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Literature Review on Circular Economy Development in Agriculture with Bibliometrics Method

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ABSTRACT: This paper uses 382 researchs from web of science to review on the topic circular economy development in agriculture. The author uses the bibliometrics method to find out the results, methodology for 23 years and the trend of this topic in the future. In the 336 articles, research methods were classified into three main categories: qualitative research, quantitative research, and mixed research with the qualitative research is much more numerous than quantitative and mixed research. The trend of this topic includes: (1) integrated approaches to reduce CO2 to stabilize climate change and related impacts, (2) Reasonable use of water: many studies show that good quality fresh water is an increasingly rare resource. (3) Seasonal, locally produced, environmentally friendly foods (organic, ecological, with limited energy and chemical inputs) will become increasingly important and utilized. (4) Environmental improvements in SMEs in local industrial zones ("industrial clusters") can be achieved.

KEYWORDS: Literature Review, Circular Economy, Bibliometrics Method, Agriculture

1. INTRODUCTION

The circular economy is an economic model in which design, production, and service activities aim to prolong the life of materials and eliminate negative impacts on the environment. If the traditional economic model is only concerned with resource exploitation, production and post-consumption disposal, leading to the creation of a huge amount of waste, the circular economy model focuses on management and regenerating resources in a closed loop to avoid creating waste. The transition to a circular economy is a great opportunity for sustainable development, not only to achieve socio-economic and environmental goals but also to respond to climate change.

The term circular economy has been studied since the 1970s. Pearce and Turner studied the impact of natural resources on economic systems and the implications for linear and open-ended perspectives (Ghisellini, P, 2016). Stahel and Reday outlined the specific characteristics of a circular economy with a focus on the industrial economy (*Geissdoerfer, M, 201*). The study assumes the economy as a closed loop with circulating materials, thus preventing waste generation, creating new jobs, achieving resource efficiency, and dematerialization of the economy industrial economy. Stahel argues that using the term 'consumption' instead of 'ownership' of goods is the most suitable sustainable business model for a circular economy, thus allowing the industry to profit without without the need for external costs and risks associated with waste (*Geissdoerfer, M, 2017*).

Initially, the circular economy concept was based on the 3R principle (Reduce*,* Reuse*,* Recycle), while recently it has shifted to the 6R principle (Reuse*, Recycle)*. Recycle*,* Redesign*,* Remanufacture, Reduce*, Recover* (Jawahir, IS, *2016).* The implementation of the circular economy emerged as a response to the need to challenge the flaws of the current linear economic system. In contrast to linear production methods, circular economy systems retain added value from products for as long as possible with the aim of eliminating waste generation.

According to the United Nations Development Agency, by 2030, the benefits of the circular economy will bring in 4.5 trillion USD and support 10/17 UN sustainable development targets. The circular economy model is proposed by several countries in the European Union (EU), China, Japan, England, France, Canada, the Netherlands, Switzerland and Finland. In particular, China was the first country to pass a bill related to the circular economy in 2009.

Sweden is a country in the Nordic region, has a highly developed economy, and maintains an extensive social welfare system, GDP per capita calculated at 2017 prices is 51,603 USD/person, ranked 11th in the world. Sweden strives to be fossil fuel-free by 2040, and a circular economy (with bio-based low-carbon waste) is one of the keys to achieving this goal. However, in the process of converting a linear economy to a circular economy, Sweden also encounters many difficulties due to the coordination between the State, businesses, and all levels and sectors. Sweden's experience in building a circular economy with low carbon emissions starts from changing the mindset of production and consumption, building an implementation plan, and progressing to applying science and technology to manufacturing industries.

In Japan, the lack of space for waste, coupled with rocky terrain and limited domestic mineral and metal resources, is a key driver of the circular economy. The shift to a circular economy began in 1870 but only bore fruit when the recycling use law was implemented in 1991. Japan became the first country to enact the Circular Economy Law. The circular economy in Japan is developed by collecting old materials or products; All companies are required to recycle their products. Recycling systems with zero emission targets have been developed, including user life cycle assessment systems, waste minimization systems, resource recycling systems, and recycling industrial chains.

In the context of global sustainable development, agriculture plays an important role. The agricultural-industrial sector is currently the largest employer and plays an important role in the livelihoods of 40% of the population, of which employment in the agricultural sector accounts for nearly 27% of total employment in 2019 (World Bank, 2021).

Today, the topic of circular economic development is of great interest in research and discussion, especially in the context of resource scarcity. Not only is it reusing waste as a valuable resource, but the circular economy is also "a calculated connection between economic activities, creating a cycle in the economy." Applying traditional techniques, scientific and technical advances, and deploying new technologies to solve the problem of treating by-products and waste during the production process, turning them into useful, viable products. Utilizing agriculture, thereby minimizing and eventually eliminating waste that causes environmental pollution, is a long-term direction in the direction of sustainable agricultural development.

2. LITERATURE REVIEW

Circular agriculture creates conditions to help farmers and businesses in the field of agricultural production minimize risks in the output of agricultural products. To do so, it is necessary to create an ecosystem of links between farmers and businesses together to make the most of the circular economy, which is still very new.

Three circular economy approaches in agriculture include:

+ Level 1, circular economy focuses on encouraging and requiring businesses to apply cleaner production and ecological design opportunities in the production processes of agricultural products.

+ Level 2, promoting circular economic development in industrial parks and ecological agricultural systems. At level 3, all steps of the production process are designed so that waste is minimized, considered for reuse, and towards creating zero waste.

There have been many studies in recent years related to circular economy development in the agricultural sector. The results show that SIAM should be widely supported because it can improve resource efficiency and environmental performance.

Chen L et al (2017) conducted a further study on China's sustainable biogas model, taking the Beijing biogas project as an example. They believe that developing biomass energy is an important way to reduce the use of fossil fuels and greenhouse gases while promoting the development of ecological agriculture and a circular economy.

Through theoretical analysis of the content and principles of the circular economy, Han J and He X (2011) summarized the basic concept of the agricultural circular economy. They emphasized that the development of a circular economy is the fundamental path to achieving sustainable development in agriculture in China. To promote the agricultural circular economy, they believe that the government needs to increase publicity to raise people's awareness of environmental protection and promote the formation of ecological values as well as consumption concepts.

Xi H (2011) identified three types of agricultural circular economy models including family cycle, rural cycle, and ecological agricultural cycle after analyzing agricultural environmental pollution and the possibility of comprehensive agricultural capacity in Yunnan province.

3. METHODOLOGY

When undertaking a systematic review approach, research may encounter difficulties in synthesizing and analyzing data sets due to the large number of documents that need to be reviewed and synthesized. Therefore, this study follows the integrated systematic review approach developed by Hauser and colleagues (2006). Thereby providing standards for the system evaluation process based on three main steps including:

(1) Establish criteria for a selected study
(2) Conduct identification and selection of potential studies
(3) Classification of selected articles

This method is considered suitable to carry out the purpose of this research which is to focus on integration and convergence for assessing the situation of circular economy development in agriculture, thereby comparing and making recommendations. Appropriate solutions for circular economic development in the agricultural sector. The specific process described includes the following steps: Data collection, data filtering, analysis, synthesis and discussion, and finally pointing out inherited values that can be applied to research.

- *Collect data*

The systematic review approach selected keywords for the search including “Circular Economy”, “Agriculture” – Agriculture and “Economic development”, on the data source Web of Science. This is a reliable, thoroughly vetted database source, a huge data

archive founded by Eugene Garfield in the 1960s as the Institute for Scientific Information (ISI) and currently is Web of Science (abbreviated as WoS). With this method, the subjectivity of researchers in data collection is eliminated. The method proposed by Becheikh et al (2006) considers only empirical articles that have been published and published in academic journals; For this reason, non-experimental studies (internet sources...) were excluded from the review.

The first results for the literature search for keywords in the subject (title, abstract, and keywords), yielded 1,382 corresponding results. The next step was to filter articles with the selected language being English, excluding book genres, yielding 382 researchs. The third step is to determine the article conditions suitable for the research from the title, to the abstract and finally the entire text to best suit the topic " *weekly economic development".* The total number of articles selected was 336 (table 1).

The systematic review process for research will include the following stages:

- Perform analysis based on the criteria (location of research, research methods, classification of circular economy affecting agriculture, policies introduced) in the research.
- Performing bibliometric analysis on selected articles will show which keywords authors and readers are interested in, and trends in circular economy development in agriculture.

Table 1. Search Results on the Selected Database

Database	Web of Science
Keyword	Circular Economy" – *Circular Economy*, "Agriculture" – *Agriculture*, and "Economic Development" – *Development Economy.*
Search	Topic (Title, Abstract, Keywords)
type of document	Articles
Publishing year	2001 – 2024
Language	English
Research area	All
Web of Science Categories	All
Result	336 articles

Source: *Collected by the author*

Bibliometric analysis methods use quantitative information from bibliographic databases (Web of Science) to identify influential previous articles. The bibliographic co-citation analysis method is based on citation data on the subject of University autonomy to determine the structure of the theoretical foundations of the current literature.

Bibliometric data from the Web of Science for the 336 reviewed articles were published and a co-citation analysis was to reveal the theoretical foundation of the research on circular economy development in agriculture. Co-citation is a measure of similarity between articles, authors, or journals (Zupic and Čater, 2014). In co-citation analysis, one counts the number of times two certain articles are cited in articles published later than the two cited articles above. The fact that the two articles are both cited by a newer article may indicate a certain quantitative relationship between the two previously published and co-cited articles.

4. RESULTS

- **Study country distribution analysis**

Across the 336 selected articles, 84 countries conducted empirical research on the topic of circular economy development in agriculture. Table 2 lists the countries with the highest publication rate from 2001 - 2024. The country with the highest article rate is China with a total of 58 publications published. Ranked second in terms of several published articles in Switzerland with 46 publications. Ranking third in the number of published articles is Italy with 39 publications, and is also the leading country in the total number of citations on the topic of circular economic development in the agricultural sector with 1,620 citations.

Table 2. 10 Countries with The Highest Publication Rates

Research position	**Quantity**	**Number of citations**	**C/Art**	**Total Link Strengths (TTL)**
China	58	1007	17.36	3663
Switzerland	48	798	17.35	2317
IDEA	39	1620	41.54	4070

India	30	421	14.03	1891
Netherlands	25	459	18.36	3080
Virtue	25	497	19.88	1732
America	23	735	31.96	3968
Older brother	22	746	33.91	3038
Australia	17	340	20.00	2618
France	15	711	47.40	4123

Source: *Author's analysis of WOS data*

- **Analysis of research organization distribution**

After studying the list of countries with the highest number of articles published, organizations and schools from those countries also appear prominently in the rankings of organizations published on the Web database of Science. According to Table 3, it is shown that the top eight institutions contributed 29.78% of the total number of publications out of 183 organizations Among them, *Ghent University* in Belgium ranked first with a total of seven published articles related to circular economy. Ranked second are the schools and organizations with the same three publications, respectively *Erasmus University Rotterdam, Girne American University, Girne American University, Hogent University of Applied Sciences and Arts, Monash University, Sukkur Iba University, University of Manchester, and Super University of Pakistan.* Accordingly, *Sukkur Iba University* is the leading institution in the number of article citations with 164 citations, with 54.67 citations per publication.

Table 3. Organizations with the Highest Number Of Published Articles

Organization		**Quantity**	**Quote**	**TC/Art**
English	Vietnamese			
Ghent University	Ghent University	7	199	28.43
Erasmus University Rotterdam Excl Erasmus Mc	Erasmus University Rotterdam	3	97	32,33
Girne American University	Girne American University	3	28	9.33
Hogent University College Of Applied Sciences Arts	Hogent College of Applied Sciences and Arts	3	31	10.33
Monash University	Monash University	3	17	5.67
Sukkur Iba University	Sukkur Iba University	3	164	54.67
University Of Manchester	University of Manchester	3	143	47.67
Super Univ	Super Univ (Part of Pakistan)	3	62	20.67

Source: *Author's analysis of WOS data*

- **Analysis of the distribution of leading publishing journals**

Analyzing the leading journals for each field is extremely important, in the agricultural sector for the topic of developing a circular economy, in 59 journals there is at least one publication, and 15 journals are collected. From Table 4, it can be seen that *Sustainability magazine* is the leading journal with a total of seven relevant articles out of a total of 29 articles, with a total of 294 citations. The second position belongs to *the Journal Of Cleaner Production* magazine with a total of 20 articles published, and is also the magazine with the highest number of citations with 1,124 times. Besides, with 7 publications published, *Resources Conservation And Recycling magazine* is the journal with the highest number of citations per publication with 59.43 times per research article, and is also the journal with the highest number of citations per publication with 59.43 times per research article. The highest journal impact index is 13.71 points.

Table 4. Magazines Lead the Way

Magazine	Quantity	Quote	TC/Art	Impact Factors
Sustainability	29	294	10,14	3.88
Journal Of Cleaner Production	20	1124	56.20	11.90
Science Of The Total Environment	17	382	22.47	10.94
Frontiers In Sustainable Food Systems	11	55	5.00	4.69
Energies	8	70	8.75	3.66
Agronomy Basel	7	90	12.86	3.94
International Journal Of Environmental Research And Public Health	7	107	15.29	4.53
Resources Conservation And Recycling	7	416	59.43	13.71
Land Use Policy	6	6	1.00	7.38
Sustainable Production And Consumption	6	59	9.83	13.56

Source: *Author's analysis of WOS data*

- **Analyze keyword trends**

Co-word analysis of keywords appearing in each article allows authors to identify research trends or prominent topics in each field. The keywords used by the study's authors provide information about the most important research topics (NJ Van Eck & Waltman, 2014). Therefore, the present study examines the co-occurrence of keywords, which may originate from the title, abstract, or author. VOSviewer checked a total of 2384 keywords that appeared at least once and also pointed out 111 keywords that appeared the most (≥ 5 times). Thus, the three main keywords in the study include "Circular economy" appearing the most 100 times, "Sustainability" and "Agriculture" appearing one after another are 59 and 43 times, thus meeting the requirements of the topic related to circular economic development in agriculture.

Table 5. Keywords with the Highest Frequency

No	Keyword	In turn	TLS	No	Keyword	In turn	TLS
1	Circular economy *(Circular Economy)*	100	401	11	Biogas *(Bioga biogas)*	17	84
2	Sustainability *(Lasting)*	59	257	12	Biomass *(Biomass fuel)*	16	83
3	Agriculture *(Agriculture)*	43	176	13	Systems *(System)*	18	81
4	Energy *(Energy)*	35	166	19	Food waste *(Food waste)*	17	80
5	Management *(Manage)*	32	149	15	Impacts *(Affect)*	14	77
6	*Water (Water)*	22	111	16	Circular Agriculture *(Circular agriculture)*	15	74
7	*Bioeconomy (Bioeconomics)*	21	98	17	Food *(Food)*	15	70
8	Waste *(Waste)*	27	98	18	China *(China)*	14	68
9	Anaerobic digestion *(Biodegradable)*	19	88	19	Performance *(Efficiency)*	16	68
10	*Life cycle assessment (Life cycle assessment)*	18	86	20	Challenges *(Challenge)*	12	65

Source: *Author's analysis of WOS data*

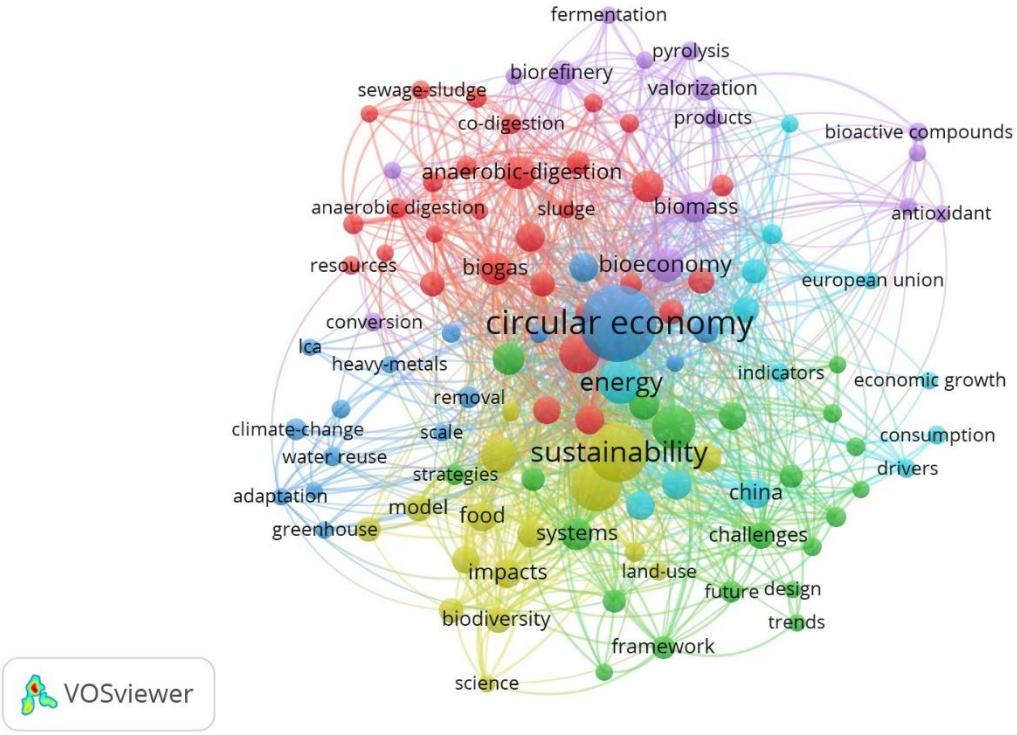

Figure 1.1. Cluster distribution of keyword cluster trends
Source: Author's analysis of WOS data

- **Distribution of leading research**

There are only 10 most cited articles out of 336 selected articles. In the distribution of the 10 studies with the highest citations, it can be seen that the majority of these articles focus on analysis and comparison of the current state of impact of the circular economy in the agricultural sector from the perspective of many people. In particular, an analysis of environmental impacts is performed, including raw material exploitation to processing, production, distribution, use, disposal, or reuse.

5. DISCUSSION AND CONCLUSION

According to the results, many studies also point out development trends for the agricultural sector, such as (1) integrated approaches to reduce CO2 to stabilize climate change and related impacts, This assumes a combination of avoidance, reuse, storage, reduction, adaptation, and mitigation of impacts. This will require improved and optimized manufacturing processes, life cycle approaches (combining material provenance with production, maintenance, and waste aspects, taking into account transportation edge) better product design, output and impact monitoring, management, sustainability goals quality control, stakeholder engagement, awareness raising and training (Huisingh et al., 2014). (2) Reasonable use of water: many studies show that good quality fresh water is an increasingly rare resource. More efforts are needed to use less water (saving and improving water use efficiency), prevent both chemical and biological water pollution, and increase wastewater treatment efficiency. (3) Seasonal, locally produced, environmentally friendly foods (organic, ecological, with limited energy and chemical inputs) will become increasingly important and utilized. Methods and strategies in sustainable agricultural development. (4) Environmental improvements in SMEs in local industrial zones ("industrial clusters") can be achieved using three governance approaches: law enforcement, chain pressure provision, and voluntary participation in CSR (Puppim de Oliveira and Jabbour, 2015). Experience with environmental management tools (e.g. environmental impact and sustainability assessments) shows that these tools are most effective if they are legally mandatory and implemented.

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