The History and Future of Agricultural Heritage: Comprehensive Synthesis and Visualization of Research Based on Web of Science Database

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Abstract. In last two decades, academic publications in agricultural heritage were increased rapidly since the Food and Agriculture Organization initialized" Global Important Agricultural Heritage System" in 2002. Yet few scholars had contributed to bibliometrics analysis and have a comprehensive insight into it. This study used multiple bibliographic methods to investigate 1045 research and visually represented the state-of-the-art of research in agricultural heritage field, as well as suggested prosperous research topics for scholars diving into. Qingwen Min was the most productive author; The agricultural heritage management, dynamic conservation, agriculture development was high in centrality but low in density, which indicated these three topics hadn't been sufficiently developed. The results could help scholars quickly identify exist research structure and explore future research topics and provide a value reference for bibliometric analysis in agricultural heritage fields and other research fields.

Keywords: Agricultural heritage; Bibliometric Analysis; Science mapping

1 Introduction

The FAO, launched "Globally Important Agricultural Heritage Systems" program in 2002, reacted the trend of undermine family agriculture and traditional agriculture [1]. Since then, the value of agricultural heritage has been acknowledged locally and globally. The emphasis on empirical contributions rather than reviews and syntheses has resulted in a voluminous, fragmented, and contested field [2]. Thus, synthesizing previous research findings played a crucial role for tasks of advancing a particular frontier of research [3]. However, scholars had contributed few to give a comprehensive evidence- based insight into how research developed in agricultural heritage field. The purpose of this study is to apply science mapping and bibliometric methods to give a comprehensive insight into the development of agricultural heritage field, based on single science database.

2 Methods and Data

This study utilized following bibliometric methods to ascertain the conceptual, and intellectual structure of agricultural heritage field. Descriptive analysis was generated by basic frequency statistic. This study focused on the WoS, which has the oldest citation database and the longest

coverage with both bibliographic data and citation data. Following search were conducted. TOPIC: (agricultural heritage) OR (Agricultural culture heritage) OR (GIAHS) OR (global important agricultural heritage) OR (agricultural heritage system) AND DOCUMENT TYPES: (Article) AND LANGUAGE: (English); Index: WoS core collection [4][5]. All data were exported and saved into "Bibtex" format with full record and cited references. Totally 1045 records were retrieved. The raw data collection included 759 articles, 41 reviews, 8 early accesses, 1 bibliographical item, 256 proceedings papers, 9 book reviews, 3 editorial materials, 1 news item and 1 duplicate item. Eventually, 726 articles were remained for further analysis.

3 Results

3.1 Overview and trend of research development

Figure 1 showed the increasing trend of annual science production (No.) during the period of 2000-2020 (annual growth rate was 5.19%). The No. increased at a low rate in the first 10 years, and rapidly grown after 2012. Obviously, the" Global Important Agricultural Heritage System" program boosted the No. Annual citations curve was also shown, which represented those annual citations had two big fluctuations occurred in 2005 and 2009, after that, rapidly increased and reached the peak in 2012, since then keep gradually declining.
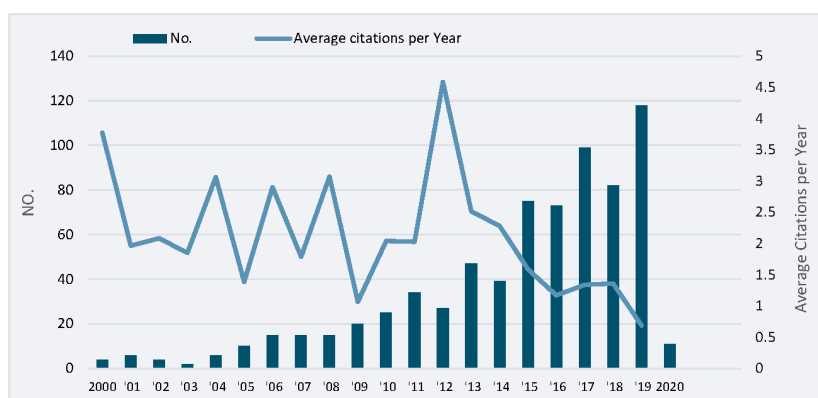

Figure 1 The overview of data collection

In term of author performance, total 2152 authors were involved in statistics. Table 1 demonstrated the top 10 influential authors, measured by H-index [6]. Min Q was the most influential author. The following was Verburg, who had 7 publications and H-index was 6, however no publication was first authored. The third was Sun Y, who had 5 first-authored publications out of 7 in total. Notably, 7 authors out of 10 were from China, which indicated Chinese Scholars had made great contributions in field of agricultural heritage. Moreover, 5 scholars were from Chinese Academy of Sciences, namely Min Q, Yang Lun, Zhang Yongxun Jiao Wenjun and Liu Moucheng. Sun Y was from Beijing Union University, who had cooperation with scholars from Chinese Academy of Sciences. Zhang J was from Zhejiang University, who led another cooperative group from China. This phenomenon was identical to the results of most institutions analysis. Chinese Academy of Sciences and Zhen Jiang

University were the most productive institutions of China in agricultural heritage domain.

Table 1 Authors performance

Author	First Authored	H-index	TC	TA	PY start
Min Q	1	7 (1)	134	26 (1)	2011
Verburg Ph	0	6 (2)	383	7 (5)	2008
Sun Yehang	5	5 (3)	56	7 (6)	2011
Haynes D	3	5 (4)	441	5 (8)	2000
Yang L	5	4 (5)	43	13 (2)	2015
Zhang Y	4	4 (6)	34	9 (4)	2015
Jiao W	1	4 (7)	30	6 (7)	2016
Plieninger T	2	4 (8)	184	5 (9)	2014
Liu M	3	3 (9)	41	11 (3)	2013
Zhang J	1	2 (10)	97	5 (10)	2011

3.2 Top 10 cited articles

A frequently cited article in the research field, means it has been critically reviewed by scholars [7], which provided a profound basis for a theme or proposed an attracting direction for further research. Moreover, pure citation-based approaches delivered the most accurate science mapping results [8]. Analysis of frequently cited articles can help understand those influential parts of agricultural heritage domain. A list of 10 most cited articles was shown in Table 2 Local citations (LCs) measure the number of citations a document has received from documents included in the analyzed collection. And global citations (GCs) calculate the number of citations a document has received from documents contained in the entire database (which is WoS). measures the impact of a document in the whole bibliographic database. 6 of 10 most cited articles were from top 10 productive journals.

Table 2 Top 10 cited articles

Article (Year)	Journal	LCs	GCs
Daugstad K, 2006	Journal Of Rural Studies	15	107
Yuan Z, 2014	Sustainability	8	17
Barrena J, 2014	Ecosystem Services	5	24
Bowen S, 2011	Journal Of Rural Studies	4	46
Brodie Je, 2012	Marine Pollution Bulletin	4	203
Nahuelhual L, 2014	Ecological Indicators	4	31
Plieninger T, 2014	Ecology and Society	4	48
LI J, 2016,	J MT SCI	4	10
HAYNES D, 2000	Marine Pollution Bulletin	3	107
Haynes D, 2000	Marine Pollution Bulletin-A	3	142

3.3 Thematic map and thematic evolution

To contrast with conceptual mapping of keywords, the thematic map helps explore the future research trends of agricultural heritage field, which were shown by Figure 2. In Figure 2, the research themes were distributed according to their centrality and density which were denoted by X-axis and Y-axis and were classified into four quadrants [9]. The centrality measures the degree of interaction between theme clusters. The density measures the internal connection strength of theme cluster. The first quadrant (upper-right quadrant) was known as motor-theme, which means the themes were important and developed well. The second quadrant (upper- left quadrant) were well-developed but unimportant for studied field and were marginal specialty. The third quadrant (lower-left quadrant) have low density and low centrality representing either emerging or disappearing, weakly developed and marginal themes. The fourth quadrant (lower-right quadrant) were low in centrality but high in density, representing the important but not well- developed themes [10]. The thematic evolution map provided a guidance for scholars finding research topics which are prosperous.
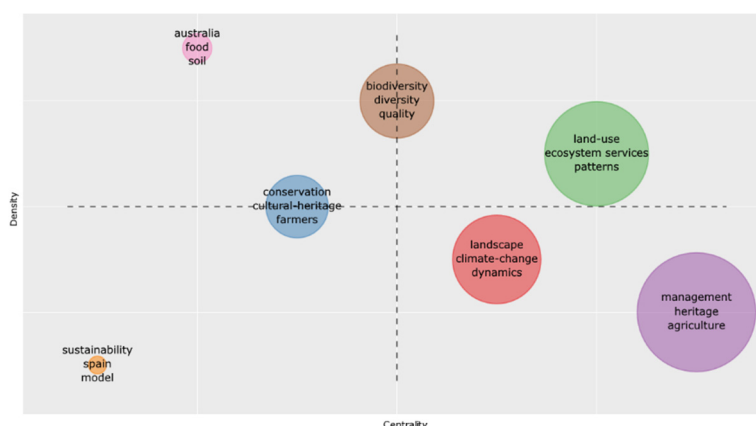

Figure 2 Thematic map

4 Conclusions

The number of publications was increased steadily (annual growth rate was 5.19%). This reflected that the FAO's project constantly attracted interests of scholars to make contributions in this field. The USA, Italy and Spain (shared the second position in production rank), and China were the four most productive countries, all of which occupied 36.96% of total publications. Australia, USA and United Kingdome were the most influential countries in term of cited frequency. Germany, France and United Kingdom were the most cooperative countries. Moreover, countries locate in same continents were more likely to establish cooperative relationships. This paper revealed a comprehensive understanding of research development in agricultural heritage field in recent 20 years based on a given corpus. The results represented the state-of-the-art of agricultural heritage research, because of only articles published in journals that listed in the WoS core database were included. Multiple bibliometric methods were integrated and applied on data collections, we believe which are helpful in two main ways: (a) to help scholar newly to the agricultural heritage field quickly identify current research structure

and explore future research themes and (b) to enhance traditional literature review by introducing quantitative rigor into it. This research also provided a value reference for conducting bibliographic analysis in agricultural heritage field as well as other scholar domains. Finally, bibliometric analysis cannot replace extensive manually reading and synthesis, although it can reduce the workload of manually reading by revealing the connections of authors, publications, journals, and countries, identifying re- search fronts, and providing a thematic mapping to help scholar explore future research directions. The knowledge and intellect of scholars were the true corner stone for innovating and advancing the research development. This research received kindly support from Institute of New Rural Development, Yunnan Agricultural University, College of Economic and Management and College of Humanities and Social Sciences of Yunnan Agricultural University.

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