

Characteristics of Cited Articles on Indonesian Agricultural Scientific Journals

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ABSTRACT

The research is aimed to study characteristics of cited articles on IAARD journals that are local language and un-indexed in the international databases, but cited internationally. Systematic random sampling was used for selecting 710 articles of IAARD journals, where 674 articles were available. The study investigated bibliometric attributes including citation attributes which comprise of origin articles, author, languages, commodities, knowledge field, resources, and publication year of the selected articles. The study found that IAARD journals cited 11,830 articles and 15,832 authors with the highest number of personal citation reached 80 citations. Most of the articles were cited one time only. English (66.59%) and Bahasa Indonesia (33.10%) were the most languages were cited on IAARD journals' articles. Plant Science and Production were the highest knowledge field occurrence (25.77%) and 305 agricultural commodities were cited, comprised of 41 animal and 264 plant commodities. Journal, monograph, and proceeding were the highest cited resources. IAARD journals cited most publication where it was published on 1991-1995. The study sampled nine (9) IAARD scientific journals using systematic random sampling and resulted 674 articles for investigation. Attributes of citation analysis were used for data analysis.

Keywords: journal, agriculture, citation analysis, Indonesia

INTRODUCTION

Information is essential for agricultural sector. The importance of agricultural information stated by Olaniyi and Adewale (2011) who strengthened utilization of agricultural information for agricultural development. The need of agricultural information of rural female farmers in Delta State, Nigeria had been stated by Achugbue and Anie (2011). Meanwhile, Atherton et al. (2009) highlighted the importance of agricultural information related to variability of the farm, crop responses, and management practices. Magarey et al. (2009) showed the need of information regarding plant bio-security. In Indonesia, Extension worker used agricultural information for planning extension programs and preparing extension materials and exhibitions (Mulyani et al., 2006).

Regarding citation analysis, Sengupta (1992) said the meaningful of any act of earlier paper citing. This importance attracted many researchers in conducting citation analysis, such as Garfield (1972, 1979, and 1998), Chun et al. (1999), and Institute de France

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Academie des Sciences (2011). Specifically, many researchers study bibliometric, scientometric, or informetric on the subject of agriculture. Hadimani and Rajgoli (2010) attracted on applied agriculture engineering, Fagbola and Adejoro (2012) interested on horticulture, Khan and Yuh-Shan (2012) on environmental, and Ezema and Eze (2012) on animal health and production. Azevedo, Mesquita, and Young (2010); Konur (2011); and Ram (2011) investigate fisheries and aquaculture. Charrondièrè et al. (2002) and Sutardji (2011) studied Food Crops. Meanwhile, Cohen et al. (2010) conducted bibliometric study on Tobacco. Lokker et al. (2012) conducted research on clinical article. Ugaz (2011) and Arya (2012) conducted bibliographic research on veterinary medicine. Shahbodaghi and Sajjadi (2010) and Ram (2011) studied medicinal plant. Researchers who also paid attention on citation analysis attributes were described on table 1.

Table 1: Researchers who studied on citation analysis attributes

No.	Citation Analysis Attribute	Researchers
1	Affiliation	Khan and Yuh- Shan (2012)
2	Articles	Konur (2011); Kumar and Kumar (2011); and Khan and Yuh- Shan (2012)
3	Author	Konur (2011); Kumar and Kumar [37]; Ezema and Eze (2012); and Papavasiliou et. al. (2013)
4	Commodities	Ezema and Eze (2012)
5	Journals	Kumar and Kumar (2011); Ezema and Eze (2012); and Vanclay (2011)
6	Knowledge Field	Papavasiliou et. al. (2013)
7	Origin Articles	Khan and Yuh- Shan (2012)
8	Publication Year	Kumar and Kumar (2011); Ezema and Eze (2012); and Vanclay (2011)
9	Resources	Kumar and Kumar (2011); Ezema and Eze (2012); and Papavasiliou et. al. (2013)

Indonesian Agency for Agricultural Research and Development (IAARD) is a second tier agency under the Ministry of Agriculture of Indonesia. The agency published scientific journals which the main readers are researchers, extension workers, and other scholars. The journals are published in local language and un-indexed in international indexing databases. Some of IAARD Journal influenced international authors. Google Scholar searching showed that the *Jurnal Ilmu Ternak dan Veteriner* had been cited 395 times in Google Scholar, and 28 times in Scopus. Meanwhile, Indonesian Journal for Agricultural Science had been cited 59 times and 14 times in Scopus (Winarko, et al. 2015). Sutardji (2003, 2011) counted internal impact factors of *Jurnal Penelitian dan Pengembangan Pertanian*, this means that the journal were also cited by Indonesian scientists. Comparing to other journals that include articles related bibliometric study in their content, none of bibliometric articles related to the journals wrote in journals itself. Other library and information journals in Indonesian also presented the bibliometric analysis of the journal a few in numbers. *Jurnal Perpustakaan Pertanian* is a good example. Number of articles related to bibliometric study and about the journals low. Only 12 of 50 articles in five years period that related to bibliometric analysis. It is a need to expand study on characteristics of IAARD publication based on referred articles.

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The study should also reveal the attributes of citation analysis such as origin of articles, author, languages, commodities, knowledge field, resources, and publication year. The study will improve bibliometric related knowledge in general and provide input for journals' management to improve quality of the journals based on research finding such as increasing non-IAARD and international authors' contribution.

METHODOLOGY

The study is aimed to reveal characteristic of IAARD journals by revealing citation attributes which is comprised of analysis on articles regarding origin of articles, author, languages, commodities, knowledge field, resources, and publication year.

Data source for citation study sampled nine (9) IAARD scientific journals published by IAARD centers. The data come from print out and on-line version articles of the journals. These journals are: a) Indonesian Journal of Agricultural Science, b) *Jurnal Enjiniring Pertanian*, c) *Jurnal Hortikultura*, d) *Jurnal Penelitian dan Pengembangan Pertanian*, e) *Jurnal Ilmu Ternak dan Veteriner*, f) *Penelitian Pertanian Tanaman Pangan*, g) *Jurnal Tanah dan Iklim*, i) *Jurnal Agro Ekonomi*, and j) *Jurnal Penelitian Tanaman Industri*.

Systematic random sampling was used for selecting the targeted articles of IAARD journals (Singarimbun and Effendi (1995), Milat et al. (2011), and Yu-Wei and Mu-Hsuan (2012)). Determining the selected articles have followed procedures describe as follow: 1) all obtained articles of each journal have been ascending sorted according to years, volume, and number. The oldest articles were placed in first row and vice versa, the recent articles have been put in last line of the list; 2) Division of total number of articles with 50 resulted interval that has been used for articles selection; 3) Starting with article number three in the list as the first sample article. The next sample articles were chosen using interval obtained from formula on item [2]]. The selection was carried out until the last articles. This procedure has resulted around 50 articles that would be used as samples. The sampling resulted 674 articles as shown in table 2.

Table 2: Number of the Articles in IAARD Journals Sampled in this Study

No.	IAARD Journal Titles	Total number of articles	Selected Articles	Available Articles
1	Jurnal Tanah dan Iklim	135	88	84
2	Indonesian Journal of Agricultural Science	129	115	103
3	Jurnal Ilmu Ternak dan Veteriner	595	68	67
4	Jurnal Penelitian dan Pengembangan Pertanian	308	63	60
5	Jurnal Hortikultura	740	92	91
6	Jurnal Enjiniring Pertanian	108	80	77
7	Jurnal Agro Ekonomi	140	70	68
8	Jurnal Penelitian Tanaman Industri	414	69	63
9	Penelitian Pertanian Tanaman Pangan	389	65	61
	Total	2,958	710	674

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For each available journal article mentioned in table 2, the following citation information were extracted and inputted in a Microsoft Excel spreadsheet to facilitate further analysis. Citation information consisted of authors' name of the cited articles, year of publication of the cited articles, title of cited articles, and the source of articles (e.g. journal titles, monographic series, conference proceedings). This citation information was extracted from the list of references of each sampled article. The study investigated bibliometric attributes including citation attributes which comprise of origin articles, author, languages, commodities, knowledge field, resources, and publication year.

RESULTS AND DISCUSSION

Origin of Articles

The origin of cited articles of IAARD journals have comes from IAARD journals itself and other publications. Table 3 shows the origin of article cited on IAARD journals.

Table 3: Origin of the cited articles of IAARD journals (1995 to 2010)

No	Origin Of Cited Articles	No. Articles	Percentage
1	IAARD	2,284	19.31
2	Non - IAARD	9,546	80.69
	Total	11,830	100

Table 3 showed that authors cited small number of articles published in IAARD journals. Authors of IAARD journals cite only 19.31 percent of total number of 11,830. The table also showed that IAARD author's citation pattern is more on non IAARD publications comparing to IAARD.

The highest number of non-IAARD citation can be explained by the easy access of IAARD researchers to information resources. Internet application development, including digital library and electronic journal benefited to the researchers to access information related their research topics. Previously, when scientific journal were subscribed as printed journal, the number of subscribed journal are limited. This limitation was due to budget availability of ICALTD who provided scientific journal for IAARD researchers. With the easy access of internet and availability of electronic journals/databases, the number of subscribed journals increased. This will enable the IAARD researchers to download big number of articles for supporting their research. The internet access on electronic journals will also open the opportunities to access information without geographical boundaries. This will enable IAARD author to get more articles from various journals and origin.

Comparing to the previous researches, Bakri and Willet (2008) found similar research finding. They reported low citation numbers of the Malaysian Journal Library and Information Science. They stated that about 86% articles on the journal do not cited. In the opposite, Hutchison and White (2003) reported that Journal of The American Taxation had high citation number of articles. Their research resulted 314 citations were made from 308 articles.

Authors

The numbers of authors cited on IAARD journals were 15,832 with 27,186 citations. Table 4 presented top ten authors cited on IAARD journals. The tables showed that there were three types' authors of cited articles on IAARD journals, namely, anonymous, institutional, personal authors. Articles with no author (anonymous) reached the highest number of citation (0.005%). *Badan Pusat Statistik* and *Balai Besar Sumber Daya Lahan Pertanian* were the national institutional authors on the second and fourth ranking with 111 and 75 numbers of citations respectively. Meanwhile, Soil Survey Staff and Food and Agriculture Organization (FAO) were the international institutional authors on the fifth and the sixth ranking with 53 and 43 citations respectively. Personal authors consisted of Adiningsih, J. S on the third ranking with 80 citations followed by Subagjo, H.; Simatupang, P.; Sinurat, A. P; and WidjajaAdhi, IPG on the sixth to tenth ranking with 40 citations for Subagjo, H. and 39 citations for each remaining authors.

Table 4: Authors of the cited articles on IAARD journals (1995 to 2010)

No	Authors Of Cited Articles	No. Articles	Percentage
1	Anonymous	137	0.005
2	Badan Pusat Statistik	111	0.004
3	Adiningsih, J. S	80	0.003
4	Balai Besar Sumber Daya Lahan Pertanian	75	0.003
5	Soil Survey Staff	53	0.002
6	Food and Agriculture Organization	43	0.002
7	Subagjo, H.	40	0.001
8	Simatupang, P.	39	0.001
9	Sinurat, A. P	39	0.001
10	WidjajaAdhi, IPG	39	0.001

Table 5 showed the pattern of cited author on IAARD journals. Most of the authors on IAARD journals were cited one time only, the citation reached 13820 occurrences. The next two highest citation numbers were belonged to authors who were cited 2 and 3 times with 2508 and 721 occurrences. Other authors were cited 4 times or more with 326 occurrences or less.

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Table 5: Pattern of top ten of cited authors on IAARD journals (1995 to 2010, n=17,957)

NO. OF CITATIONS	FREQUENCY	PERCENT
1	13820	76.96
2	2508	13.97
3	721	4.02
4	326	1.82
5	179	1.00
6	98	0.55
7	71	0.40
8	63	0.35
9	48	0.27
10	22	0.12

The previous research related to author citation, Fasae (2011)] reported that cited author of Master Technology theses submitted in the Department of Agricultural Economics and Extension, Federal University of Technology Akure, Nigeria had maximum of 48 citations. This numbers is smaller comparing to the maximum citations of personal author of this research. The maximum personal author's citation was 80 citations.

Languages

Languages of the articles cited on IAARD journals presented on table 6. The table informs that cited articles in IAARD journals using at least four languages, namely, English, Bahasa Indonesia, Dutch, and French.

Table 6: Languages of the cited articles of IAARD journals (1995 to 2010)

No.	Languages Of Cited Articles	No. Articles	Percentage
1	English	7,878	66.59
2	Indonesia	3,916	33.10
3	France	19	0.16
4	Netherland	13	0.11
5	Other	4	0.03
	Total	11,830	100

Most of IAARD journals' authors cited articles, which were written in English. Number of cited articles on this language achieved 66.59% of the total cited articles (11,830). This citation was double comparing to the citation, which were written in Bahasa Indonesia (33.10%). The Dutch, French and other languages cited low in number.

English is the highest cited language with number of citation reached 7878. This number related to the number of non-IAARD cited articles. The high number of English articles citation is also related to the easy access of researchers to information resources/databases via internet application. This access possibly researchers to

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download big number of information related to their research topics. Supporting information through electronic journals/databases subscriptions by ICALTD also strengthened the easy access of IAARD researchers' information resources.

Most of IAARD authors cited articles in English. The higher number of citation articles in English concurrent to research on Index Islamicus Database. The research showed the domination of citation of the articles written in English that reached 56.3 percent of 277 citations. The remaining percentage belonged to French, German, Russian, Polish, Italian, Dutch, Swedish, Hungarian, Danish, and Lithuanian (Anwar (2001)). Keat and Kaur (2008) reported more extreme research finding. They showed that most of the student of the Master in Library and Information Science at the University of Malaya cited 93.77% articles in English in preparing their dissertation. Similarly, Shahbodaghi and Sajjadi (2010) stated who conducted research on Iranian medical informatics found that articles 98.4% of 183 citing articles were written in English, and the remaining is in French.

Commodities

Study on the cited commodities in the IAARD journals found that there were 305 agricultural commodities which comprised 41 animals and 264 plants. Table 7 presents the cited agricultural commodities, which were classified into five subsectors. Food crops commodities were the highest with 2,140 citations followed by estate crop and horticulture in second and third places. Both sub sectors received 1,126 and 1,008 citations respectively. Meanwhile, subsector of the animal husbandry and, fish and aquaculture received 983 and 137 citations respectively.

Table 7: The agricultural commodities of cited articles in the IAARD journals based on sub sectors (1995 to 2010)

No.	Sub Sector Agricultural Commodities	No. Articles	Percentage
1	Food Crops	2,140	39.67
2	Estate Crops	1,126	20.88
3	Horticulture	1,008	18.69
4	Animal Husbandry	983	18.22
5	Fish And Aquaculture	137	2.54
	Total	5,394	100

Similar to the agricultural commodities of the cited articles, the research also found that the cited articles in the IAARD journals presented by the sub sector of food crops as the highest cited group of agricultural commodities. This fact proved the importance of food crops in the agricultural research. The remaining commodities were protein and fat resources. Meanwhile, commodities presented in the estate crops and horticulture groups were reflected as the commodities that support daily food supply. This two groups of commodities comprised commodities related to vegetables, fruits, ingredients, and others.

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Citations of agricultural commodities in the IAARD journals varied from one to 301. Commodities, which were cited one time, had the highest occurrences (301 occurrences - 44.13%). The commodities with two and three citations had 106 and 54 occurrences respectively. The remaining commodities had four citations and more, received 33 occurrences or less (see Table 8).

Table 8: The pattern of the cited agricultural commodities in the IAARD journals (1995 to 2010)

No.	No. Of Citations	No. Of Occurrences	Percentage
1	1	301	44.13
2	2	106	15.54
3	3	54	7.92
4	4	33	4.84
5	5	25	3.67
6	8	16	2.35
7	7	14	2.05
8	6	13	1.91
9	10	11	1.61
10	12	11	1.61

Research on the cited agricultural commodities is rare. The only articles found on agricultural commodities were researches conducted by Thomaz et. al. (2010 and Ezema and Eze (2012). Thomaz et. al. (2010 had reported on several animal commodities such as macro invertebrate, fish, zooplankton, amphibian, phytoplankton, plankton, macrophyte, bird, bacteria, and periphyton in the research on bibliometric of aquatic ecology. Meanwhile, Ezema and Eze (2012) reported on the occurrence of poultry, goats/sheep, cattle, rabbits, dogs, swine, fishery, rats, horses, monkeys, snails, grass cutters in the study of animal health and production in Nigeria. These two articles were the only articles containing animal commodities. None of the plant commodities were indicated in the researches.

The commodities mentioned by Thomaz et. al. (2010 and Ezema and Eze (2012) above, shown some similarities to several agricultural commodities in this research. Fish was the animal commodities, which was indicated in both researches. Meanwhile, shrimp and prawn were referred by Thomaz et. al. (2010 as periphyton. Other than fish, comparing the animal commodities between this research and the research conducted by Ezema and Eze (2012), there were other available commodities commonly found, namely, poultry (Duck, *Passer*, *Gallus gallusdomesticus*, and *Anser*), goats/sheep, cattle (*Bosprimigenius*, *Bostaurus*, *Bovinae*, *Bubalusbubalis*), rabbits, dogs, swine, and horses.

Knowledge Fields

Knowledge Fields of cited articles on IAARD journal was classification of articles were cited on IAARD journals based on AGRIS/CARIS categorization scheme. Table 9 revealed the knowledge fields of the cited articles on IAARD journals.

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Table 9: Knowledge fields of the cited articles on IAARD journals (1995 to 2010)

No.	Field Of Knowledge	No. Occurrences	Percentage
1	Plant Science And Production	3115	25.77
2	Natural Resources And Environment	1967	16.27
3	Plant Protection	1680	13.90
4	Economics, Development And Rural Sociology	1521	12.58
5	Animal Science, Production And Protection	1498	12.39
6	Processing Of Agricultural Products	719	5.95
7	Methodology	431	3.57
8	Agricultural Machinery And Engineering	283	2.34
9	Human Nutrition	207	1.71
10	Postharvest Technology	180	1.49
11	Agriculture In General	149	1.23
12	Education, Extension And Information	127	1.05
13	Pollution	103	0.85
14	Fisheries And Aquaculture	91	0.75
15	Forestry	10	0.08
16	Administration And Legislation	6	0.05
	Total	12,087	100

The table showed that 16 subject categories (knowledge field) of AGRIS/CARIS categorization scheme with 12,087 occurrences had been found. Plant Science and Production achieved the highest occurrence with 25.77 percent of the total occurrences. While, Natural Resources and Environment with the percentage of 16.27 percent taken the second place, and Plant Protection with the percentages of 13.90 percent taken the third places. In contrast, the lowest ones were: a) Administration and Legislation, b) Forestry, and c) Fisheries and Aquaculture with the percentages of 0.05, 0.08, and 0.75 percent respectively. Detail information of field of knowledge with high number of articles will be discussed later.

Plant science and production; natural resources and environment; plant protection; economics, development and rural sociology; and animal science, production and protection were the field of knowledge dominated the cited articles. The explanation of this fact is related to field of knowledge of articles. Similarly, these fields of knowledge are related to the importance of field of research conducted by researchers which also related to research on food fulfillment. Three of the field of knowledge, namely, plant science and production; plant protection; and animal science,] publication types included journal, monograph, proceeding, paper, report, thesis/dissertation, bulletin, instruction manual, newsletter, statistical data, map and other types of publication (see Table 10). Other types of publication consist of dictionary and encyclopedia, government document, television program, abstract, brochure and software with a low number of citations.

Table 10: Resources of cited articles in the IAARD journals (1995 to 2010)

No	Type Of Cited Publications	No. of Cited Articles	Percentage
1	Journal	4,895	41.38
2	Monograph	3,157	26.69
3	Proceeding	1,437	12.15
4	Report	446	3.77
5	Seminar, workshops, and meeting paper	386	3.26
6	Thesis and dissertation	377	3.19
7	Bulletin	362	3.06
8	Instruction manual	285	2.41
9	Newsletter	194	1.64
10	Statistical data	148	1.25
11	Others	143	1.21
	Total	11,830	100

Most researchers selected journal, monograph, and proceeding due to the publications' contents that are scientific, current, and abundance. In this case, journal is the highly sought publication type. Journal is commonly selected by the researchers due to its high scientific contents compared to the other publications. Articles in the journal will have to pass tight screening of editorial board/referee that determined whether a manuscript passed the journal requirement or not. The other characteristic of a journal, which become a selection criteria is its current information content. Journals commonly published in a certain period of time that will enable the journals' contents to be updated periodically. Journals also provided researchers with a vast of information. Many journals with similar fields of study published a number of articles in a year. This will enable researchers to harvest information to support their researches. Even with lower scientific values compared to journals, monograph and proceeding, they have almost similar characteristics to the journals with contents that were scientific, current, and abundance. The authors of the IAARD journals considered three main types of source for supporting their articles namely journal, monograph, and proceeding.

Years published

Years published of the cited articles in the IAARD journals can be seen in Table 11 which the span of years published started from 1885 to 2010. Based on the grouping of a 5 year period, the period of 1991-1995 had the highest number of citations (2,444 citations, 20.66%). It was followed by the periods of 1996-2000 and 2001-2005 with 2,315 and 1,825 citations respectively. On the contrary, the periods of 1966-1970, 1961-1965, and 1885-1960 received the lowest citation percentage in the IAARD journals (1.83%, 1.27%, and 1.93%).

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Table 11: Years Published of the Cited Articles in the IAARD Journals (1995 to 2010)

No.	Years Published	No. Cited Articles	Percentage
1	2006-2010	746	6.31
2	2001-2005	1,825	15.43
3	1996-2000	2,315	19.57
4	1991-1995	2,444	20.66
5	1986-1990	1630	13.78
6	1981-1985	1119	9.46
7	1976-1980	772	6.53
8	1971-1975	385	3.25
9	1966-1970	216	1.83
10	1961-1965	150	1.27
11	1885-1960	228	1.93
	Total	11,830	100

Schaffer (2004) had used a similar grouping on the span of the years in his research. The said researcher found that the oldest citations in the year of 1894 which was almost similar to citations found within the period of 1885-1960 in this research. Another old publication which was published in 1935 was cited in the final year project reports emanating from the Faculty of Computer Science and Information Technology, University of Malaya (Edzan (2007)).

Tiew and Kaur (2000) divided the years of published of the cited articles in their researches into a period of ten years. They reported that within the period of 1978-1987, the highest citations with 31.03% out of the total citations were found. Meanwhile, research on students' academic exercise conducted by Edzan (2007) showed that the most cited years of published articles were within the last three years (29.9%). Schaffer (2004) on the other hand found that the oldest citation in his samples was from 1894. The period of between 1990 to 1999 had the highest cited articles.

Samdahl and Kelly (1999) found that the Journal Leisure Research was cited 156 counts for its journals published within 6 to 10 year period. This followed by articles published within the period of 1-5 years and over 10 years old with the citations count reached up to 151 and 111 respectively. Most of the cited years of the computer science literature were between 1990-1999, followed by 1980-1989 and 1970-1979 with the total citations of 168, 25, and 3 counts respectively (Goodrom, 2001). Makkasau and Mansjur (2006) stated that most of the cited literatures published in 1991-2000 (341 out of a total of 762 articles, 44.75%). Only eight cited articles published in 2001-2005 and ten articles were published in 1921-1960. Similarly, Sutardji (2003) reported that most of the cited articles were published within 11-20 year period prior to the years of the publications (40.15%), followed by 1-10 years (36.15%) and 21-31 years (15.31%).

From the cited years of published articles as mentioned above, it could be summarized that the number of years were varied of all the previous researches. Tiew and Kaur (2000) and Ezema and Eze (2012) found that the highest citations were within 10-20

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years after an article was published. Makkasau and Mansjur (2006) reported that the highest was within the period of 10-15 years after an article was published. Meanwhile, Samdahl and Kelly (1999) and Sutardji (2011) found that the highest cited no of years of an article was within 5-10 year period. In addition, Edzan (2007) reported that the highest citation was within the last three years. Comparatively, the cited years of published articles in the previous researches and this research, the highest citations were found between 1996-2000 (10-15 year period), we could conclude that the grouping of the years span was still within the grouping of the other researches.

CONCLUSION

The study investigated bibliometric attributes including citation attributes which comprise of origin articles, author, languages, commodities, knowledge field, resources, and publication year. The study found that IAARD journals cited 11,830 articles and 15,832 authors with the highest number of personal citation reached 80 citations. Most of the articles were cited one time only. English (66.59%) and Bahasa Indonesia (33.10%) were the most languages were cited on IAARD journals' articles. Plant Science and Production were the highest knowledge field occurrence [25.77%] and 305 agricultural commodities were cited, comprised of 41 animal and 264 plant commodities. Journal, monograph, and proceeding were the highest cited resources. IAARD journals cited most publication where it was published on 1991-1995.

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