IPB Repository	109000	113000	6760	6	104	23	6893	32	12.786246	34
ORION	117000	115000	8040	1	22	0	8063	23	12.749291	35
FÄ±rat Univ. Inst. OA	68300	98900	15000	1	63	0	15064	22	12.702163	36
UPN JATIM REPOSITORY	14900	6620	11000	0	5	1	11006	1400	12.533984	37
Hector Kobbekaduwa Agrarian Research and Training IR	35900	35000	3990	0	7	3	4000	243	12.439011	38

Western Mindanao State Univ.y Repo.	54600	454000	1850	7	20	0	1877	23	12.381623	39
DSpace@GIPE	55900	12400	28600	1	0	0	28601	45	12.30261	40
TAGEM Open Access System	64100	21300	45600	1	41	1	45643	13	12.260738	41
R-Space, Korea Rural Economic Institute	20000	8990000	4480	0	6	0	4486	1	12.258831	42
ePrints Sriwijaya University - UNSRI Online Repository	13200	14900	1810	0	8	0	1818	1660	12.125645	43
HF-IR (the Library of Hefei Institutes of Physical Science)	89900	1860	5860	6	8	6	5880	603	12.12515	44
UNSRI Online IR	12200	14100	1810	0	58	0	1868	1660	12.079246	45
Univ. Malaysia Kelantan IR	10200	9540	894	1	2	0	897	5900	12.063976	46
Rice Knowledge Management Portal	43700	17500	1310	2	6	0	1318	378	11.933109	47
OPENAGRI	41300	32200	2560	590	64	0	3214	35	11.527102	48
Baskent Univ. Open Access Sys.	34100	51100	6040	0	33	0	6073	14	11.522889	49
NARO IR	70700	270000	7510	2	42	3	7557	1	11.511315	50
DSpace at IRRI	17400	32600	4520	0	5	1	4526	48	11.442905	51
SAUL Archive	5890	3570	2390	1760	0	8	4158	1230	11.383756	52
Open Access: Agriculture Research Repository	29200	54200	2480	10	119	0	2609	20	11.269069	53
National Chung Hsing University Library-Taiwan Agricultural History Digital Archives During the Japanese Colonial Period	31300	33400	390	0	3	0	393	196	11.258122	54
KNOWLEDGE REPOSITORY OPEN NETWORK)	33000	36800	7970	1	110	20	8101	6	11.123234	55

Muhammadiyah University of Sidoarjo	11600	1700	2190	0	4	0	2194	1140	11.045231	56
NSDL@ NISCAIR, India	6550	4300	3350	12	28	0	3390	467	11.001409	57
Thai Agricultural Research Repo.	35800	33700	1130	0	3	3	0	5130	10.967722	58
Univ. HKBP Nommensen	15200	463000	189	0	3	0	192	24	10.86312	59
Yamagata University Academic Repository	27900	61700	7530	1	3	0	7534	2	10.766128	60
ePrints@Bangalore Univ.	20300	1280	1300	3	2	1	1306	525	10.602991	61
Eprints@IARI	29100	15900	1350	1	2	0	1353	22	10.491193	62
Madan Puraskar Pustakalaya	55900	16900	1520	5	16	0	1541	9	10.469526	63
Toyama Science Museum Repository	44600	25300	1620	0	2	2	1624	0	10.439133	64
POLNEP Repository	6350	3000	1600	0	0	0	1600	218	10.174654	65
Digital Repo. Warmadewa Univ.	9010	5660	1510	1	4	0	1515	86	10.174635	66
UNITRI Repository	5480	5570	1240	0	6	1	1247	146	10.097038	67
Open Access E-Repository @ IIHRH	15800	18100	1080	0	3	0	1083	16	10.047267	68
Repository University Muhammadiyah Jember - Test Repository	10800	4690	314	0	1	0	315	272	9.9896586	69
KRIBB Repository	11400	18600	2590	1	1	0	2592	0	9.9161441	70
E-Theses and Dissertations of UAS Dharwad	13200	4940	371	0	3	0	374	134	9.8664598	71
eprints@NAARM	28400	28700	284	0	1	0	285	14	9.8643556	72
Obihiro University of Agriculture and Veterinary Medicine Academic Repo.	7840	10400	4950	0	2	0	4952	0	9.7822213	73
Igdir Universitesi Acik Erisim Sistemi	9840	11600	1680	0	5	0	1685	0	9.4601442	74
CSIR North East Institute of Science and Technology OAIR	6580	6000	916	1	1	0	918	5	8.6103723	75

Sirmak University IR	4350	4980	861	0	2	0	863	0	8.4478207	76
DSpace@GOP	10200	9700	176	0	0	0	176	5	8.2920371	77
IR@NEERI - IR@NEERI	6140	228	346	1	0	1	348	105	8.0610543	78
Tokyo Seiei College Repo.	81700	9	6420	0	24	6	6450	0	7.8521155	79
IR of Inst. for the History of Natural Sciences, Chinese Academy of Sciences	14100	1850	148	2	32	4	186	5	7.7370563	80
Koya University Eprints	5340	5120	159	0	0	0	159	2	7.2914209	81
AHKRC Digital Library	1800	1220	184	1	0	0	185	3	6.4381078	82
IR of Chengdu Ins. of Biology, CAS	2300	84	117	5	4	0	126	34	6.2700391	83
SP of IISR, Kozhikode, INDIA	161	100	45	0	1	0	46	24	4.6019775	84
IR of Research Center for Eco-Environmental Sciences, CAS	188	414	38	1	0	0	39	5	4.5333753	85
Repository of the Chittagong Veterinary and Animal Sci. Univ.	3880	7	5	0	0	0	5	57	4.2409571	86
IR of Institute of Geographic Sciences and Natural Resources Research, CAS	180	281	1	5	1	0	7	3	3.3783806	87
CapSU Tapaz Aklatan Repository	5	6	0	0	0	0	0	0	0.4771213	88

An attempt has been made to rank the Webpages and the links of Asian Agricultural Repositories using appropriate webometric indicators. In addition to the WISER ranking, which was explained in the research methodology. Table 2 highlights the status of the Asian agricultural repositories' websites based on their WISER value. The Taiwan Agricultural Research Institutional Repositories website occupied the highest rank with 20.56 WISER value scored the topmost position, and had the third position with regards to the number of Webpages and had fourth position in-links, and it was the website of SP Online at STDCME of the PRC with 18.42 WISER values that came in the second position, followed by Tea Research Institute Repository of Sri Lanka (18.08). At the bottom, the website of the CapSU Tapaz Aklatan Repository of Capiz State University Tapaz Satellite College of Philippines came with 0.477121256 WISER values. It also had the least number of in-links in the Asian Continent which shows that the WISER method brings out a more representative and reliable picture than the web impact factor which is biased towards a minor number of Webpages and in-links.

Alternative Document Model for Interlinking between Agricultural Repositories in Asia

ADMs are a method of combining web content into units for computational purposes. It works on web pages, directories, domains, etc. Alternative Document Model (ADM) is used for data collection for open access to digital repositories of agricultural science in Asia. Raw data is collected using web crawlers, such as SocSciBot4 for agricultural digital repositories in Asia. In this data, the UPN Veteran Jakarta (upnjatim.ac.id, eprints.upnjatim.ac.id) University repository shows Page in links-20, Directory in links-18 and Domain in links-2 and Site in links-1 and remaining showed nil in data.

Interlinking between Digital Repositories of Agricultural Sciences in Asia



Figure: 1 Network diagram of Repositories

Network topology was built based on the ADM count summary data at the different levels (i.e., page, directory, and file) after crawling the data through the web crawler, SocSciBot (developed by Mike Thelwall). Fig. 1 shows the micro-link topology of Open Access Digital Repositories of Agricultural Sciences in Asia. Such link topologies can be generated to similarly show the network diagram of Repositories of Agricultural Sciences (combined) and other Repositories. The combined network diagram is shown because of its complicated network structure and visibility issues due to huge links that help to know which Open Access Digital Repositories of Agricultural Sciences provides links to whom. Figure 1 depicts the relationships between 88 IDRs. Few IDRs (i.e., 7 IDRs) throughout Asia are linked to one another, but a large number of IDRs not linked to any other IDR.

Major Findings

- In simple link WIF (SLWIF) the website of Science paper online @ Sci. and Tech. Development Center of Ministry of Education of PRC ranked the first position and have uploaded the highest number of rich content files (i.e., 84.64%), followed by the websites of Taiwan Agricultural Research Institutional Repositories and Tokyo University of

Agriculture and Technology Repository (with 5.49 % and 1.37%) and also has the highest score in Google Scholar (i.e. 26.89%) of this repository.

- As per Simple Link WIF, Ext. Link and In-Link WIF the websites of Repository of Medan Area University ranked second position.
- In Ext. Link WIF the websites of Fundamental Scientific Library of the NAS i.e. Knowledge@FSL, ranked 3rd position. In contrast, in In-Link WIF or RWIF the websites of Fundamental Scientific Library of the NAS i.e., Knowledge@FSL ranked 1st position.
- The website of Taiwan Agricultural Research Institutional Repositories occupied the highest rank with 20.56 WISER value scoring the topmost position followed by the Repository of Science and Technology Development Center of the Ministry of Education of the People's Republic of China and Repository of Tea Research Institute, Sri Lanka regarding the WISER value of IDR websites which shows in the Table6.
- Out of the links among 88 selected websites of IDR, only seven agricultural repositories in Asia are linked to one another. However, most IDRs are not linked to any other IDR.

Suggestions

Based on the findings of the Webometrics study, the following suggestions are recommended:

- i. Agricultural Repositories having fewer WebPages should upload comprehensive information and content on their websites, ultimately increasing the number of WebPages. It will also improve the WISER value of a website.
- ii. Agricultural Repositories' websites having fewer in-links should build good relations with the external world to increase their in-links. To develop these websites, the webmaster can contact administrators of various research organizations, national and international library associations and other similar institutions.

- iii. Full information should be uploaded in rich content files to improve the quality of uploaded information and effective presentation of information.

In this 21st century, the documents produced by Google Scholar have been used as a web indicator for ranking and evaluating a website. So Agricultural Repositories will need to understand the importance of the quality of scholarly literature because the uploaded information on websites can receive number of citations that will help to increase the reputation and impact of these repository websites.

Conclusion

Scholarly communication has improved as a result of open access initiatives and movements. IR has evolved into various educational and research institutions in many nations which have aided in the acquisition and preservation of all academic literature and information resources. Similarly, the growth of ICTs, particularly the WWW, has aided in preserving and disseminating information at any time, in any format, and from any place. IRs all around the globe maintain websites that allow free access to worldwide research findings and agricultural science is no exception. According to the study, Asian countries have 88 agricultural repositories with websites, demonstrating that institutional repositories appreciate the importance of the web and its utility in everyday life. However, continual monitoring of website functionality and usability is essential.

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