

## **A review of economic, relational, social and environmental measures of agricultural cooperatives performance: trends, sectoral, and geographical association**

### **REVIEW ARTICLE**

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### **Abstract**

There is increasing interest in the performance of agricultural cooperatives. However, there is little consensus on what measures are most appropriate to use or how best to capture the social and environmental impact of these organisations. Despite this, to date, there are no studies that review the literature on agricultural cooperative performance to establish how the most used performance measures have evolved over time and establish any relationship between the sectors and locations of agricultural cooperatives. Thus, this paper seeks to address this gap by (i) identifying the foremost measures that have been used to evaluate the performance of agricultural cooperatives; and (ii) exploring the trends, sectoral and geographical association with the use of these performance measures. A multistage analytical framework, comprising a journal article network analysis and a qualitative meta-analysis, was used to extract relevant information from 124 journal articles and perform content analysis. Subsequently, a non-parametric test was used to examine the association between the year of publication, sector and geographical location of agricultural cooperatives and the performance measures. The results highlight a diverse list of indicators utilised to assess the performance of agricultural cooperatives. However, there is a narrow focus and dominant use of short-term economic metrics, and limited use of environmental and sustainability measures. Also, the results show a significant increase in the use of liquidity indicators in more recent publications. There exists a significant association between the sector of the agricultural cooperative and the most used performance measures but no association with the geographical location. The findings highlight the need to develop performance measures that evaluate the positive spill-over effects of agricultural cooperative activities on non-members, communities, and the natural environment. Also, the findings provide a rubric for benchmarking the performance and identifying best practices that can be shared across different cooperatives.

**Keywords:** agricultural cooperatives, network analysis, performance, qualitative meta-analyses

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## 1. Introduction

Cooperative performance is a complex and ambiguous construct that is open to multiple interpretations (Grashius and Su, 2019; Soboh *et al.*, 2009). Consequently, there is no consensus on what measures are most appropriate to use to evaluate cooperative performance (Benos *et al.*, 2016). Cooperatives are a unique form of organisational structure where the members<sup>1</sup> are the owners of the organisation as well as suppliers or users of its products and services. In contrast to investor-owned firms (IOFs), cooperative members “contribute equitably to, and democratically control, the capital of their cooperative” (ICA, 2017: p. 29). Cooperatives also adhere to certain values and principles including a commitment to social and environmental sustainability (ICA, 2017; Luo *et al.*, 2020). These attributes generate specific characteristics, where profit maximisation and return on capital are not necessarily the organisation’s primary goals, nor are they the only way to benefit its owners (Soboh *et al.*, 2009; Sykuta and Cook, 2001). Thus, conventional methods of evaluating business performance are not necessarily adequate (Benos *et al.*, 2016; Hirsch and Hartmann, 2014).

Agricultural cooperatives are a subset of cooperative organisations that are owned by producers who transact with the cooperative in agri-food products or inputs. Agricultural cooperatives constitute a significant portion of cooperative organisations comprising 32% of the world’s top 300 cooperatives (measured by turnover in USD; World Cooperative Monitor, 2022). Though agricultural cooperatives are similar in structure to other cooperatives, they have some distinct characteristics arising from the biological nature of agricultural processes and products. These include factors such as perishability, variable quality and yield, and seasonality, in addition to the impact of weather, pests, and other environmental risks (Grimm *et al.*, 2014; Van der Vorst *et al.*, 2002). Furthermore, there is added complexity due to issues such as food safety, environmental sustainability, and ethical concerns that are important to stakeholders and consumers (Beske *et al.*, 2014; Govindan, 2018; Matopoulos *et al.*, 2007; Rábade and Alfaro, 2006; Rueda *et al.*, 2017). Consequently, evaluating the performance of agricultural cooperatives has some unique challenges.

There is growing interest in the performance of agricultural cooperatives as evidenced by a rapid increase in publications and citations on this topic (Luo *et al.*, 2020). Two recent reviews of the literature on agricultural cooperatives by Grashius and Su (2019) and Luo *et al.* (2020) identify agricultural cooperative performance as an important topic within the literature. According to Kalogeras *et al.* (2013), the empirical analysis of agricultural cooperative performance can be broadly grouped into two categories: (i) economic efficiency-related indicators and (ii) financial ratios.

Of these two, most studies use the financial analytical lens (Ajates, 2020; Benos *et al.*, 2016; Franken and Cook, 2015). This perspective emphasises short-term accounting measures like Return on Assets (ROA), Return on Equity (ROE), Return on Sales (ROS), and liquidity measures (Claver *et al.*, 2007; Grashius, 2019). Financial indicators are also frequently used to compare the performance of cooperatives with IOFs. The second approach focuses on operational performance and uses economic efficiency measures such as technical, productive, cost, and allocative efficiencies (Bartova and Fandel, 2020; Franken and Cook, 2013; Pokharel and Featherstone, 2019; Skevas and Grashuis, 2020).

These approaches have shown notable shortcomings. The use of economic efficiency measures relies on econometric analysis which is based on the narrow assumptions of neoclassical economic theory (Slade and Hailu, 2016). However, the approaches are unable to evaluate non-financial measures of performance

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<sup>1</sup> A “member” can be a person or legal entity who owns and transacts with a cooperative.

(Franken and Cook, 2013; Benos *et al.*, 2016) like the agricultural cooperatives' relational, social, and environmental aspects (Claver *et al.*, 2007). To include the relational aspects, some studies use subjective measures such as cooperative members' satisfaction and social capital (Hakelius, 2018; Lajara-Camilleri and Server-Izquierdo, 2017). In recent years, there has been an increasing emphasis on Sustainable Business Models (SBM), Corporate Social Responsibility (CSR), and analysis of Triple Bottom Line (Fiore *et al.*, 2020). Consequently, there is a greater focus on the social and environmental sustainability principles of cooperatives. For example, Luo *et al.* (2020: p. 7) state that Western agricultural cooperatives have "always emphasised social and environmental performance". Despite this, it is not evident how these non-financial aspects are been measured or whether more recent literature has addressed these questions. Hence, it is important to establish whether the measures that have been used to assess the performance of agricultural cooperatives have evolved over time in response to these contemporary issues.

Research on cooperative performance is conducted in a wide range of geographical locations and within different agricultural sectors. Although the effects of these attributes have been reported, there is currently no empirical evidence to establish if the geographical differences affect the type of performance measurement used. Some studies identify geographical differences in the characteristics of agricultural cooperatives (Brusselaers *et al.*, 2014; Bijman and Iliopoulos 2014; Pokharel *et al.*, 2020). It is unclear, however, if the choice of performance measures is associated with these cooperatives. Many studies use a variety of performance measures with no consistent rationale as to the selection of specific measures relevant to specific geographical contexts (Benos *et al.*, 2018). Therefore, establishing the association between performance measures and geographical regions will identify if there are patterns in the use of specific indicators.

Sectorial differences in the performance of cooperatives have been linked to the perishability of different agricultural products (Bijman and Iliopoulos, 2014). According to Lerman and Parliament (1991), the differences in the operations of agricultural cooperatives determine the type of performance measures that are relevant. Therefore, it is important to establish if specific performance measures are associated with sectors involving different agricultural products. Moreover, the evolution of performance measures over time, their association with different sectors of agricultural production and geographical location represents a significant research gap. Evaluating these associations can identify where there may be an overemphasis on certain measures and can encourage the use of measures that can better capture the multidimensional objectives of cooperatives. This is especially important regarding the social and environmental aspects of cooperatives.

Therefore, the purpose of this paper is to examine the type of measures used to evaluate the performance of Western agricultural cooperatives and explore the association of these measures with the sector within which they operate, and the geographical location.

Specifically, this paper seeks to answer these research questions:

- (i) What measures are used to evaluate agricultural cooperatives' performance?
- (ii) Have the use and type of performance measures evolved over time?
- (iii) Are there differences in the type of performance measure used in different sectors and geographical locations?

By establishing how the most used performance measures have evolved over time and any relationship between the sectors and locations of agricultural cooperatives, the findings can serve as a rubric for benchmarking the performance of agricultural cooperatives. The findings can help identify the most successful practices that have led to positive changes in performance, which can be shared across different cooperatives. Ultimately, this can lead to the adoption of best practices, improved overall performance, and greater efficiency within the agricultural cooperative sector.

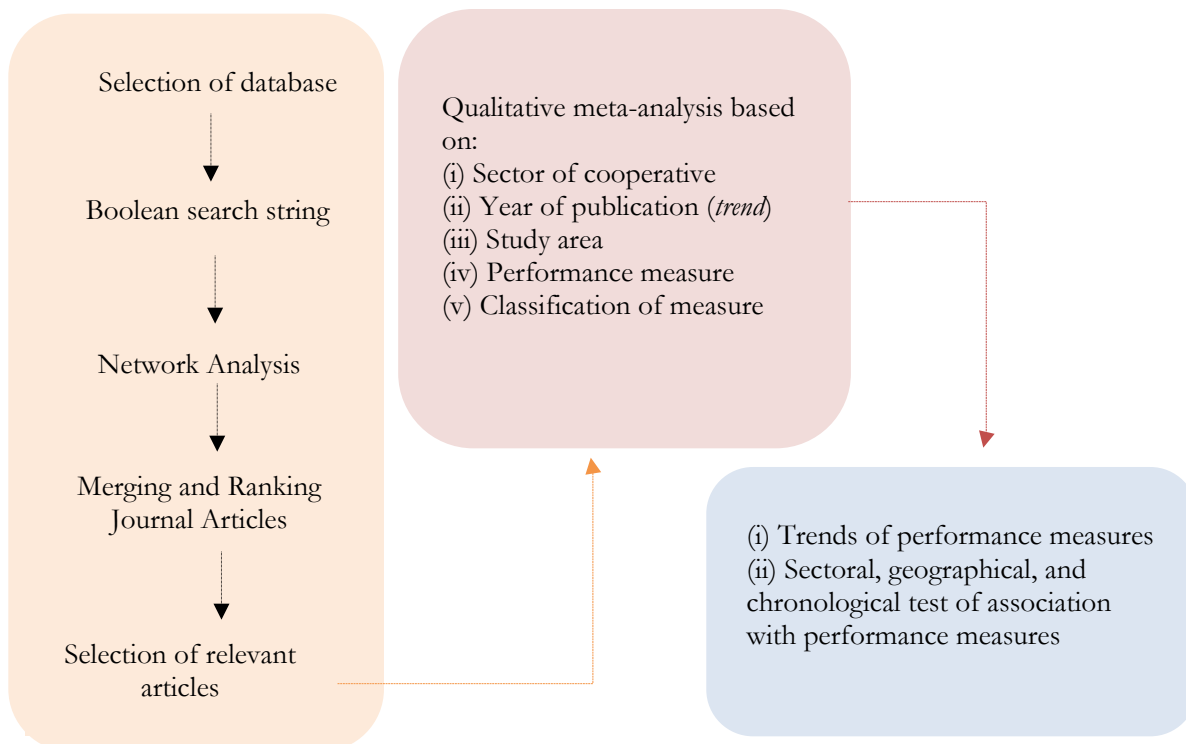
## 2. Methodology

A multistage analytical framework, presented in Figure 1, was used to examine the trends of agricultural cooperatives' performance measurement, and establish the sectoral and geographical differences in the measures that have been used to assess agricultural cooperative performance. The first stage focused on the use of Journal Article Network Analysis (Aboah and Lees, 2020) to identify relevant literature from selected databases. The second stage involved a qualitative meta-analysis and a content analysis of various themes to extract relevant data for quantitative synthesis of the sectoral and geographical trends of measuring the performance of agricultural cooperatives in the third stage. The procedures involved at each stage of the analytical framework are detailed in the succeeding sub-section.

### 2.1 Stage 1: journal article network analysis (JANA)

A Journal Article Network Analysis (JANA) was developed to collate relevant literature for the qualitative meta-analysis. This methodology improves the replicability of a systematic literature review, prevents the loss of essential data, and predetermination and exclusion of significant journal articles. The main advantage that JANA has over the use of citation analysis (Luo *et al.*, 2020) is that citation analysis by default favours articles with old publication dates due to the focus on the number of citations, while JANA deals with the thematic network incorporating information from title, keywords and abstract (Aboah *et al.*, 2019). Thus, with JANA, newly published journal articles that are strongly thematically connected with articles with older publication dates are included in the analysis.

The JANA involves four steps for the article selection (Aboah and Lees, 2020; Aboah *et al.*, 2019). The first step is database selection. The selection of database(s) is important to ensure the inclusion of all relevant articles. This paper used two databases compatible with the Vosviewer<sup>®</sup> software (Scopus and Web of Science).



**Figure 1.** A multistage analytical framework.

The second step involves the use of a different combination of Boolean search strings to find relevant journal articles. A broad Boolean search string was designed to avoid excluding important information. The search string used contained three groups of terms:

- (i) agriculture\*, agribusiness, farmer, agri, agro, or food
- (ii) cooperative, co-operative, producer organization, coop, or co-op
- (iii) performance, efficiency, financial, social, environment\* or sustainab\*.

The terms were joined within groups with “OR” Boolean operators, and between groups with “AND” Boolean operators. Selected articles needed at least one of each group of terms. The searches targeted the title, abstract and keyword sections for the Scopus database and the topic section for the Web of Science. The two databases were used to enhance the reliability of the bibliometric analysis (Echchakoui, 2020; Caputo and Kargina, 2022). This process ensured that articles appearing in only one database were included in the analysis. Although some grey literature and reports focused on the subject matter, the review limited the search criteria to peer-reviewed articles published without a restriction on the timeline. Articles in English, Spanish and Portuguese were selected, due to the capabilities of the authors. The Boolean string resulted in 2138 and 4414 articles from the Scopus and Web of Science databases, respectively. The publication years for the extracted preliminary papers range from 1937 to 2020.

The third step involves performing a divergent JANA for each database. The JANA involves a calculation of the link strength of the articles extracted in the preliminary search, using the information from the title, keywords, Digital Object Identifier (DOI), abstract and citation links. The articles included in the content analysis stage were selected based on their total link strength. This criterion was applied regardless of whether the article appeared in one or both of the databases. The link strength is the number (counts) of directed links that an article shares with other articles in the network

The link strength is based on the similarity of keywords, topics and themes addressed in each article. So closely linked articles will generally discuss similar issues (in this case, agricultural cooperative performance). The Vosviewer<sup>®</sup> software processes the common information among journal articles and selects closely linked articles based on two conditions. Articles that are published in later years are connected to those published earlier but not the reverse. Thus, one condition was that the links between the two articles are logically forward-looking. Another condition, which is a variant of the first, was that publication links are acyclic, meaning that two given publications cannot cite themselves mutually (Van Eck and Waltman, 2014). The minimum threshold for selecting an article was set to zero links because articles with recent publication dates have lower link strength. Hence, articles were incorporated into the analysis if they had at least one reference to existing literature; conversely, those lacking any such reference were excluded. A link between two journal articles A and B is presented as a directed connection (A→B), where A and B are articles published in later and earlier dates.

The JANA groups strongly linked articles into the same cluster based on the article’s subject or theme using the articles key words. Different colours are used to distinguish the clusters.

The threshold for forming a cluster was set at a minimum of five articles. This threshold was considered sufficient to exclude smaller clusters while still allowing for the identification of thematic similarities within groups consisting of at least five articles.

The size of the cluster circle in the JANA represents the number of other articles that are connected to it. The larger the circle size, the more article connections. The search selected all those articles that had at least one link between them. The JANA resulted in the selection of 699 closely linked articles for Web of Science, and 399 for Scopus as shown in Figures 2 and 3, respectively.

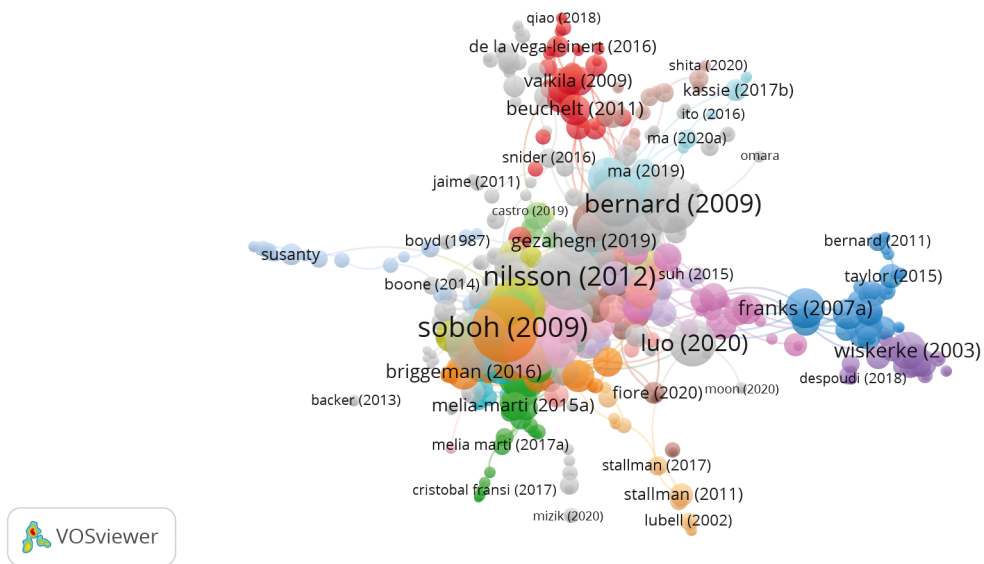


Figure 2. Web of Science network map.

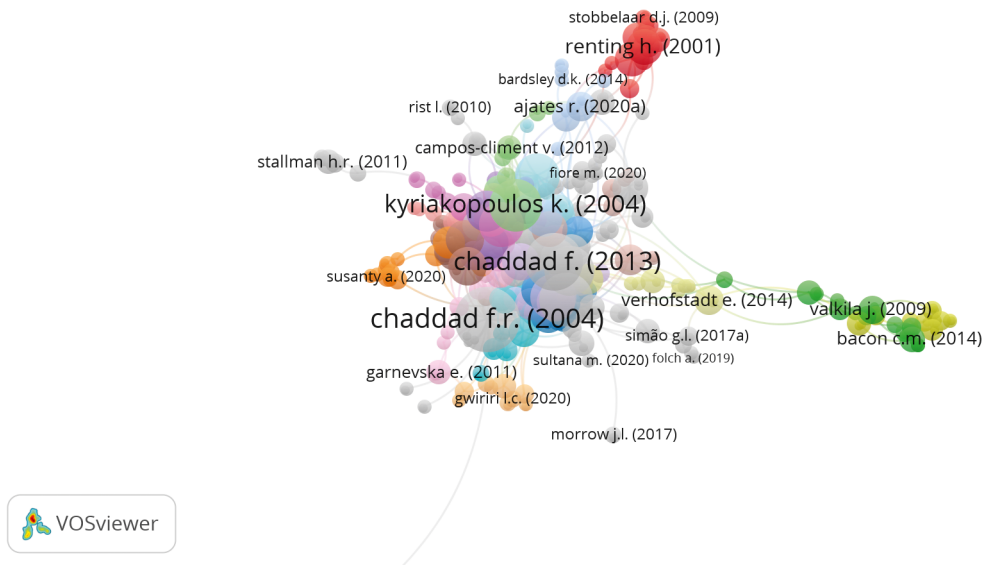


Figure 3. Scopus network map.

The fourth step involved merging duplicate articles (articles found in both databases). To estimate total link strength ( $Ls_{(total)}$ ) for closely linked articles selected from the JANA as presented in equation 1.

$$Ls_{(total)} = L_{w(i)} X_{w(i)} + L_{s(i)} X_{s(i)} \tag{1}$$

where  $L_w$  and  $L_s$  are the link strength in the JANA database from the Web of Science and Scopus databases, respectively. If a publication appeared in the JANA for the Web of Science, then  $X_{w(i)}=1$ , else ( $X_{w(i)}=0$ ). Likewise, if a publication appeared in JANA for Scopus, then  $X_{s(i)}=1$ , else  $X_{s(i)}=0$ . In other words if an article appears in the JANA for both databases, the total link strength was calculated as the sum of its link strengths in each JANA. This addressed the issue of articles that had different link strengths in the two databases. Since the purpose of the JANA was to rank the articles based on link strength to select articles

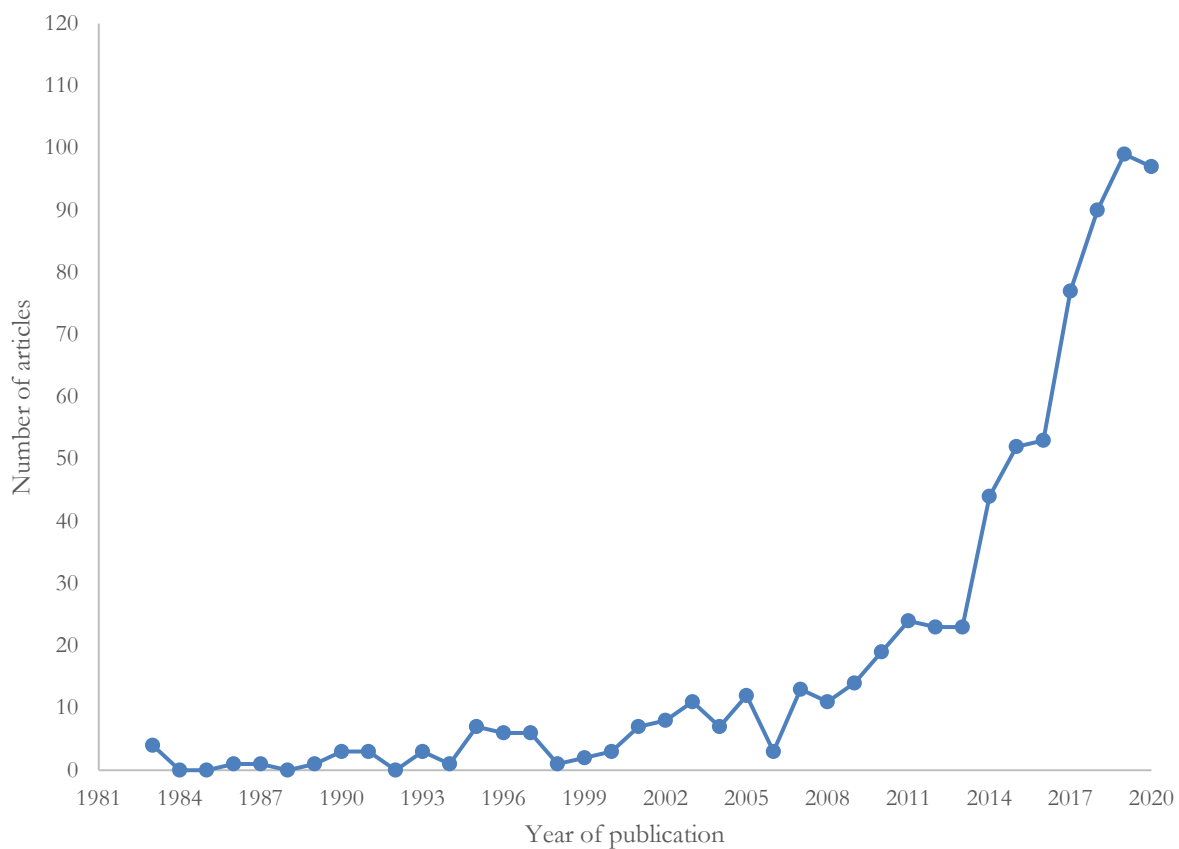
for the qualitative meta-analysis, this approach was deemed appropriate for achieving that goal (Aboah and Lees, 2020; Aboah *et al.*, 2019).

After merging articles, it resulted in a list of 745 closely connected articles. A trend of these articles, presented in Figure 4, highlights a general increase in measuring the performance of agricultural cooperatives after 2013.

The contents of the 745 articles were carefully analysed, using the inclusion and exclusion criteria, presented in Table 1. The most common exclusion reasons were related to articles that were not focused on western developed countries, written in the specified languages, or directly related to agricultural cooperative performance.

## 2.2 Stage 2: qualitative meta-analysis

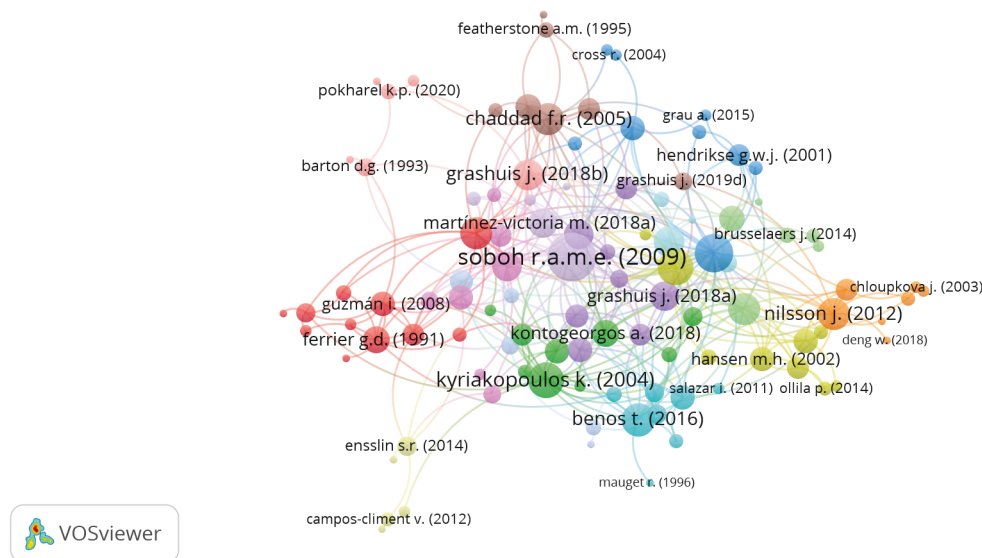
After merging and applying the inclusion and exclusion criteria, 124 strongly connected articles (Figure 5) that analysed the performance of agricultural cooperatives in developed countries were selected for the qualitative meta-analysis. The average link strength of the selected articles was 13.2. The minimum and maximum link strengths were 1 and 98, respectively. Furthermore, 57 out of the total selected articles had a link strength of more than 10. The selected articles were ranked in order of link strength, and the topmost articles were selected for the qualitative meta-analysis; all articles with a link strength greater than or equal to 1 were selected for the qualitative meta-analysis.



**Figure 4.** Trend in year of publication of literature on agricultural cooperative performance.

**Table 1.** Inclusion and exclusion criteria

Inclusion criteria	Rationale
Papers directly addressing aspects of evaluating or measuring an agricultural cooperatives performance (e.g., sector, study area, year of publication).	The objective of the study is to investigate how cooperatives' performance can be measured.
Exclusion criteria	Rationale
Papers not directly related to agricultural cooperatives.	The focus of the study is the subset of agricultural cooperatives.
Papers focusing on non-western developed countries.	Western developed countries and western developing countries or non-western countries have experienced a different process of cooperative movements. Therefore, usually cooperative studies outside western countries focus on different performance criteria, i.e., members development, or post centralized economies development.
Papers without a direct focus on performance evaluation.	The objective of the study is to analyse the different ways in which cooperatives' performance can be measured.



**Figure 5.** Final network connection.

For the qualitative meta-analysis, the following data were extracted from the selected articles: authors, journals, year of publication, geographic location, theoretical lens, methodology, objectives, sample, sector, period analysed, performance measures, antecedents, classification of measures, cooperative structure, and the key findings.<sup>2</sup> Thereafter, the year of publication, the sector, and geographic location of the articles were used to determine if any relationship was present between these characteristics and the performance measures used. In the 124 articles selected, 14 sectors were identified as the subject of analysis. These sectors include grains, dairy, fruits and vegetables, wine, cotton, organic products, bioethanol, olive, animal feed supply, alpine products, forestry, meat, lamb, and supply cooperatives. Some articles focused on one sector, while others investigated a few or many of them. Regarding geographic location, the 124 articles were classified into 23 categories. Those categories corresponded with the individual countries of the selected regions (North America, Europe, and Oceania), and different combinations of those countries and regions. The performance measures, sector and geographic locations were coded as nominal measures to facilitate the quantitative analysis.

### 2.3 Stage 3: quantitative analysis

The Pearson's Chi-Square test was used to determine whether there is an association between the sector of the cooperative and the indicators that are mostly used for measuring the performance of agricultural cooperatives. The Pearson's Chi-Square test was estimated as:

$$\chi^2 = \sum ((O_{ij} - E_{ij})^2 / E_{ij}) \quad (2)$$

Where  $O_{ij}$  and  $E_{ij}$  are the observed and expected frequencies, respectively;  $i$  and  $j$  are the indexes for the rows and columns of a contingency table. A similar test was performed for the study area, the year that the study was published and the indicators that are mostly used to measure the performance of cooperatives. The null hypothesis for the Pearson's Chi-Square test ( $H_0$ ) is that the sector of an agricultural cooperative, the study area where the research was conducted, and the year in which the study was conducted are independent (no association) of the indicator mostly used for measuring the performance of the cooperative. The Cramer's  $V$  was used as the test statistic to determine the strength of association when the Pearson's Chi-Square test is statistically significant. Cramer's  $V$  ranges from 0 to 1; with  $<0.3$  being weak association, between 0.4 to 0.5 moderate association, and  $>0.5$  strong association.

## 3. Results and Discussion

Two key results are presented and discussed in this section. The first part shows the trends in the use of performance measures and how they are classified. The year of publication is used as the basis for capturing the trends of performance measures. The next section covers the tests results used to establish the association between the study areas, the sector they operate in, and the use of performance measures. The results are based on the findings of 124 peer-reviewed journal articles selected from the Journal Article Network Analysis that focused on agricultural cooperative performance. Out of the total, 63 used panel data, 42 used cross-sectional data, and 19 were theoretical studies. The average number of years for the studies involving the use of panel data is 9.5 years.

### 3.1 Trend of Performance Measures

Table 2 summarises the top 20 most frequently used indicators for measuring agricultural cooperative performance. The results show a diverse list of indicators and a lack of consistency in their application. From 124 articles retrieved from the network analysis, a total of 53 different performance indicators are identified.

<sup>2</sup> Generally, articles that propose conceptual frameworks have high link strength because other articles build on these frameworks. However, such articles are not relevant for this study's content analysis, which is a post-JANA step to extract data points for the quantitative analysis.

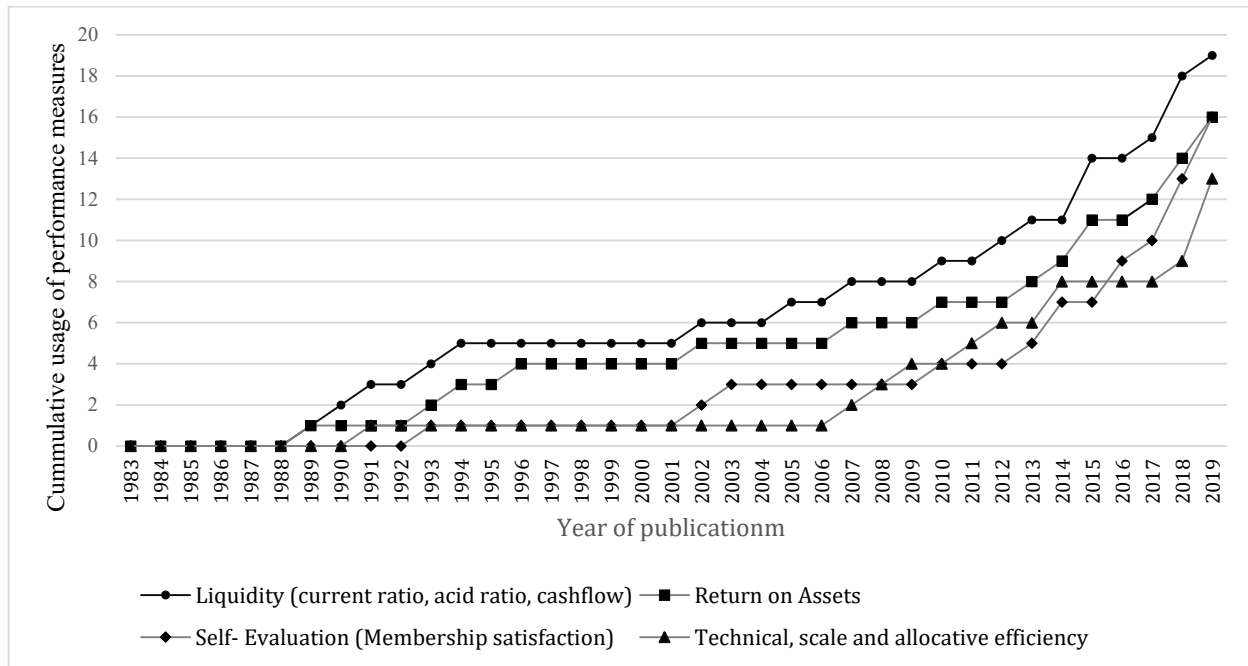
**Table 2.** The total frequency of 20 most used measures of cooperative performance.

Performance measure	Usage frequency
Liquidity (current ratio, acid ratio, cashflow)	19
Return on assets (ROA)	17
Self-evaluation (Membership satisfaction)	17
Technical scale and allocative efficiency	14
Membership of voluntary coops (members' involvement, commitment, loyalty)	14
Premium price/cost of members' supply, return on patronage	13
Assets turnover ratio (different types of assets)	12
Marginal profitability of capital (ROE)	10
Operating profit margin	10
Capital structure (short-term debt, long-term debt)	10
Market share (access)	10
Social capital (bonding and bridging, trust)	10
Debt to asset ratio	9
Profitability ratios	8
Survival analysis	8
Debt to equity ratio	6
Productivity growth (growth rate)	6
Turnover per member	6
Environmental performance (implementation of ecological agriculture)	5
Inventory turnover ratio	4

Analysis of the top ten most used indicators can be segmented as financial measures, self-evaluation measures, technical efficiency measures, market-related measures, and social-related measures. The findings show that agricultural cooperative performance has mostly been measured using the financial indicators presented (Table 2). Specifically, measures of liquidity (i.e., current ratio and acid test) are the most frequently used indicators of performance. The return on assets (ROA) is the second most used financial indicator for assessing agricultural cooperative performance. The dominant use of liquidity indicators to measure performance suggests that more attention has been paid to the short-term performance of agricultural cooperatives. In most cases, the liquidity indicators are used with other financial indicators such as ROA; however, measures of liquidity are consistently used with a range of other financial indicators.

Specifically, measures of liquidity (i.e., current ratio and acid test) are the most frequently used indicators of performance. The return on assets (ROA) is the second most used financial indicator for assessing agricultural cooperative performance. The dominant use of liquidity indicators to measure performance suggests that more attention has been paid to the short-term performance of agricultural cooperatives. In most cases, the liquidity indicators are used with other financial indicators such as ROA; however, measures of liquidity are consistently used with a range of other financial indicators.

Figure 6 shows the cumulative trend of the four most used performance measures. This graph is in line with the analysis presented in Table 2. It identifies that the two financial ratios; liquidity (current ratio/acid ratio, cashflow) and return on assets have consistently been the most frequently used measures of performance since 1993. The economic efficiency measures (technical scale and allocative efficiency) and the qualitative measure of membership satisfaction have had a similar use over this period. The dominant use of financial measures assumes that agricultural cooperatives are somehow like IOFs and can be measured in the same way. It is worth noting that some of the financial indicators that measure the benefits to cooperative members (for instance, premium price or satisfaction) acknowledge the differences between cooperatives and IOFs.

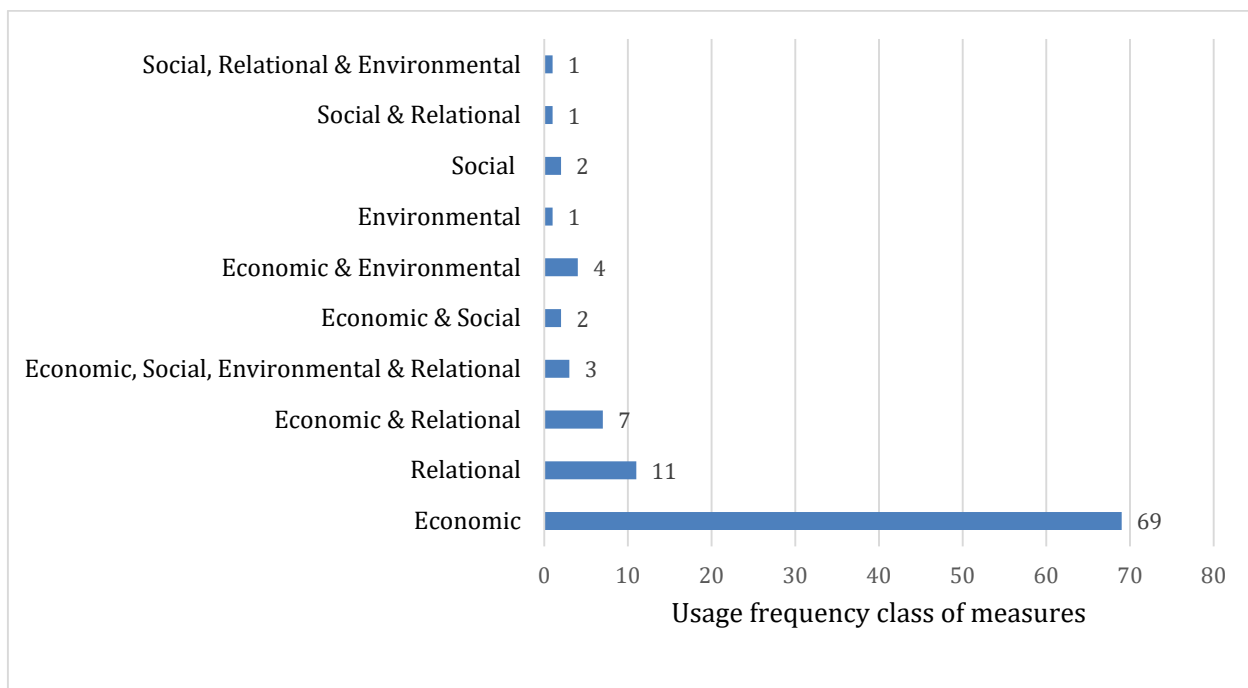


**Figure 6.** Cumulative trend of the four most used performance measures of agricultural cooperatives.

However, their usage is lower. Furthermore, measures that focus on the external performance of agricultural cooperatives, which do not directly benefit members have not been often used.

Figure 7 shows the measures of performance classified into four groups: economic, relational, social, and environmental. Economic performance includes measures that are related to financial analysis, or economic efficiency (Benos *et al.*, 2018). Relational performance refers to measures of the interrelationship between the members of the cooperative or the members with the cooperative. These aspects are commonly incorporated into the social capital model (Nilsson *et al.*, 2012). The social performance classification refers to measures that reflect the relationship of the cooperative with those who are not members of the cooperative. These include suppliers to IOF's or related competitor organisations, other supply chain participants, and the wider society (Chloupkova *et al.*, 2003; Luo *et al.*, 2020; Ortiz-Miranda *et al.*, 2010). Moreover, environmental performance includes the impacts and the interrelation of the cooperative and its members with the natural environment (Claver *et al.*, 2007; Melia-Marti *et al.*, 2020; Baranchenko and Oglethorpe, 2012).

The results support three main conclusions. Firstly, the results confirm that economic measures have dominated the literature on cooperative performance (Fig. 7). Therefore, supporting the observations of Ajates (2020) and Claver *et al.* (2007) who stated that most of the literature on the performance of agricultural cooperatives used an economic lens. Secondly, the results also indicate that though the economic perspective dominates the literature, member benefits from a social perspective has gained some attention (Feng, Friis and Nilsson, 2016; Benos *et al.*, 2016). Finally, the results highlight the lack of studies that focus on the external social and environmental measures of performance. Even when social and environmental measures are used, most of these studies still include economic performance criteria. This emphasis ignores a fundamental principle of cooperatives which is to “work towards the sustainable development of their communities” (ICA, 2017: p. 85). This statement implies that cooperatives by nature provide benefits beyond their members and involve both economic and social outcomes. From a financial performance and economic efficiency perspective, these external benefits are viewed as a weakness of cooperatives and are described in the literature as the external free-rider problem (Iliopoulos and Cook, 1999; Ortmann and King, 2007). In contrast to this view, these wider benefits can be seen as positive spill-over effects (Galdeano-Gómez, 2008; Galdeano-Gómez



**Figure 7.** Frequency of the classification of the most used performance measures (Grouped by primary classification).

*et al.*, 2008). For example, agricultural cooperatives can benefit non-members by being price leaders and through stabilisation of prices (Soboh *et al.*, 2009).

The results of the test of association indicate a statistically significant association ( $p < 0.05$ ) between the use of liquidity indicators and the year in which the studies were conducted (Table 3). The test of the strength of association, evidenced by Cramer's  $V$  of 0.58, signifies a strong association between the use of liquidity indicators and the study year. This demonstrates an increasing trend in the use of these indicators. No statistically significant association is reported for the other indicators in the analysis. This shows there has been no substantial increase in the use of non-financial measures. Significantly, it highlights a neglect in the use of indicators that capture the benefits to members and the external environmental and social impacts of agricultural cooperatives' activities (operations).

The use of subjective or objective measures for measuring performance has been linked to the type of data used in a study. Primary data often links with subjective measures while secondary data allows for the use of objective measures (Murphy *et al.*, 1996). The predominance of financial measures can be attributed to their advantages, notably the ease of accessing secondary data from financial reports and the capability to compare objective measures across various organizations (Benos *et al.*, 2016).

### 3.2 Sectorial test of association

Results of the sectoral association with the use of the performance measures, presented in Table 4, show a statistically significant association ( $p < 0.05$ ) between the classification of measures and the performance indicators. Also, the results indicate that the classification of the measures has a moderate association with the sector of the cooperative, as evidenced by the value of 0.49 for Cramer's  $V$ .

**Table 3.** Test of association between study year and performance measures

Test statistic	Study year				Membership voluntary activities	Technical and scale efficiency
	Classification of measures	Liquidity	Self-evaluation	Return on assets		
Pearson $\chi^2$	240.9827	42.0884	20.5530	28.0492	17.1668	24.2326
Pr	0.956	0.043*	0.843	0.462	0.945	0.669
Cramer's $V$	0.4408	0.5826	0.4071	0.4756	0.3721	0.4421

Classification of measures comprises classification into economic, relational, social and environmental measures of performance.

\* $p \leq 0.05$ ; \*\* $p \leq 0.01$ ; \*\*\* $p \leq 0.001$ .

**Table 4.** Test of association between sectors of cooperatives and performance measures

Test statistic	Sector				Membership voluntary activities	Technical and scale efficiency
	Classification of measure	Liquidity (current/acid ratio)	Self-evaluation	Return on assets		
Pearson $\chi^2$	294.2076	12.3350	23.6019	6.0981	33.2262	25.0734
Pr	0.000**	0.654	0.072	0.978	0.004**	0.049*
Cramer's $V$	0.4871	0.3154	0.4363	0.2218	0.5176	0.4497

\* $p \leq 0.05$ ; \*\* $p \leq 0.01$ ; \*\*\* $p \leq 0.001$ .

Disaggregating the results reveals that indicators for measuring performance classified under economic measures are the most used measures across all the sectors. The indicators classified under the social-relational measures were the second most used. Out of the 16 different sectors identified in all the selected journal articles, two groups of the sectors (i.e., (i) mixed sector comprising fruits, vegetables, and dairy, and (ii) grains only) used exclusively economic measures (100%). For studies that focused on wine and dairy cooperative sectors, 81% and 75% used economic measures, respectively. Studies that focus on organic-only and bio-ethanol cooperatives did not consider economic measures as crucial for measuring cooperative performance. The studies that focused on the organic-only and bio-ethanol sectors predominantly used social-relational measures for assessing cooperative performance.

Narrowing the analysis to the specific performance measures, the test results show that there was no statistically significant association between the use of financial measures (i.e., liquidity indicators and return on assets) as indicators for performance and the sectors of the cooperative. Moreover, the results in Table 4 show a statistically significant association ( $p < 0.05$ ) between the use of membership voluntary activities (members' involvement, commitment, loyalty) as a performance measure and the sector of the agricultural cooperative. Specifically, the results suggest that studies that focused on cooperatives for different agricultural commodities predominantly used membership voluntary activities as a measure of cooperative performance. The Cramer's  $V$  value of 0.5176 indicates a strong association between the use of membership voluntary activities as a performance measure and the sector of an agricultural cooperative.

Additionally, the results show a statistically significant association ( $p < 0.05$ ) between the use of technical and scale efficiency as a cooperative performance measure and the sector of the cooperative. Cramer's  $V$  indicates a medium association between the use of these measures and the sector of an agricultural cooperative. In particular, studies that focused on various sectors such as fruits and vegetable cooperatives and dairy cooperatives use technical and scale efficiency as a measure for cooperative performance. According to Franken and Cook (2015), a difference exists in the indicator for measuring performance (e.g., return on equity) for dairy cooperatives, IOFs, and grain cooperatives. Also, although dairy, fruits and vegetable

cooperatives may outperform IOFs when liquidity measures are used, there was no significant difference when the return on equity is used (Franken and Cook, 2015).

### 3.3 Geographical Test of Association with Performance Measures

The results on the association between the geographical location of studies and performance measures indicate no statistically significant association (Table 5). This implies that the use of a performance indicator cannot be tied to a particular geography. However, the test results in Table 5 show a statistically significant association between the performance measures and the study area when the performance indicators are grouped into their respective classifications.

The distribution of the different study areas show that most of the journal articles assessed the performance of agricultural cooperatives in the United States (26%); followed by Spain (23%), the world (12%), and aggregation of European cooperatives (9%). Indeed, for all the study areas, performance indicators that are classified as economic measures were the most used measures (68%); followed by social-relational measures (6.5%), economic-social-relational measures (4.8%), social measures (4.8%), and economic-relational measures (4.8%). The environmental measures were used as an exclusive measure in 1.6% of all the journal articles. Measures that focused holistically on the sustainability of agricultural cooperatives activities (i.e., economic-environmental-social measures) were the least used. This shows that the positive spill-over effects of societal benefits of agricultural cooperatives are rarely evaluated in terms of cooperative performance. There are some attempts to include sustainability measures; however, the operationalisation of environmental performance is varied in the literature (Claver *et al.*, 2007).

## 4. Conclusions

This paper examined the most important measures used to evaluate the performance of agricultural cooperatives, and explored the trends, sectoral differences, and geographical association in Western developed countries. The findings highlight a disparate list of indicators used in the literature. However, there is a dominant use of short-term economic measures. Although the institutional differences between IOFs and cooperatives are consistently acknowledged in the literature, this distinction is not reflecting the performance measures used. In line with the findings of Benos *et al.* (2018), this paper revealed that a large proportion of the economically focused literature used financial indicators (Franken and Cook, 2015). Some of the reviewed articles did in fact incorporate other measures that highlight the dual owner-patron nature of agricultural cooperatives (e.g., premium price), including Frick (2017), Grashuis and Magner (2018), and Melia-Marti and Martinez-Garcia (2015). Nevertheless, their use is not generalised. This highlights the need for more research on performance measures that can capture both financial and non-financial benefits of cooperatives.

This paper provides evidence that there is a neglect of the measures that reflect the benefits of cooperatives to non-members, other stakeholders, and the natural environment. In particular, the findings reveal a neglect of environmental measures in existing studies despite the growing awareness of the impact of agriculture

**Table 5.** Test of association between the study area and performance measures.

Test statistic	Study area				Membership voluntary activities	Technical and scale efficiency
	Classification of measure	Liquidity	Self-evaluation	Return on assets		
Pearson $\chi^2$	344.1338	20.0776	19.1100	16.4796	28.5025	16.7198
Pr	0.000**	0.578	0.639	0.791	0.160	0.779
Cramer's $V$	0.5268	0.4024	0.3926	0.3646	0.4794	0.3672

\* $p \leq 0.05$ ; \*\* $p \leq 0.01$ ; \*\*\* $p \leq 0.001$ .

on the natural environment (Baranchenko and Oglethorpe, 2012; Willet *et al.*, 2019) and the focus on sustainable business models (Fiore *et al.*, 2020). This concern does not seem to be reflected in the studies on the performance of agricultural cooperatives in western countries. These findings do not support the research of Luo *et al.* (2020), who stated in their literature review that social and environmental performance is the second largest theme in the studies of agricultural cooperatives.

The results highlight the lack of studies that focus on the external social measures of cooperative performance. While the effect of communities' characteristics on cooperatives has received some level of attention in the cooperative literature, the positive social benefit of cooperatives on the community, has received less attention. Some exceptions include the work of Figueiredo and Franco (2018) in Portugal and Gallego-Bono and Chaves-Avila (2020) in Spain. In contrast, the effect of cooperatives on the community has received significant attention in developing-countries-based studies (Bernard and Spielman, 2009 Esnard *et al.*, 2017; Kumse *et al.*, 2021; Wossen *et al.*, 2017). Therefore, there is a need for future studies to explore the social effects of Western cooperatives on their communities.

This paper offers several important contributions to the literature on the performance of agricultural cooperatives. Firstly, the JANA analysis establishes a replicable framework to evaluate the literature on the measurement of agricultural cooperative performance. Secondly, though there are existing literature reviews on agricultural cooperatives, these have a different focus from this review. For example, Marcis *et al.* (2019) focus on sustainability performance, Luo *et al.* (2020) on research themes and Grahuis and Su (2019) on the empirical analysis of cooperative performance as an outcome variable.<sup>3</sup> This review is the first to specifically address the broad topic of Western agricultural cooperative performance and empirically evaluate the trends in the use of performance measures and associations with different sectors and geographical locations.

Thirdly, this paper identifies the multiplicity of indicators used to measure the construct. It also provides empirical evidence of the dominant use of economic indicators. Consequently, the lack of emphasis on measures that evaluate the impact of agricultural cooperatives on non-members, communities, and the natural environment. These are important findings given the assertion the cooperatives by nature have a commitment to social and environmental sustainability (ICA, 2017) and that western agricultural cooperatives have always emphasised social and environmental performance (Gallardo-Vázquez *et al.*, 2014; Luo *et al.*, 2020; Marcis *et al.*, 2019).

This paper reveals several gaps and opportunities for future research. Firstly, there need to be a significant shift from the dominate use of economic indicators and comparing performance on these measures to IOF. Future research must address this imbalance and identify indicators that measure the social and environmental performance of cooperatives. This can then provide a basis to compare cooperatives with IOFs on these dimensions. In relation to this, the reliance on available secondary data should be addressed, particularly the analysis of published financial reports. Secondly, more research is required to identify which indicators are more relevant to specific sectors and geographical locations. Finally, research should address the limited focus on theoretical frameworks for conceptualising cooperative performance.

This paper proves to be highly relevant to managers and policy makers. With the current concerns of the environmental impact of agriculture, it is important to know the relative performance of cooperatives to other organisational structures. If cooperatives provide positive spill over effects that potentially impact on their financial performance how can this dilemma be addressed for society to continue to receive the benefits of cooperative organisations. Furthermore, for managers of cooperatives needing to address calls for greater environmental responsibility, this research supports the need for measures that can evaluate this dimension of performance.

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<sup>3</sup> Grahuis and Su (2019) evaluate both western and developing world cooperatives with a significant weighting towards non-western cooperatives.

There are a number of limitations of the research. Firstly, the analysis focused on trends, sector, and geographical location. There may be other variables that may have association with the use of performance measures. For example, the organisational and governance structure of cooperatives as well as issues such as capital constraints or financing problems. Secondly, the focus on Western developed countries and consequential neglect of the measures used for measuring in non-western developed countries present a restrictive finding. Additionally, the journal articles included in the systematic literature review were retrieved from only two databases that are compatible with the selected software. Potential journal articles that fall outside these databases were excluded from the analysis. Furthermore, there is a significant body of research undertaken by independent research organisations that is not published in academic journals. Future studies could incorporate cooperative research not published in peer-reviewed journals.

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## Appendix

**Table A1.** List of articles included in the literature review, ranked by link strength

Author(s)	Year	Journal	DOI	Link strength	Study area
Chaddad and Cook	2004	Review of Agricultural Economics	<a href="https://doi.org/10.1111/j.1467-9353.2004.00184.x">https://doi.org/10.1111/j.1467-9353.2004.00184.x</a>	98	Conceptual
Nilsson <i>et al.</i>	2012	Agribusiness	<a href="https://doi.org/10.1002/agr.21285">https://doi.org/10.1002/agr.21285</a>	82	Sweden
Soboh <i>et al.</i>	2009	Review of Agricultural Economics	<a href="https://doi.org/10.1111/j.1467-9353.2009.01448.x">https://doi.org/10.1111/j.1467-9353.2009.01448.x</a>	56	World
Soboh, Lansink and van Dijk	2012	Journal of Agricultural Economics	<a href="https://doi.org/10.1111/j.1477-9552.2011.00324.x">https://doi.org/10.1111/j.1477-9552.2011.00324.x</a>	45	Europe
Chaddad <i>et al.</i>	2005	Journal of Agricultural Economics	<a href="https://doi.org/10.1111/j.1477-9552.2005.00027.x">https://doi.org/10.1111/j.1477-9552.2005.00027.x</a>	44	USA
Benos <i>et al.</i>	2016	Agribusiness	<a href="https://doi.org/10.1002/agr.21429">https://doi.org/10.1002/agr.21429</a>	43	Greece
Benos <i>et al.</i>	2018	Sustainability	<a href="https://doi.org/10.3390/su10124536">https://doi.org/10.3390/su10124536</a>	41	World
Grashuis	2020	Agribusiness	<a href="https://doi.org/10.1002/agr.21612">https://doi.org/10.1002/agr.21612</a>	32	USA
Kalogeras <i>et al.</i>	2013	Agribusiness	<a href="https://doi.org/10.1002/agr.21323">https://doi.org/10.1002/agr.21323</a>	31	Netherlands
Kyriakopoulos <i>et al.</i>	2004	Agribusiness	<a href="https://doi.org/10.1002/agr.20021">https://doi.org/10.1002/agr.20021</a>	28	Netherlands
Hakelius and Nilsson	2020	Sustainability	<a href="https://doi.org/10.3390/su12219073">https://doi.org/10.3390/su12219073</a>	27	Sweden
Chloupkova <i>et al.</i>	2003	Agriculture and Human Values	<a href="https://doi.org/10.1023/a:1026141807305">https://doi.org/10.1023/a:1026141807305</a>	27	Denmark, Poland

**Table A1.** Continued

Martinez-Victoria <i>et al.</i>	2018	Agribusiness	<a href="https://doi.org/10.1002/agr.21513">https://doi.org/10.1002/agr.21513</a>	26	Spain
Soboh <i>et al.</i>	2011	Agribusiness	<a href="https://doi.org/10.1002/agr.20246">https://doi.org/10.1002/agr.20246</a>	26	Europe
Grashuis and Su	2019	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12205">https://doi.org/10.1111/apce.12205</a>	25	World
Kontogeorgos <i>et al.</i>	2018	Journal of The Knowledge Economy	<a href="https://doi.org/10.1007/s13132-016-0402-8">https://doi.org/10.1007/s13132-016-0402-8</a>	25	Greece
Hohler and Kuhl	2018	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12177">https://doi.org/10.1111/apce.12177</a>	24	World
Ferrier and Porter	1991	Journal of Agricultural Economics	<a href="https://doi.org/10.1111/j.1477-9552.1991.tb00344.x">https://doi.org/10.1111/j.1477-9552.1991.tb00344.x</a>	24	USA
Grashuis and Franken	2020	Journal of Cooperative Organization and Management	<a href="https://doi.org/10.1016/j.jcom.2020.100119">https://doi.org/10.1016/j.jcom.2020.100119</a>	23	USA
Feng <i>et al.</i>	2016	Agribusiness	<a href="https://doi.org/10.1002/agr.21427">https://doi.org/10.1002/agr.21427</a>	23	Sweden
Arcas <i>et al.</i>	2011	Outlook On Agriculture	<a href="https://doi.org/10.5367/oa.2011.0051">https://doi.org/10.5367/oa.2011.0051</a>	23	Spain
Lerman and Parliament	1991	Agricultural Economics	<a href="https://doi.org/10.1016/0169-5150(91)90013-b">https://doi.org/10.1016/0169-5150(91)90013-b</a>	23	USA
Ajates	2020	Journal of Rural Studies	<a href="https://doi.org/10.1016/j.jrurstud.2020.06.019">https://doi.org/10.1016/j.jrurstud.2020.06.019</a>	21	
Russell <i>et al.</i>	2017	Agricultural Finance Review	<a href="https://doi.org/10.1108/afr-09-2016-0074">https://doi.org/10.1108/afr-09-2016-0074</a>	20	USA
Li, Jacobs and Arts	2015	Agricultural Finance Review	<a href="https://doi.org/10.1108/afr-11-2014-0034">https://doi.org/10.1108/afr-11-2014-0034</a>	20	USA
Melia-Marti and Martinez-Garcia	2015	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12083">https://doi.org/10.1111/apce.12083</a>	20	Spain
Grashuis and Cook	2019	International Food and Agribusiness Management Review	<a href="https://doi.org/10.22434/ifamr2018.0101">https://doi.org/10.22434/ifamr2018.0101</a>	19	USA
Deng <i>et al.</i>	2020	Journal of Evolutionary Economics	<a href="https://doi.org/10.1007/s00191-020-00690-8">https://doi.org/10.1007/s00191-020-00690-8</a>	18	World
Grashuis	2018	Sustainability	<a href="https://doi.org/10.3390/su10030652">https://doi.org/10.3390/su10030652</a>	18	Western countries
Grashuis	2018	Agricultural Finance Review	<a href="https://doi.org/10.1108/afr-05-2017-0031">https://doi.org/10.1108/afr-05-2017-0031</a>	18	USA
Mateos-Ronco and Guzman- Asuncion	2018	International Food and Agribusiness Management Review	<a href="https://doi.org/10.22434/ifamr2016.0178">https://doi.org/10.22434/ifamr2016.0178</a>	18	Spain

**Table A1.** Continued

Lerman and Parliament	1990	Agribusiness	<a href="https://doi.org/10.1002/1520-6297(199011)6:6&lt;527::aid-agr2720060602&gt;3.0.co;2-r">https://doi.org/10.1002/1520-6297(199011)6:6&lt;527::aid-agr2720060602&gt;3.0.co;2-r</a>	17	USA
Grashuis	2020	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12260">https://doi.org/10.1111/apce.12260</a>	15	USA
Grashuis	2019	Agribusiness	<a href="https://doi.org/10.1002/agr.21574">https://doi.org/10.1002/agr.21574</a>	15	USA
Singh <i>et al.</i>	2019	Journal of Business Economics and Management	<a href="https://doi.org/10.3846/jbem.2019.9858">https://doi.org/10.3846/jbem.2019.9858</a>	15	USA
Bijman <i>et al.</i>	2014	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12055">https://doi.org/10.1111/apce.12055</a>	15	Europe
Ortiz-Miranda <i>et al.</i>	2010	Environment and Planning	<a href="https://doi.org/10.1068/a42168">https://doi.org/10.1068/a42168</a>	15	Spain
Guzman and Arcas	2008	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/j.1467-8292.2007.00354.x">https://doi.org/10.1111/j.1467-8292.2007.00354.x</a>	15	Spain
van der Krogt <i>et al.</i>	2007	Agribusiness	<a href="https://doi.org/10.1002/agr.20140">https://doi.org/10.1002/agr.20140</a>	15	Europe
Brandano <i>et al.</i>	2019	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12220">https://doi.org/10.1111/apce.12220</a>	14	Italy
Grashuis and Jasper	2017	Journal of Cooperative Organization and Management	<a href="https://doi.org/10.1016/j.jcom.2017.09.002">https://doi.org/10.1016/j.jcom.2017.09.002</a>	14	USA
Campos-Climent <i>et al.</i>	2012	Management Decision	<a href="https://doi.org/10.1108/00251741211247003">https://doi.org/10.1108/00251741211247003</a>	14	Spain
Hansen, Morrow and Batista	2002	International Food and Agribusiness Management Review	<a href="https://doi.org/10.1016/s1096-7508(02)00069-1">https://doi.org/10.1016/s1096-7508(02)00069-1</a>	14	USA
Sykuta and Cook	2001	American Journal of Agricultural Economics	<a href="https://doi.org/10.1111/0002-9092.00278">https://doi.org/10.1111/0002-9092.00278</a>	14	Conceptual
Melia-Marti <i>et al.</i>	2020	Sustainability	<a href="https://doi.org/10.3390/su12166575">https://doi.org/10.3390/su12166575</a>	13	Spain
Hakelius	2018	Journal of Cooperative Organization and Management	<a href="https://doi.org/10.1016/j.jcom.2018.06.001">https://doi.org/10.1016/j.jcom.2018.06.001</a>	13	Sweden
Bijman and Iliopoulos	2014	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12048">https://doi.org/10.1111/apce.12048</a>	13	Europe
Soboh <i>et al.</i>	2014	NJAS - Wageningen Journal of Life Sciences	<a href="https://doi.org/10.1016/j.njas.2014.05.003">https://doi.org/10.1016/j.njas.2014.05.003</a>	13	Europe

**Table A1.** Continued

Svendsen and Svendsen	2000	Sociologia Ruralis	<a href="https://doi.org/10.1111/1467-9523.00132">https://doi.org/10.1111/1467-9523.00132</a>	13	Denmark
Franken and Cook	2019	Sustainability	<a href="https://doi.org/10.3390/su11195321">https://doi.org/10.3390/su11195321</a>	12	USA
Ensslin <i>et al.</i>	2014	Revista De Economia E Sociologia Rural	<a href="https://doi.org/10.1590/s0103-20032014000300010">https://doi.org/10.1590/s0103-20032014000300010</a>	12	Conceptual
Guzman <i>et al.</i>	2009	Fruits	<a href="https://doi.org/10.1051/fruits/2009018">https://doi.org/10.1051/fruits/2009018</a>	12	Spain and Italy
Elliott <i>et al.</i>	2018	Sustainability	<a href="https://doi.org/10.3390/su10062048">https://doi.org/10.3390/su10062048</a>	11	USA
Marcos-Matas <i>et al.</i>	2018	International Food and Agribusiness Management Review	<a href="https://doi.org/10.22434/ifamr2016.0163">https://doi.org/10.22434/ifamr2016.0163</a>	11	Italy
Michalek <i>et al.</i>	2018	Food Policy	<a href="https://doi.org/10.1016/j.foodpol.2017.12.009">https://doi.org/10.1016/j.foodpol.2017.12.009</a>	11	Slovakia
Olilla <i>et al.</i>	2014	Agricultural and Food Science	<a href="https://doi.org/10.23986/afsci.45222">https://doi.org/10.23986/afsci.45222</a>	11	Finland
Arcas-Lario and Hernandez-Espallardo	2003	European Review of Agricultural Economics	<a href="https://doi.org/10.1093/erae/30.4.487">https://doi.org/10.1093/erae/30.4.487</a>	11	Spain
Hind	1994	Journal of Agricultural Economics	<a href="https://doi.org/10.1111/j.1477-9552.1994.tb00395.x">https://doi.org/10.1111/j.1477-9552.1994.tb00395.x</a>	11	UK
Valette <i>et al.</i>	2018	Journal of Wine Economics	<a href="https://doi.org/10.1017/jwe.2017.1">https://doi.org/10.1017/jwe.2017.1</a>	10	France
Martinez-Victoria <i>et al.</i>	2017	Spanish Journal of Agricultural Research	<a href="https://doi.org/10.5424/sjar/2017151-10270">https://doi.org/10.5424/sjar/2017151-10270</a>	10	Spain
Lajara-Camilleri and Server-Izquierdo	2017	Ciriec-España, Revista De Economia Publica, Social Y Cooperativa	<a href="https://doi.org/10.7203/ciriec-e.89.8854">https://doi.org/10.7203/ciriec-e.89.8854</a>	10	Spain
Beverland	2007	Food Policy	<a href="https://doi.org/10.1016/j.foodpol.2006.10.004">https://doi.org/10.1016/j.foodpol.2006.10.004</a>	10	New Zealand
Hendrikse and Veerman	2001	Agricultural Economics	<a href="https://doi.org/10.1016/s0169-5150(00)00122-5">https://doi.org/10.1016/s0169-5150(00)00122-5</a>	10	Conceptual
Pennerstorfer and Weiss	2013	European Review of Agricultural Economics	<a href="https://doi.org/10.1093/erae/jbs008">https://doi.org/10.1093/erae/jbs008</a>	9	Austria
Boyle	2004	Agribusiness	<a href="https://doi.org/10.1002/agr.20000">https://doi.org/10.1002/agr.20000</a>	9	Ireland
Fiore <i>et al.</i>	2020	British Food Journal	<a href="https://doi.org/10.1108/bfj-04-2019-0263">https://doi.org/10.1108/bfj-04-2019-0263</a>	8	Poland
Pokharel <i>et al.</i>	2020	Journal of Cooperative Organization and Management	<a href="https://doi.org/10.1016/j.jcom.2020.100108">https://doi.org/10.1016/j.jcom.2020.100108</a>	8	USA

**Table A1.** Continued

Apparao <i>et al.</i>	2019	Journal of Cooperative Organization and Management	<a href="https://doi.org/10.1016/j.jcom.2019.03.003">https://doi.org/10.1016/j.jcom.2019.03.003</a>	8	Conceptual
Skevas and Grahuis	2019	Agribusiness	<a href="https://doi.org/10.1002/agr.21617">https://doi.org/10.1002/agr.21617</a>	8	USA
Grashuis and Cook	2018	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12211">https://doi.org/10.1111/apce.12211</a>	8	USA
Kasabov	2015	European Urban and Regional Studies	<a href="https://doi.org/10.1177/0969776415587121">https://doi.org/10.1177/0969776415587121</a>	8	UK
Bartova and Fandel	2020	Equilibrium-Quarterly Journal of Economics and Economic Policy	<a href="https://doi.org/10.24136/eq.2020.022">https://doi.org/10.24136/eq.2020.022</a>	7	Slovakia
Cheng and Katchova	2019	International Food and Agribusiness Management Review	<a href="https://doi.org/10.22434/ifamr2018.0050">https://doi.org/10.22434/ifamr2018.0050</a>	7	USA
Martinez-Victoria <i>et al.</i>	2018	Agricultural Economics	<a href="https://doi.org/10.1111/agec.12410">https://doi.org/10.1111/agec.12410</a>	7	Spain
Melia-Marti <i>et al.</i>	2017	Revesco - Revista De Estudios Corporativos	<a href="https://doi.org/10.5209/reve.54924">https://doi.org/10.5209/reve.54924</a>	7	Spain
Hirsch and Hartmann	2014	Agricultural Economics	<a href="https://doi.org/10.1111/agec.12129">https://doi.org/10.1111/agec.12129</a>	7	Europe
Galdeano-Gomez <i>et al.</i>	2006	Journal of Agricultural Economics	<a href="https://doi.org/10.1111/j.1477-9552.2006.00061.x">https://doi.org/10.1111/j.1477-9552.2006.00061.x</a>	7	Spain
Smart <i>et al.</i>	2019	Agribusiness	<a href="https://doi.org/10.1002/agr.21609">https://doi.org/10.1002/agr.21609</a>	6	USA
Rebelo <i>et al.</i>	2017	Revesco - Revista De Estudios Corporativos	<a href="https://doi.org/10.5209/reve.53243">https://doi.org/10.5209/reve.53243</a>	6	Portugal
Grau <i>et al.</i>	2015	British Food Journal	<a href="https://doi.org/10.1108/bfj-12-2014-0399">https://doi.org/10.1108/bfj-12-2014-0399</a>	6	Germany
Melia-Marti and Martinez-Garcia	2015	Itea - Informacion Tecnica Economica Agraria	<a href="https://doi.org/10.12706/itea.2015.006">https://doi.org/10.12706/itea.2015.006</a>	6	Spain
Brusselaers <i>et al.</i>	2014	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12050">https://doi.org/10.1111/apce.12050</a>	6	Europe
Beltran Tapia	2012	European Review of Economic History	<a href="https://doi.org/10.1093/ereh/hes014">https://doi.org/10.1093/ereh/hes014</a>	6	Spain
Cross <i>et al.</i>	2009	European Review of Agricultural Economics	<a href="https://doi.org/10.1093/erae/jbp027">https://doi.org/10.1093/erae/jbp027</a>	6	USA

**Table A1.** Continued

Trechter	1996	Agribusiness	<a href="https://doi.org/10.1002/(sici)1520-6297(199607/08)12:4&lt;385::aid-agr8&gt;3.0.co;2-v">https://doi.org/10.1002/(sici)1520-6297(199607/08)12:4&lt;385::aid-agr8&gt;3.0.co;2-v</a>	6	USA
Ajates	2020	Organization	<a href="https://doi.org/10.1177/1350508419888900">https://doi.org/10.1177/1350508419888900</a>	5	UK/Spain
Ferrer <i>et al.</i>	2019	Journal of Wine Economics	<a href="https://doi.org/10.1017/jwe.2019.36">https://doi.org/10.1017/jwe.2019.36</a>	5	Spain
Pokharel and Featherstone	2019	Agricultural Economics	<a href="https://doi.org/10.1111/agec.12483">https://doi.org/10.1111/agec.12483</a>	5	USA
Figuereido and Franco	2018	Land Use Policy	<a href="https://doi.org/10.1016/j.landusepol.2018.09.022">https://doi.org/10.1016/j.landusepol.2018.09.022</a>	5	Portugal
Grashuis and Magnier	2018	Agribusiness	<a href="https://doi.org/10.1002/agr.21551">https://doi.org/10.1002/agr.21551</a>	5	USA
Baourakis <i>et al.</i>	2002	Agribusiness	<a href="https://doi.org/10.1002/agr.10031">https://doi.org/10.1002/agr.10031</a>	5	Greece
Lucas-Martinez <i>et al.</i>	2020	Outlook On Agriculture	<a href="https://doi.org/10.1177/0030727020907334">https://doi.org/10.1177/0030727020907334</a>	4	Spain
Colom Gorgues <i>et al.</i>	2019	Revesco - Revista De Estudios Corporativos	<a href="https://doi.org/10.5209/reve.62811">https://doi.org/10.5209/reve.62811</a>	4	Europe
Fusco and Miglaccio	2018	Euromed Journal of Business	<a href="https://doi.org/10.1108/emjb-02-2016-0002">https://doi.org/10.1108/emjb-02-2016-0002</a>	4	Italy
van Peurseem <i>et al.</i>	2016	Journal of Accounting and Organizational Change	<a href="https://doi.org/10.1108/jaoc-03-2013-0022">https://doi.org/10.1108/jaoc-03-2013-0022</a>	4	New Zealand/Australia
Boone and Ozcan	2014	The Academy of Management Journal	<a href="https://doi.org/10.5465/amj.2012.0194">https://doi.org/10.5465/amj.2012.0194</a>	4	USA
Baranchenko and Oglethorpe	2012	Business Strategy and The Environment	<a href="https://doi.org/10.1002/bse.733">https://doi.org/10.1002/bse.733</a>	4	UK
King <i>et al.</i>	2010	American Journal of Agricultural Economics	<a href="https://doi.org/10.1093/ajae/aaq009">https://doi.org/10.1093/ajae/aaq009</a>	4	World
Melia <i>et al.</i>	2010	Spanish Journal of Agricultural Research	<a href="https://doi.org/10.5424/sjar/2010082-1185">https://doi.org/10.5424/sjar/2010082-1185</a>	4	Spain
Russo <i>et al.</i>	2000	International Food and Agribusiness Management Review	<a href="https://doi.org/10.1016/s1096-7508(00)00025-2">https://doi.org/10.1016/s1096-7508(00)00025-2</a>	4	Italy
Barton <i>et al.</i>	1993	Agribusiness	<a href="https://doi.org/10.1002/1520-6297(199305)9:3&lt;281::aid-agr2720090308&gt;3.0.co;2-x">https://doi.org/10.1002/1520-6297(199305)9:3&lt;281::aid-agr2720090308&gt;3.0.co;2-x</a>	4	USA
Caves and Petersen	1986	American Journal of Agricultural Economics	<a href="https://doi.org/10.2307/1241422">https://doi.org/10.2307/1241422</a>	4	USA
Castilla-Polo <i>et al.</i>	2018	Journal of Cleaner Production	<a href="https://doi.org/10.1016/j.jclepro.2018.05.210">https://doi.org/10.1016/j.jclepro.2018.05.210</a>	3	Spain

**Table A1.** Continued

Claver <i>et al.</i>	2018	Journal of Environmental Management	<a href="https://doi.org/10.1016/j.jenvman.2006.09.012">https://doi.org/10.1016/j.jenvman.2006.09.012</a>	3	Spain
Marcos-Matas <i>et al.</i>	2013	Outlook On Agriculture	<a href="https://doi.org/10.5367/oa.2013.0123">https://doi.org/10.5367/oa.2013.0123</a>	3	Spain
Hailu <i>et al.</i>	2007	Agricultural Finance Review	<a href="https://doi.org/10.1108/00214660780001209">https://doi.org/10.1108/00214660780001209</a>	3	Canada
Rebelo <i>et al.</i>	2002	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/1467-8292.00188">https://doi.org/10.1111/1467-8292.00188</a>	3	Portugal
Deng and Hendrikse	208	Small Business Economics	<a href="https://doi.org/10.1007/s11187-017-9893-3">https://doi.org/10.1007/s11187-017-9893-3</a>	3	Conceptual
Borsellino <i>et al.</i>	2020	International Journal of Wine Business Research	<a href="https://doi.org/10.1108/ijwbr-10-2018-0062">https://doi.org/10.1108/ijwbr-10-2018-0062</a>	2	Italy
Gallego-Bono and Chaves-Avila	2020	Economic Research-Ekonomska Istrazivanja	<a href="https://doi.org/10.1080/1331677x.2019.1696694">https://doi.org/10.1080/1331677x.2019.1696694</a>	2	Spain
Frick	2017	Journal of Wine Economics	<a href="https://doi.org/10.1017/jwe.2017.33">https://doi.org/10.1017/jwe.2017.33</a>	2	Europe
Castilla-Polo and Gallardo-Vazquez	2016	Itea - Informacion Tecnica Economica Agraria	<a href="https://doi.org/10.12706/itea.2016.013">https://doi.org/10.12706/itea.2016.013</a>	2	Spain
Campos-Climent and Sanchez-Palacio	2015	Journal of Business Research	<a href="https://doi.org/10.1016/j.jbusres.2015.01.056">https://doi.org/10.1016/j.jbusres.2015.01.056</a>	2	Spain
Bardsley and Bardsley	2014	Ecological Economics	<a href="https://doi.org/10.1016/j.ecolecon.2013.12.004">https://doi.org/10.1016/j.ecolecon.2013.12.004</a>	2	Switzerland
Hohler and Kuhl	2014	Annals of Public and Cooperative Economics	<a href="https://doi.org/10.1111/apce.12052">https://doi.org/10.1111/apce.12052</a>	2	Europe
Galdeano-Gomez	2008	Applied Economics	<a href="https://doi.org/10.1080/00036840600905266">https://doi.org/10.1080/00036840600905266</a>	2	Spain
Galdeano-Gomez	2006	Spanish Journal of Agricultural Research	<a href="https://doi.org/10.5424/sjar/2006043-194">https://doi.org/10.5424/sjar/2006043-194</a>	2	Spain
Cross and Buccola	2004	American Journal of Agricultural Economics	<a href="https://doi.org/10.1111/j.0002-9092.2004.00674.x">https://doi.org/10.1111/j.0002-9092.2004.00674.x</a>	2	Conceptual
Mauget and Declerck	1996	Agribusiness	<a href="https://doi.org/10.1002/(sici)1520-6297(199605/06)12:3&lt;265::aid-agr6&gt;3.0.co;2-z">https://doi.org/10.1002/(sici)1520-6297(199605/06)12:3&lt;265::aid-agr6&gt;3.0.co;2-z</a>	2	Europe
Misra <i>et al.</i>	1993	Agribusiness	<a href="https://doi.org/10.1002/1520-6297(199307)9:4&lt;351::aid-agr2720090406&gt;3.0.co;2-4">https://doi.org/10.1002/1520-6297(199307)9:4&lt;351::aid-agr2720090406&gt;3.0.co;2-4</a>	2	USA
Venieris	1989	European Review of Agricultural Economics	<a href="https://doi.org/10.1093/erae/16.1.129">https://doi.org/10.1093/erae/16.1.129</a>	2	Greece

**Table A1.** Continued

VanSickle and Ladd	1983	American Journal of Agricultural Economics	<a href="https://doi.org/10.2307/1240873">https://doi.org/10.2307/1240873</a>	2	Conceptual
Castillo-Valero <i>et al.</i>	2015	Revesco - Revista De Estudios Corporativos	<a href="https://doi.org/10.12706/itea.2015.012">https://doi.org/10.12706/itea.2015.012</a>	1	Spain
Coren and Clamp	2014	Journal of Cooperative Organization and Management	<a href="https://doi.org/10.1108/00021461211277222">https://doi.org/10.1108/00021461211277222</a>	1	USA
Lajara-Camilleri and Mateos-Ronco	2012	Economia Agraria Y Recursos Naturales	<a href="https://doi.org/10.7201/earn.2012.02.04">https://doi.org/10.7201/earn.2012.02.04</a>	1	Spain
Hardesty and Salgia	2007	California Agriculture	<a href="https://doi.org/10.3733/ca.v061n04p172">https://doi.org/10.3733/ca.v061n04p172</a>	1	USA

**Table A2.** List of all performance measures used to evaluate agricultural cooperative performance

Performance measure	Usage frequency
Liquidity (current ratio/acid ratio, cashflow)	19
Return on assets	17
Self-evaluation (membership satisfaction)	17
Technical scale and allocative efficiency	14
Membership of voluntary coops (members' involvement, commitment, loyalty)	14
Premium price/cost of members' supply, return on patronage	13
Assets turnover ratio (different types of assets)	12
Marginal profitability of capital (ROE)	10
Operating profit margin	10
Capital structure (short-term debt, long-term debt)	10
Market share (access)	10
Social capital (bonding and bridging, trust)	10
Debt to asset ratio	9
Profitability ratios	8
Survival analysis	8
Debt to equity ratio	6
Productivity growth (growth rate)	6
Turnover per member	6
Environmental performance (implementation of ecological agriculture)	5
Inventory turnover ratio	4
Total revenue	4
Safety margin (degree of operating leverages)	4
Cost of capital	3
Farm gross value added	3
Price-behaviour	3
Net income	2
Solvency	2
Variable costs ratio	2

**Table A2.** Continued

Net sales	2
Brand equity (stocks of trademarks)	2
Malmquist total factor productivity (no environmental input)	2
Malmquist total factor productivity (including environmental input)	2
Local development	2
Quality	2
Socializing accountability, social responsibility	2
Variance of profitability ratios	1
Farm profits	1
Value added over turnover	1
Export intensity	1
Side selling	1
Market orientation	1
Earnings retention	1
Equity redemption	1
Dividends	1
Contracting efficiency	1
GHG emissions	1
Organic sales	1
Community services	1
Job's creation	1
Inclusion	1
SWOT	1
Cooperation among cooperatives	1
Model (Quinn and Rorbaugh)	1

