

## Article

# Is Sustainability Reporting Promoting a Circular Economy? Analysis of Companies' Sustainability Reports in the Agri-Food Sector in the Scope of Corporate Sustainability Reporting Directive and EU Taxonomy Regulation

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**Abstract:** Circular economy has the potential to contribute significantly to sustainable development. Despite its popularity, implementation in Europe is still low. Through more stringent sustainability reporting, the circular economy should be increasingly implemented by companies, which is currently pursued by the EU through two new legal acts. Therefore, we need a more integrated understanding of existing practices of corporate sustainability reporting to identify weak points and possibilities for further improvement. This article aims to (i) investigate whether companies in the agri-food sector have reported on the circular economy so far, (ii) to what extent future legal obligations are already being met, and (iii) if the two new EU legal acts hold significance for the promotion of circular economy through corporate reporting. To assess the current reporting practices, a qualitative content analysis and a mapping approach of 20 selected sustainability reports from key players in the agri-food sector have been conducted. Additionally, seven semi-structured expert interviews were carried out to review the future role of the legal acts. Results show that reporting in the agri-food sector on circular economy has increased considerably as of 2016, but it is still lacking in terms of the two new legal acts. Although the Global Reporting Initiative (GRI) can be seen as a good basis for reporting, there is a large number of new obligations, which means that companies should start preparing at an early stage. This is especially true for those agri-food companies that have not yet been subjected to any reporting obligations. Experts have agreed with this view, considering the legal acts as an important vehicle for promoting the concept. However, they also recognize the weaknesses, such as the existing scope for interpretation, which still need to be addressed before the final publication of the standard and the technical criteria. Future research should analyze the final commitments of the reports (including for small and medium-sized companies), compare them with established reporting standards, seek expert opinions on them, and quantitatively examine sustainability reports in this and other industries.



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## 1. Introduction

Corporate reporting on non-financial activities has increased significantly in recent years [1]. Many companies also report on their contribution to the circular economy in their sustainability reports, as the concept is perceived as increasingly important [2]. The circular economy also plays a major role in the agri-food sector [3]. To date, however, there are few studies that address how companies report on their transition to a circular economy. Gunarathne et al. [4] have already investigated how the circular economy is communicated in selected companies in Sri Lanka by analyzing the number of selected keywords. However, how this has been done by agri-food companies so far is not known.

According to Poponi et al. [3], the use of indicators to monitor progress is a key element in moving to a circular model. In their analysis, they identified 102 relevant circular economy indicators for the agri-food sector. It is unclear to what extent these indicators are already part of corporate reporting. According to the findings of Topp-Becker and Ellis [5] sustainability reporting by companies in the agri-food supply chain has been limited. The lack of consistent and coherent quality information makes it difficult for potential funders and investors to assess the impact of projects and companies in relation to the circular economy [6].

Although the concept of a circular economy has received strong support from many stakeholders, the concept behind it remains unspecific and not uniformly defined. A literature review of 114 journal articles by Dewick et al. [6] (2020) shows that a total of 95 different definitions of the term circular economy exist. According to Raes [7], there are even 114 different definitions. After analyzing 114 definitions, Kirchherr et al. [8] find that the definitions show few specific connections between the circular economy concept and sustainable development. Ünal and Shao [9] highlight the disparity between the theory of circular economy and real-world application. To date, there has also been no specific focus on circular economy in established reporting standards, such as the Global Reporting Initiative (GRI), which is the most widely used horizontal reporting framework. Furthermore, approaches to reporting have been very generic and inconsistent [1].

The circular economy forms one of the most important parts of the two new EU legal acts. In relation to the CSRD, there is a separate reporting standard called ESRS E5, which refers to the circular economy. The circular economy is also found as one of the six environmental objectives in the Taxonomy Regulation, which means that financial aspects related to the transition to a circular economy must also be reported. The final standard and technical criteria are expected by summer 2023.

Therefore, the aim of this article is to (i) investigate whether companies in the agri-food sector have reported on the circular economy so far, (ii) to what extent future obligations are already being met, and (iii) if the significance of the two new EU legal acts for corporate reporting can be determined, or in particular if their importance for the promotion of circular economy can be analyzed. In this way, weak points can be identified, if necessary, and possibilities for improvement can be pointed out. Since there is currently very little scientific research on the matter, this study aims to be seen as a stepping stone for further research. A qualitative approach was followed to examine general trends in the current reporting practices [10]. More comprehensive insights into sustainability reporting and circular economy need to be obtained once the final directive is released, more companies are obliged to report according to the CSRD and ESRS E5, and therefore a broader basis for research has been established.

The remainder of this article is structured as follows: in the next section, we will present definitions and a short literature review, followed by the material and methods, the results, and finally the discussion section. The following section contains a brief review of the relevant literature used for this work. Materials and methods contain an explanation of how the data were collected for the analysis of the sustainability reports and the expert interviews, and how the respective data were analyzed. In the results section, the collected data are presented and analyzed. The discussion is dedicated to the critical interpretation of the results, and comparing them with the existing literature. Finally, in the conclusion of the paper, we provide an outlook on future research and implications.

## 2. Literature Review

### 2.1. Circular Economy

The concept of circular economy is not new and its origins have been discussed and debated many times [6,8]. Most often, a circular economy is presented with waste and resource management activities that aim to decouple economic development from the consumption of finite resources through the introduction of closed resource loops [1]. According to Gallo et al. [11], a circular economy should aim to create cycles so that the

value of materials and energy remains within production and consumption systems for as long as possible [12]. Implementing the circular economy at the organizational level requires the use of business models as a key lever [13]. It is often argued that this narrow conception of a circular economy is not purposeful because it lacks systematic approaches that enable companies to transition to circular business models [1]. It can be argued that the divergent definitions and different approaches towards circularity are even blurring its theoretical lines, making it less practical and feasible [14]. To identify practices and systemic changes that are truly sustainable and circular, it is essential to have quick assessment tools that consider a whole system perspective [12,15]. Therefore, a definition of unison needs to be introduced.

On the part of the European Commission, the definition of a circular economy in the action plan for the promotion of circular economy is as follows: “A circular economy aims to maintain the value of products, materials and resources for as long as possible by returning them into the product cycle at the end of their use, while minimizing the generation of waste” [16]. The European Financial Reporting Advisory Group (EFRAG) defines circular economy comparatively similarly as follows: “Economic system that uses a systemic approach to maintain a circular flow of re-sources, by regenerating, retaining or adding to their value, while contributing to sustainable development” [17]. The combination of the two definitions forms the working definition of this article.

Overall, 82 million tons of finite resources were extracted per year globally, 33% of edible food was thrown away, and 98% of materials were not kept in a closed loop [18]. Almost every industry has the opportunity to transform business models into circular models, with different potentials attributed to each sector. Food and agriculture, among others, are considered to have a particularly high growth potential [16]. A similar picture emerges from a survey by the United Nations Environmental Programme (UNEP), which indicates that more than 30% of the financial sector sees the greatest potential, among others, in food and agriculture [7]. Agri-food companies play a crucial role in the circular economy concept, as their value chain has many aspects that can be invested in to make production more sustainable [3,19]. In principle, the transition of agricultural supply chains to a circular economy can contribute to the achievement of the Sustainable Development Goals (SDGs) 2, 8, 12 and 15. It can serve to improve food security and reduce hunger, especially in rural areas, while creating income opportunities for producers and small rural enterprises [20]. Thus, the agri-food sector is seen as one of the key sectors for a transition to sustainable development.

## 2.2. Sustainability and Sustainability Reporting

Sustainability implies different meanings, which is why there is no clear differentiation. In this article, the same understanding as in Winkler and Duscha [21] is assumed, which is as follows:

- Ecological aspects: Sustainable management of the natural system by preventing climate change, air and water pollution, resource depletion and biodiversity loss.
- Social aspects: Interaction between people, the reduction in inequality, the promotion of fair working conditions and investment in current/future generations.
- Economic aspects: Economic systems that meet current needs without compromising those of future generations, with a special focus on financial market stability.

Companies consider their impact on a wide range of sustainability issues in the course of sustainability reporting. This is mainly based on transparent risk and opportunity analyses. Relying on this, a sustainability report discloses a company’s economic, environmental and social impacts, as well as the organization’s values and governance model [22]. Sustainability reporting, therefore, has two general purposes as follows: “to assess the current state of an organization’s economic, environmental and social dimensions, and to communicate an organization’s efforts and sustainability progress to their stakeholders” [23]. Therefore, a sustainability report is often designated as an internal and external accountability and control instrument [24].

Tiscini et al. [25] argue that adopting an integrated reporting approach that incorporates social, environmental and economic information can enhance the accuracy and reliability of information related to sustainability. Despite increasing numbers of sustainability reporting by companies and the positive aspects associated with it, there are often various concerns. These include above all the relatively large scope for interpretation, the lack of an audit requirement and the comparability of reports, even if companies use common standards [26]. In order to improve sustainability reporting, the European Commission has presented a draft for the revision of the EU directive on corporate sustainability reporting, the so-called “Corporate Sustainability Reporting Directive” (CSRD). This not only extends the reporting obligations but the number of companies is also affected [17]. The prior regulation impacted only about 7000 to 8000 companies with over 500 employees, whereas the updated CSRD now mandates reporting for all companies with 250 or more employees. Apart from the employee count criterion, companies must also exceed either a total balance sheet of 20 million euros or a turnover of 40 million euros, which equals roughly 50,000 companies [27].

### 2.3. Sustainable Financing

At present, there is neither a clear understanding nor a uniform definition of sustainable financing or sustainable green finance. In principle, investments are made not only on the basis of economic considerations but also considering ESG criteria, namely, environment, social and governance [28]. The European Commission understands sustainable finance to be essentially a financial system that places a strong focus on environmental and social concerns. Thus, in addition to promoting economic growth, it aims to simultaneously reduce pressure on the environment, greenhouse gas emissions, pollution and waste, while increasing efficiency in the use of natural resources. In addition, sustainable finance includes increasing awareness and transparency of risks that can impact the sustainability of the financial system. It also includes the management of such risks by financial and corporate actors through appropriate corporate governance [29]. Sustainable financing also plays a crucial role in the agri-food sector, which can be seen as a central component of the global and national economy. The demand for sustainable investments in the agri-food sector is increasing and can promote sustainable agricultural practices in the long run, even though this sector represents only a relatively small part of the global capital market allocation [30].

After years of conceptual discussions, the topic of sustainable finance is put on the implementation agenda and new sustainability reporting requirements have been proposed [22]. In the future, the EU Taxonomy Regulation shall be the guiding framework of criteria that provides a common understanding of which economic activities can be considered environmentally sustainable [29]. It is expected to contribute to an improvement in transparency by requiring reporting on the classification of investments [31] and reporting on the contribution to the achievement of pre-defined environmental targets [32].

## 3. Materials and Methods

### 3.1. Research Questions

1. What has been the contribution of sustainability reporting by agri-food companies in relation to the circular economy so far?
  - a. How is circular economy communicated by international agri-food companies in sustainability reports?
  - b. To what extent does this communication about circular economy differ from findings in the literature?
  - c. What differences can be identified with regard to the time course of sustainability reports of the agricultural and food sector?
2. What is the significance of the Corporate Social Responsibility Directive and EU Taxonomy Regulation for promoting a circular economy?

- a. What changes will the two legal acts bring about in terms of communication about circular economy based on GRI?
- b. Can the concept of the circular economy be promoted by changing the reporting requirements?

### 3.2. Literature Section

In the first step, a systematic literature search was conducted. The following databases were scanned for German and English academic publications: “Google Scholar”, “Science Direct” and “Research Gate”. In addition, to narrow down the search process, the most recent literature possible from the last five years (2017–2022) and the following keywords (both in German and English) were searched for: “Sustainability reporting and circular economy”, “Entrepreneurial reporting on circular economy” and “Circular economy reporting”. By analyzing the title and abstract, only those scientific papers were considered in which the content and quality of circular economy information in sustainability reports were examined.

Research question 2.a was answered by means of a literature analysis of already published drafts. In doing so, the GRI reporting standard was compared with the available draft standard on circular economy ESRS E5 of the CSRD on the one hand and the requirements by the Taxonomy Regulation on the other hand. As the two legal acts are currently still under development (with a final version expected at the end of June 2023), this article works with drafts and working documents published in Q1–Q2 2022. Figure A1 provides an overview of all elements of the literature review and analysis.

### 3.3. Empirical Part: Analysis of Sustainability Reports

In total, five different companies (Arla Foods, Agrana, Associated British Foods, Nestle and Cargill) and their sustainability reports from four different years were selected, including the report from the first and the most recent reporting year and two reports within these publications (see Table A1 in Appendix A). Thus, a total of 20 sustainability reports were examined. The selection of agri-food companies was based on a mix of different countries, products and company sizes, as well as sustainability reporting in English for at least four years. In order to ensure comparability, we ensured that these reports were not prepared by the same sustainability consulting firm.

The reports were searched in the so-called “Corporate Register database”, which is the largest online database for sustainability reports. Stewart and Niero [2] also used this database in a similar context and analysis of 20 sustainability reports.

Since the concept of the circular economy does not have a uniform definition, the same method of a search strategy as in Gunarathne et al. [4] was used to answer question 1.a. Here, direct, explicit, implicit as well as other keywords were defined and counted in relevant passages of sustainability reports, with a statement about the company’s commitment to the circular economy. The keywords of Gunarathne et al. [4] were adopted for the analysis and supplemented by additional keywords resulting from answering question 2.a. Table A2 (Appendix A) shows which keywords were used.

To answer question 1.a, a content analysis and a mapping approach were applied, which can also be found in the analysis of Stewart and Niero [2]. The content analysis aims to investigate how companies link circular economy with sustainability. In the first step, all passages in which companies explicitly refer to a circular economy are collected and stored as units of record. In the second step, a deductive approach is used to investigate the relationship between sustainability and circular economy (conditional, advantageous and trade-off). The description of coding as conditional, advantageous and trade-off can be found in Table A3 (Appendix A). Additionally, as the use of indicators is seen as a key element in moving companies towards a circular economy, it will also be inductively determined, as in Stewart and Niero [2], for each sustainability report whether sustainability indicators related to a circular economy are reported. Based on the importance of the preliminary drafts of the CSRD and Taxonomy Regulation, it will additionally be analyzed

whether companies report on targets, impacts, opportunities and risks related to the circular economy.

The mapping approach will be used to examine the nature of communicated collaboration in relation to a circular economy. Categories, as in Stewart and Niero [2], include the following: Research/innovation/technology development project; local recycling system support; working group/forum/dialogue; systems for the circulation of goods; partnership with remanufacturer; campaign/education.

Through the above analysis, it is possible to estimate how great the contribution of companies in the agricultural and food sector has been to the circular economy so far. The comparison of results and analysis of different points in time serves to answer questions 1.b and 1.c. The collected data are composed in an Excel spreadsheet, as in Stewart and Niero [2], and then analyzed, as in Gunarathne et al. [4] and Stewart and Niero [2].

### *3.4. Empirical Part: Interviews with Experts*

In addition, seven semi-structured expert interviews (videoconference/in-person) with sustainability consultants of different-sized companies (see Table A4 in Appendix A) were conducted to assess the importance of the two legal acts in promoting a circular economy. The number of interviews was dependent on theoretical saturation. In the selection of experts, attention was paid to the fact that the consultancies already supported the implementation of sustainability reports according to established standards and had knowledge of sustainable finance as well as knowledge of both new legal acts. The interview guideline was based on the drafts at the time of the interviews in Q2 2022.

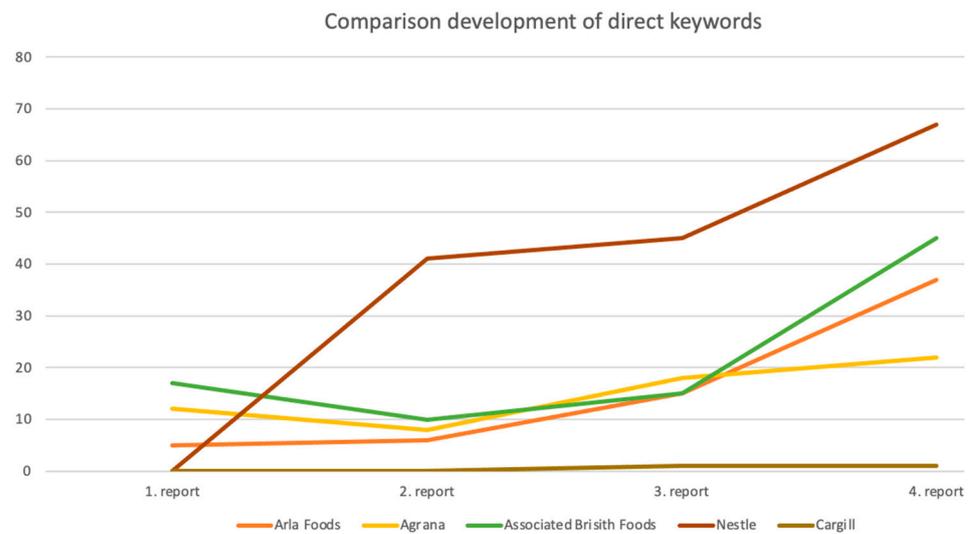
The interviews were transcribed and analyzed using qualitative content analysis according to Mayring and Fenzl [33] in MAXQDA. Specifically, the procedure of a summary and inductive category development was chosen. Based on the analysis of the expert interviews, research question 2.b, and thus question 2 was finally answered, which can be found in the following section.

## **4. Results**

### *4.1. Analysis of Sustainability Reports—Communication on Circular Economy in Sustainability Reports*

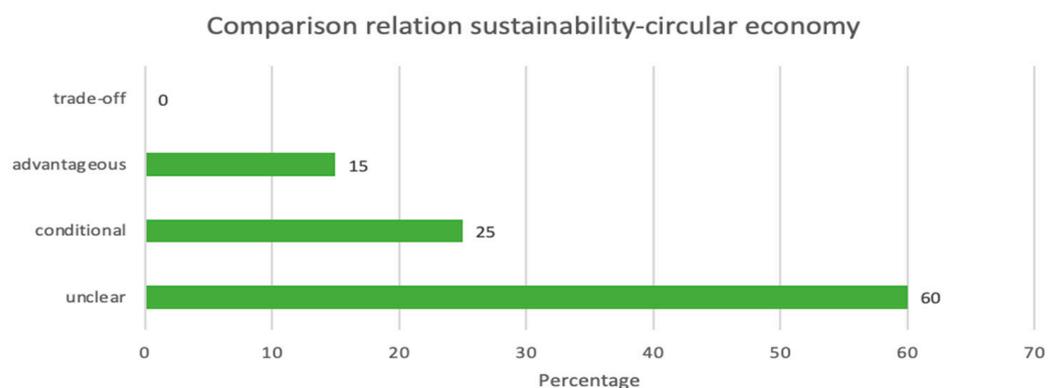
The evaluation shows that the analyzed companies increasingly deal with the circular economy over time. As Figure 1 illustrates, the direct keywords increase sharply for four out of five companies over the number of reports. It is particularly striking that terms such as “circular economy” are present in four out of five companies from the third report analyzed. This suggests that companies need a certain period of time before they also report specifically on circular economy, or that the thematization of circular economy has only begun since the mid-2010s. The result is also consistent with that of Stewart and Niero [2], who state that the use of the term “circular economy” increased sharply from 2016/2017, which also roughly corresponds to the selected third reporting year of the companies. This trend can also be attributed to the increased political addressing of the circular economy in these years [34]. However, the result also shows that there are still many large agri-food companies that have not yet directly addressed circular economy in the course of reporting.

Looking at the most frequent keywords, it is noticeable that a large part of the keywords originates from the content analysis of Gunarathne et al. [4], which means that only a small part of the keywords (raw material, life cycle and by-product/co-product) is related to the CSRD and Taxonomy Regulation. Based on this analysis, it could be concluded that only a small part of the CSRD and Taxonomy Regulation reporting content has been addressed so far. However, the additional analysis of indicators, targets, impacts, opportunities, risks and cooperations shows that three out of five companies (Arla Foods, Associated British Foods and Nestle) have already established a good basis for future reporting obligations.



**Figure 1.** Comparison of the development of direct keywords.

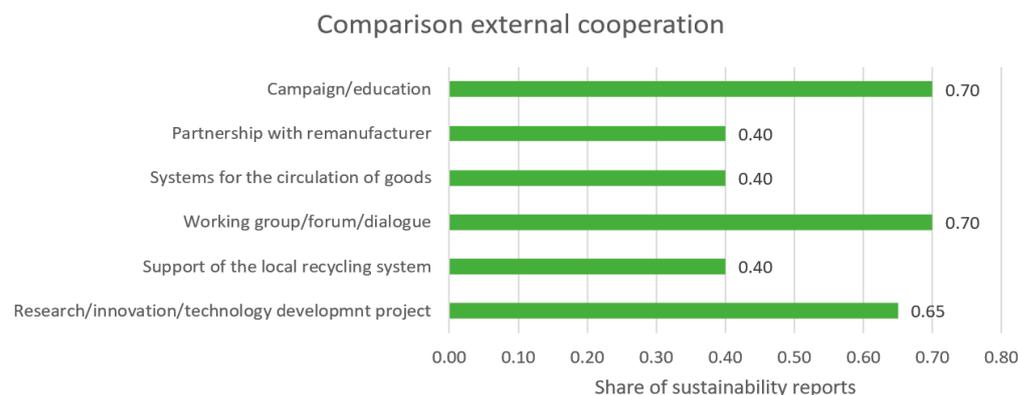
As the deductive categorization in Figure 2 shows, the link between circular economy and sustainability is mostly “unclear” in the reports analyzed, as in those by Stewart and Niero [2]. This follows the general trend in practice and suggests that companies assume that the circular economy has an inherent contribution to the sustainability agenda [2]. The link is “advantageous” in 15% of the reports and “conditional” in 25% of the reports, with the positioning of the company emerging over time. Thus, the relationship is “unclear” in all the companies in the first two years of the reports analyzed, remaining in one of the five companies (Cargill). For two of the remaining four companies, the relationship evolved from “advantageous” to “conditional”, such as Arla Foods [35], which reports “Towards a circular business,” with the following rationale: “to make a positive contribution to a more sustainable future.” In 2021, the ambition was “Towards fully circular packaging 2030” to achieve sustainability of packaging products “to take dairy packaging into a sustainable future” [36], thus making it “conditional”. As with Stewart and Niero [2], no company reports a trade-off relationship between sustainability and circular economy, thus assuming that circular economy inherently contributes to the sustainability agenda. According to Stewart and Niero [2], companies may well be aware of the trade-offs, but they fail to communicate them because the report is aimed at a non-technical audience.



**Figure 2.** Comparison of the relationship between sustainability and circular economy.

As for the mapping approach, four of the five companies analyzed reports on external collaborations in the context of circular economy in their sustainability reports. As with Stewart and Niero [2], the most common types of collaboration include working groups/forums/dialogues and research/innovation/technology development projects

(see Figure 3). Differences compared to the findings of Stewart and Niero [2] arise in relation to the occurrence of campaigns/education, as these are only found in under 10% of sustainability reports in the Stewart and Niero [2] reports analyzed, whereas they are cited in 70% of the reports in this analysis. Working groups/forums/dialogues show that companies have initiated or started an active dialogue with, e.g., peers to explore the role of circular economy in company-specific business [2]. Associated British Foods [37], for example, cites a number of “Packaging Community of Excellence forums”. Nestle [38], by comparison, is part of the Consumer Goods Forum’s Plastic Waste Coalition for Action, “in order to drive progress in packaging design and development toward a circular model”.



**Figure 3.** Comparison of external collaborations.

Collaborations in the area of research/innovation/technology development show that several companies already have concrete projects to implement circular economy principles in technologies and products, together with relevant stakeholders, such as innovation consultants and knowledge partners. For example, Arla Foods [36] has collaborated with AIM (European Brands Association) “to pioneer digital watermarks for smart packaging recycling in the EU.” Agrana [39] also states the following: “Tailor-made solutions for new applications in food packaging were developed in close cooperation with external partners”. As can be seen from these examples, the central issue is often the further development of packaging and its recycling. As in Stewart and Niero [2], the focus is often not on consumer-based research but on technological innovations. Exceptions include Nestle [38]; for example, the company states the following: “To increase the adoption of consumer recycling, people need easy ways to dispose of their recyclable household materials. To this end, we have joined with Jacobs Douwe Egberts to create Podback, a first-of-its-kind coffee pod re-cycling system in the UK”.

Partnerships with remanufacturers and commodity loop systems can be directly linked to circular business model strategies, namely, the extension of resource value and product life. Basic examples include joint ventures with recyclers or collaborations with secondary raw material suppliers, as well as collaborations with retailers or charities. For such circular business model strategies to be successful, more collaboration with external stakeholders is needed [2]. An example of the analysis is Associated British Foods [37], which is collaborating with FareShare, a national network of non-profit food distributors in the UK, among others, or Arla Foods [36], which is working with authorities to secure collection and recycling and, on the other hand, collaborating with suppliers and start-ups to develop future solutions for local recycling schemes.

Since, on the one hand, there are still agricultural and food companies that, despite the reporting obligation, address circular economy only to a small extent or not at all, and, on the other hand, there are many companies that have not yet been obliged to report, there will be an enormous additional reporting burden for a large number of companies in the future as a result of the CSRD and Taxonomy Regulation. It should also be emphasized that even those companies that already report on circular economy to a large extent do not fully comply with the future reporting obligations. Thus, even large corporations such

as Nestle will face further reporting obligations regarding the circular economy in the future. As Topp-Becker and Ellis [5] and Hřebíček et al. [23] indicate, agribusiness and food companies do not show strongly developed reporting. This can be denied with respect to the selected companies, but since small to medium-sized agri-food companies have hardly published sustainability reports so far, this can be agreed upon in principle. In summary, the contribution of large agri-food companies to the circular economy has increased over time (2007–2021), but the level of ambition varies between companies. Future reporting requirements are also not yet met by large agri-food companies.

#### 4.2. Changes in Communication about Circular Economy Due to CSRD and Taxonomy Regulation

In a comparison between the CSRD and the GRI, there are additional reporting requirements, particularly with regard to qualitative information. In the case of information on policies, targets and action plans relating to circular economy, the requirements go beyond those of the GRI. In the future, ESRS E5 will require, among other things, a special focus on policies for decoupling resource consumption/regeneration, as well as the inclusion of the geographical scope and stakeholder involvement in objectives and action plans. With regard to the quantitative information, there is a great overlap between GRI 301 and GRI 306, as GRI served as an inspiration for the development of the standard. Nevertheless, there are some differences and additional indicators, such as “total weight (tonnes) and percentage of materials designed along circular principles”. Additionally, there is new information on financial effects. According to the current state of development, the reporting requirements on a circular economy will thus be greatly expanded in the future.

The Taxonomy Regulation also imposes additional reporting requirements. Among other things, it must be reported which economic activities of the company can be considered taxonomy-compliant and why. With regard to the identified economic activities, on the one hand, qualitative information must be provided to demonstrate that the economic activity is to be considered taxonomy-compliant, and on the other hand, the following quantitative information must be provided:

- Sales: Proportion of sales contributing to the environmental goal of a circular economy.
- CapEx: Proportion of investments that contribute to the environmental goal of a circular economy.
- OpEx: Share of operating expenses that contribute to the environmental goal of circular economy.

Required disclosures are also referenced in ESRS E5, illustrating the connectivity between the two legal acts.

#### 4.3. Expert Interviews—Reporting Requirements and the Promotion of Circular Economy

In principle, the experts (see Table A4 in Appendix A) agree that reporting on the circular economy can help to promote the concept. The main reason given is the engagement with the topic and the promotion of awareness, which is seen as an essential first step. However, according to the experts, it does not automatically mean that enough is implemented in practice. In several interviews, however, it is stated that reporting is probably not sufficient and that additional obligations are needed.

This picture is also reflected with regard to the two legal acts. Basically, all experts agree that the CSRD and the Taxonomy Regulation can make a positive contribution to the promotion of the concept, although certain uncertainties are mentioned due to non-final standards and technical criteria. Furthermore, it is mentioned that the promotion of circular economy is strongly dependent on the industry and a general statement is therefore difficult. It is also emphasized again that there is no guarantee for a concrete implementation in practice and, therefore, further obligations, such as a design guideline, are needed. In addition, two experts believe that the legal acts are still in the early stages and will probably not have such strong leverage at the moment, which means that additional revisions will be needed in the future. The Taxonomy Regulation is seen as having a comparatively greater potential to promote a circular economy than the CSRD, as there is greater leverage

via the financial market. Two experts attribute a greater potential to the CSRD, as it covers all business sectors and activities, while the taxonomy is only applicable to selected economic activities. Two experts also point out that both legal acts are needed because they complement each other. The reason given for this is that the CSRD is very broad and sector-agnostic, while the Taxonomy Regulation is more specific and sector-dependent.

With regard to the implementation on the company side, a possible difference between different companies is identified. On the one hand, experts state that companies will implement the legal acts with a different level of ambition and that there will be two groups of companies as a result, those with a high level of ambition and those with a low level. Furthermore, the experts distinguish between smaller companies and corporate groups. Some experts state that corporations already have a far-reaching idea of circular economy and that the implementation of the legal acts will not be a big problem in practice. In most cases, smaller companies have not yet had to deal with this issue and often lack the necessary human resources. Basically, it is also pointed out that companies that have already reported according to GRI will have a low-effort experience in implementing the CSRD, as some of the indicators can also be found in the currently published draft of the CSRD [17]. Furthermore, all experts agree that companies that have already implemented the two legal acts more than required will not reduce their ambition level as a result.

In summary, mandatory reporting, and in particular the two legal acts, is seen as an essential first step towards the promotion of a circular economy and implementation on the corporate side. The main reason for this is the increase in awareness of the topic, including the expanded scope of application, the measurability and, specifically for the Taxonomy Regulation, the aspect of financing. In general, the topic of circular economy will increase, although the experts believe that circular economy will nevertheless remain a marginal issue and that the topic of climate will be given priority. This assessment agrees with the results of the report analysis (Agrana and Cargill).

The experts attribute a large number of strengths to the two legal acts. These include the promotion of measurability, reduction in the risk of greenwashing, increase in comparability, the inclusion of the entire value chain, and strictness and introduction of an audit requirement. With respect to the Taxonomy Regulation, the introduction of clear criteria and thresholds and the inclusion of the financial market are also cited as strengths. The experts also identified a variety of other strengths concerning the CSRD. These include the broad impact and irreversibility already mentioned, as well as the introduction of a separate standard for the circular economy, which increases overall transparency, comparability, completeness and reliability. Weaknesses identified for both legal acts are the possibility of different levels of stringency by auditors, the triggering of global supply chain problems, the existing scope for interpretation and, above all, the high level of effort required from companies. As both legal acts are still under development, the danger of losing important standard requirements as well as the number of economic activities is cited due to the strong lobbying. In both cases, it is also stated that certain information is subject to strong interpretation and discrepancies, with which companies will pursue a different view and even conscientiousness. Specifically, for the CSRD, three experts also mention that comparability is partly not given due to the abundance of standards and the possibility of not reporting specific disclosures.

The majority of the experts mention the education of companies in this area as well as the concrete answering of open questions that exist on the part of the companies as essential suggestions for improvement. In addition, clearer definitions and communication by the EU as well as interpretations by industry representatives are cited by the experts as suggestions for improvement. With regard to the CSRD, the provision of working support (e.g., workshops) and guidance, similar to that of the GRI, was also specifically mentioned. In addition, experts would like to see simplified solutions for smaller companies, more concrete indicators for the circular economy, cross-references between the standards and, in general, greater consideration of global risks during the development of the standard.

In principle, all experts agree that ambiguities that exist in relation to a circular economy (e.g., fuzzy indicators) are being improved. However, five out of seven experts state that the problem has not been solved. The main reasons given are the vagueness of the details and high complexity. In this regard, it is also mentioned that the circular economy is not more comprehensible for the general population. Another problem that can be improved by the two legal acts, as already mentioned in the strengths, is greenwashing. All experts agree that the prevention of greenwashing can be improved, but the possibility remains that the problem can never be completely solved. Basically, the experts are of the opinion that greenwashing can henceforth only be done intentionally. Two experts mentioned here that the responsibility lies primarily with the auditors to avoid greenwashing. In addition, experts see strong regulation by the market in the future in the case of greenwashing incidents. In a comparison between the CSRD and the Taxonomy Regulation, the possibility of greenwashing is seen to be low in the case of the latter, since it is mainly a matter of quantitative information.

In other aspects, it was mentioned that companies should bring the circular economy to all stakeholders in the future, whereby it was also said that circular economy is basically more understandable for the general public than other topics such as climate. Thus, there is great potential for implementation. Another aspect mentioned was that companies have many opportunities for inspiration, for example, through peers. Finally, the collection and processing of data was cited as the main challenge. In the future, not only the final design of the two legal acts will be exciting for experts but also their linkage with other legal acts, such as in the specific case of the Corporate Sustainability Due Diligence Directive.

In summary, the reporting obligation of non-financial information through the two legal acts creates the need to report specifically on the circular economy, with required disclosures going beyond those of the GRI. Depending on the final design, the two legal acts can have an important role in promoting a circular economy. Nevertheless, both legal acts should be considered only as part of the solution to promote the concept.

## 5. Discussion

### 5.1. Analysis of Sustainability Reports—Contribution of Sustainability Reporting on Circular Economy

To answer the question about the contribution of sustainability reporting by agri-food companies in relation to the circular economy has been so far, we conducted a qualitative content and keyword analysis as well as a mapping approach. The result of the content analysis of selected agri-food companies shows that the coverage of the circular economy has increased over time, which is in line with Stewart and Niero [2]. As with Stewart and Niero [2], the focus of the present analysis was on European companies, making the statement particularly valid for the European region. Since, according to Liao et al. [40], European companies tend to present CSR activities more extensively than American companies, it could be that reporting on circular economy has basically not increased as much in the American region. Additionally, based on the present analysis, it can be seen that the sustainability reporting of one American company (Cargill) has not grown as much as the European companies. Since the future reporting obligations apply to companies based in Europe, a stronger increase in reporting on the circular economy can be assumed here than in the American region in the future.

Since the studied companies differ in terms of industry, it can be claimed that certain keywords are picked up by all industries in the course of addressing the circular economy, which complies with the results from Gunarathne et al. [4]. According to Garcia-Sanchez et al. [41], the industry has a major influence on which topics are reported on. Which areas of a circular economy are addressed could, therefore, also depend on the industry. This aspect can also be extended to other similarities and differences with the literature. Accordingly, it is true for all industries that working groups/forums/dialogues, as well as research/innovation/dialogue with a connection to a circular economy are frequently implemented. However, since campaigns and educational initiatives are implemented

comparatively more often in the analyzed companies, the problem that consumers are not involved enough seems to play a subordinate role in the agricultural and food sector. Since consumer acceptance is considered crucial for the transition to a circular economy, it could be assumed that the agri-food sector is already transitioning towards a circular economy [42]. Since this is not yet the case according to the Ellen MacArthur Foundation [18], the question arises whether this actually contributes to increasing the circular economy practices or whether it is a special case.

Basically, a minimal extent of disclosure of direct keywords is revealed. Direct keywords suggesting a close connection to the cradle-to-cradle principle (e.g., biodegradable food packaging) and the transformation of a company's upstream activities are reported to a limited extent compared to implicit keywords. This also raises the question of the extent to which there is sufficient awareness of circular economy principles and the strategies and pathways for integrating them into corporate activities [4]. In general, the agri-food sector is seen as having great potential in terms of transformation to a circular economy [18]. However, the extent to which the opportunities are apparent to organizations in the sector is not known and could, therefore, be the reason for the partial lack of awareness. The frequent presence of supplier-related explicit keywords (e.g., "sustainable procurement") suggests a high level of supply chain integration of upstream activities. This shows that agri-food companies do not only focus on internal company boundaries but also include supplier collaborations in their sustainability management. Comparatively, recycling activities are mainly related to waste recycling and not reuse, which means that companies focus on the downstream part of corporate activities [4].

The fact that companies sometimes report only minimally on impacts, opportunities and risks related to a circular economy may be due to the fact that this is neglected at the company level, or due to the so-called "practice-performance portrayal gap". In sustainability and integrated reporting, companies may disclose less or more than their actual level of sustainability performance. Accordingly, the results of the analysis of sustainability and integrated reports may reflect limited knowledge and interest in the circular economy among professionals tasked with preparing reports. Conversely, from a legitimacy perspective, this could also be because companies seek to report only sustainability information through which stakeholders perceive them as legitimate [4]. As mentioned earlier, the industry also has a major influence on which topics are reported on [41]. As can also be seen from the analysis, for example, for companies in the agricultural and food sector, these would be topics related to health, biodiversity and farmers. Compared to Topp-Becker and Ellis [5], the focus of the analyzed companies is, therefore, not only on ecological but primarily on social topics. More balanced reports on social, economic and ecological topics by agricultural and food companies in the future [5] could be achieved through the implementation of the CSRD and Taxonomy Regulation. According to Tiscini et al. [25], this integrated reporting on social, environmental and economic information will lead to an improvement in the quality of information on the circular economy.

The presence of many implicit keywords suggests that the application of sustainability principles to promote sustainability performance is very strong. This suggests that while companies strive to improve their sustainability performance by pursuing various strategies, these actions are not yet aligned with the principles of the circular economy. According to Gunarathne et al. [4], many scholars emphasize that the transition to a circular economy requires not only economic activity at the corporate level but also support and change at the macro and meso levels. In economies where multinational companies operate, governments focus primarily on meeting the primary needs of society, such as infrastructure development, with little attention paid to areas of sustainable development, such as the circular economy [4]. An existing corporate interest in improving sustainability performance at the micro level may, therefore, not yet have been partially translated to the macro and meso levels.

Another aspect to consider when interpreting the results is the potential influence of GRI on corporate reporting. Many of the keywords are included in the GRI standards,

e.g., GRI 301 Materials, GRI 302 Energy, GRI 305 Emissions and GRI 306 Waste. Since companies are significantly influenced by reporting standards such as GRI, the disclosure of certain keywords may be driven by the motive to comply with the standard. The major influence of institutional pressure, such as from GRI, and the motivation of companies to comply with these standards in order to appear legitimate may also play a role in the comparative low disclosure of direct keywords [4]. For example, the explicit keyword with the highest disclosure rate is “recycl\*”, which is mentioned in GRI 301, 305 and 306. Therefore, it can be seen that companies are more motivated to make relevant disclosures in their reports when standards specify these disclosure requirements. Thus, related to the reporting requirements by the CSRD and Taxonomy Regulation, it can be claimed that explicit keywords will strongly increase. Currently, keywords that emerged on the basis of the analysis of the currently available drafts [17] were still taken up by the analyzed companies to a very small extent.

Some of the results of the analysis of the sustainability reports are particularly interesting for the circular economy research community. With regard to the analysis of the link between sustainability and circular economy, a limited reference is shown for the most part, although most reports already mention measures with reference to the circular economy. This suggests that the circular economy is still primarily seen as a vision by companies. This reinforces the existing call in academia for more methods to evaluate how good a circular economy strategy is from a sustainability perspective, that is, including environmental, economic and social aspects [2]. The excessive presence of unclear linkages could also be attributed to the lack of inclusion of circular economy in reporting standards, which Opferkuch et al. [1] criticize in their analysis. Thus, in the future, clearer linkages could also result from a separate reporting standard for the circular economy. It is important to mention that it was not investigated whether and to what extent companies have implemented or achieved what was communicated over the years, which means that no statements can be made about any form of greenwashing.

### 5.2. Changes in Communication about Circular Economy Due to CSRD and Taxonomy Regulation

To answer the question about the significance of the two legal acts, we analyzed the drafts of the two legal acts. The analysis of the contents of the currently published drafts of the CSRD and Taxonomy Regulation suggests that there will be increased reporting obligations in the future. In principle, it can be said that companies that currently already report in accordance with GRI 301 and GRI 306 have already built up a certain basis for the future additional obligations imposed by the CSRD and Taxonomy Regulation, as there are certain overlaps as shown in Table 1. According to GRI, EFRAG’s development has been well aligned with the GRI requirements, although there is “still considerable scope for greater alignment and convergence with the GRI” [43].

**Table 1.** High-level overview of overlaps and additions of CSRD and Taxonomy Regulation compared to GRI reporting requirements.

Overlap with GRI	Additions to GRI
Policies	
Actions	Products and materials
Targets	Financial effects from resource use and circularity
Resource inflow	Green turnover, CapEx and OpEx
Waste	

As these are currently still drafts, certain requirements may still change fundamentally. Furthermore, additional standards, such as the sector-specific standards and the standards for small and medium-sized enterprises, are still being developed. Thus, once all final documents have been published, a renewed analysis and comparison with GRI will be required, especially so that companies can prepare for future reporting at an early stage.

### 5.3. Expert Interviews—Reporting Requirements and the Promotion of Circular Economy

The preceding results lead to the question if the concept of circular economy can be promoted by changing the reporting requirements. The experts (Table A4 in Appendix A) have similar views on many issues. There are slight differences concerning the extent to which reporting can lead to the implementation of the concept in practice. Here, some of the experts explicitly mention that reporting is not a guarantee for the implementation of concrete circular economy measures in practice. In the course of this discussion, it is mentioned that other instruments are also needed. Other experts share the same opinion, stating that “steering economic activities to internalize environmental damage is part of shaping the framework conditions in market-based systems—but there are other, much more targeted instruments for this” [44]. Criticisms published by Creditreform [44], Europe’s most important creditor protection organization, but not mentioned by the experts interviewed, include incompatibility with EU treaties and the lack of global comparability. In general, according to experts, companies should start preparing for future reporting requirements at an early stage. Audit companies such as Dekra and TÜV Süd agree with this [44]. Due to the novelty of the two legal acts and the lack of final documents, there are very few assessments by experts, such as consultants or auditors, that can be compared with the results of this study.

In general, differences in the experts’ assessments can be attributed to different experiences in practice, as the companies they advise are most likely pursuing different levels of ambition. For example, the additional workload for companies as a result of the two legal acts is assessed differently. In principle, however, a distinction is made between smaller companies and corporate groups. Some experts state that large companies already have a comprehensive idea of the circular economy, which means that compliance with the legal acts will not be a problem. Smaller companies have in most cases not yet dealt with circular economy to this extent. In addition, they often lack personnel. According to Stiftung Familienunternehmen und Politik [45], the additional reporting requirements are so complex that corporate commitment to sustainability could be reduced. It is also argued that smaller companies are disproportionately burdened by the CSRD. According to the EU Commission, the costs of implementing the CSRD requirements at the company level are expected to amount to around EUR 100,000 for the first year [45]. As already described, experts mention that it can be challenging for smaller companies, but they do not directly refer to a disproportionate burden.

These results can also be combined with those of the keyword analysis of the sustainability reports. There is an agreement among the experts that corporations are already increasingly dealing with a circular economy, as keywords have increased over the years in the reports of large companies. Since most smaller companies do not yet publish reports, as they have not yet been required to report under the NFRD, it can be assumed that they have not yet addressed the concept to any great extent. If this will result in an excessive demand on the part of small and medium-sized companies depends above all on the standards that are developed for these companies. As these will not be published until 2023, future work should focus on analyzing them from the point of view mentioned above.

The fact that some of the information provided by the experts is quite generic shows that the experts are still cautious about drawing hasty conclusions, as the two legal acts are still being drafted. In addition, the experts often mention that they do not yet know the legal acts in detail, which also explains the general statements. Furthermore, since the two legal acts have not yet been finalized, the results should be used with caution and reevaluated after the final publications. For instance, it is possible that parts of the reporting requirements or taxonomy-eligible economic activities may be deleted. In this case, the two legal acts would no longer be as comprehensive, rigorous and broadly effective, which was cited by experts as a major strength of the legal acts. After the introduction of the final standard ESRS 5 and the technical criteria, or after the first application by the companies, a new survey of experts should be conducted in order to be able to continuously improve the legal acts.

In general, the results regarding the suggestions for improvement show that the experts have strong demands on the EU, especially with regard to answering open questions and offering assistance. Currently, experts believe that the EU is not fulfilling its obligations to companies and that they are left in the dark. Confusion among companies is also increased by the constant postponement of deadlines and non-transparent communication. By addressing the issues in a targeted manner and communicating the developments in a transparent way, the EU could help companies prepare now and eliminate ambiguities early on. In addition, the EU should already aid companies in order to promote knowledge in companies and facilitate implementation. This applies above all to the concept of the circular economy since the ambiguities cannot be completely eliminated by the two legal acts. Suggestions for improvement, which were taken up by experts, can also be found in the feedback received during the public consultation on the standards, which took place until the beginning of August 2022. Above all, there is a need for further guidelines, especially with regard to the implementation of the materiality analysis (impact assessment of certain topics). Other suggestions for improvement relate to achieving uniform terminology and a certain consistency and logic between the standards. In addition, participants in the public consultation would like to see greater alignment with already established standards such as GRI, whereby companies that already report according to GRI are well prepared for future obligations, as mentioned above [17].

## 6. Conclusions

The circular economy has gained increasing importance over the last years due to numerous social, environmental and economic benefits. Different sectors show varying potential for implementation, with the agricultural and food sectors being among those with great potential. As many initiatives have been developed over the years to transform the economy into a circular system, the level of engagement on the part of companies has also increased in recent years. This can be seen in sustainability reporting, for instance, as the concept of circular economy has developed over the years, although there was no specific focus on circular economy in previous reporting standards. However, based on recently published EU legislation, this will change in the future.

The CSRD and EU Taxonomy Regulation will result in additional reporting obligations in the future, including the circular economy. Depending on whether and how long companies have been reporting on their contribution to the circular economy, they will be confronted with a varying degree of additional reporting effort. In addition, the overlap of reporting requirements between GRI 301 and GRI 306 gives companies a certain advantage if they have already reported according to these standards. Reporting according to GRI can, therefore, help with reporting according to CSRD. However, reporting content required on the basis of the Taxonomy Regulation is entirely new. Therefore, the present results contain useful information for future reporting on the circular economy for agri-food companies.

In principle, companies should start preparing for the two legal acts at an early stage in order to be able to meet the requirements in good time. As the analysis of the selected reports has shown, “circular economy” is stated in four out of five companies from the third report onwards which was analyzed. Therefore, it can be seen that companies that have been publishing reports for a longer time also already report on circular economy to a greater extent. Furthermore, it is evident that most of the companies analyzed are dealing with the circular economy, but that this does not yet meet the requirements of the drafts of the two legal acts. Preparation is, therefore, indispensable and should already take place on the basis of the drafts. In addition, the selected companies are large companies that already have extensive resources. Small and medium-sized companies generally have a low level of reporting to date. Since small and medium-sized companies will also be subjected to reporting requirements in the future, there will be an enormous additional reporting effort for companies in the agricultural and food sector on the circular economy.

Most of the experts also agree with the additional reporting effort. The experts see an advantage for companies that already report according to GRI, which means that

companies should start implementing the legal acts at an early stage. Large companies have an advantage, while small and medium-sized companies had little involvement with the subject matter so far and will, therefore, be confronted with major challenges in the future. The experts see the promotion of a circular economy through mandatory reporting as a general possibility, although a connection between reporting and actual implementation by the companies in practice is considered difficult. In general, experts agree that the additional reporting requirements can be seen as a good first step towards the circular economy and raising awareness. However, for a concrete implementation in practice, additional regulatory obligations, such as a design guideline, are needed. Weaknesses seen include indicators and definitions that are too imprecise. Nevertheless, the experts cite numerous advantages of the two legal acts, such as the increase in transparency. In most cases, the taxonomy is seen as having greater potential due to its direct link to the financial market.

### *6.1. Discussion of Method and Limitations*

Concerning the method of content analysis and keyword search, there are some aspects that can lead to bias. Some of the keywords do not refer to the circular economy in a certain context, which means that a review is necessary. General statements on the basis of the frequency of keywords are also not target-oriented, since it gives little information about the depth of addressing circular economy. Therefore, as carried out in this study, a more comprehensive analysis, including targets and indicators, should be part of further research once there is a greater database for sustainability reports. In addition, synonyms exist for many of the keywords, which should be considered in the course of the analysis in order to avoid incorrect results. Therefore, as in this work, keywords should be pretested. Comparatively, when conducting qualitative content analysis and the mapping approach, careful attention must be paid to a consistent approach. In this work, therefore, a look at the examples in the literature was taken at the beginning and a comparison between the analysis results was carried out regularly during the analysis. In general, the number of pages of the reports should also be considered in the course of the comparison, as this can vary greatly.

The analysis of the sustainability reports shows some limitations. For example, it only includes agricultural and food companies that publish their sustainability activities in English sustainability reports, which means that many small and medium-sized companies are omitted as potential objects of study. Therefore, this limits the sample and the basis for comparison due to the fact that in the agri-food sector, such reports are only issued by large companies over a substantial period of time. Smaller companies have not yet been obliged to do so; they have not yet created a representative basis for comparison. Conclusions for the industry, therefore, only apply to large companies, giving an incomplete picture of the industry. Furthermore, since the companies have been reporting for different lengths of time, the selected reporting years differ, which means that no direct comparison is possible, but only a general trend over the years and cycles of reporting are present. In addition, the information in the reports is limited, as the most important topics of the year are reported after being filtered by the company's communications team and according to stakeholder concerns, thus providing only limited insight into the company's sustainability work. Moreover, there is a possibility of greenwashing, whereby a pure focus on sustainability reports does not convey a reliable picture of the organizations [4]. In addition, the study only examined how companies disclosed circular economy principles in their corporate communications but not how they integrated them into corporate practices. This could lead to an overall one-sided picture of how the circular economy is actually addressed. Stewart and Niero [2], nevertheless, believe that reporting on circular economy in sustainability reports does provide insight into the mindset and acceptance of companies.

In principle, there are some risks in conducting and evaluating expert interviews. Therefore, certain aspects should already be perceived when developing the interview guide, such as avoiding closed and suggestive questions. Likewise, the so-called inter-

viewer bias, i.e., distortion of results by the interviewer, was counteracted by an unbiased and neutral attitude in addition to the use of a guideline. Narratives from practice could not be used for further analysis, although this did not lead to any restriction in terms of answering the research question. During the evaluation, despite the application of qualitative content analysis according to Mayring and Fenzl [33], distortions of the results can occur if a uniform approach is not followed in the coding. In order to counteract possible distortions, the procedure was defined in detail at the beginning of this study.

In addition, there are also certain limitations concerning the selection of experts. On the one hand, the CSRD and the Taxonomy Regulation are new legal acts, and on the other hand, due to the complexity of both legal acts, it is difficult to find experts in both areas, which means that only a small circle of experts could be interviewed. Nevertheless, theoretical saturation was aimed at and achieved. In addition, the standard of circular economy and the technical criteria and economic activities are still being developed, which is why only very general statements could be made.

## 6.2. Outlook

In principle, it remains to be seen whether the new reporting obligations will actually come into force by June 2023 and what content will finally be included. In this respect, a renewed comparison will be necessary in order to be able to assess the extent to which companies that have already reported in accordance with GRI will be confronted with additional reporting obligations. In principle, it would also be interesting to carry out a survey directly with the companies affected, as it would help to determine the specific attitudes and occurring problems. Since small and medium-sized companies will also be obligated in the future, future work can conduct a more comprehensive analysis, and thus provide important assistance in preparing companies for their reporting obligations.

Future work is needed to more comprehensively assess the reporting of circular economy in this sector to date through quantitative research designs, including statistical consideration of, on one hand, factor analysis and correlations of keywords and, on the other hand, potential differences between subsectors and regions. It remains to be evaluated whether circular economy reporting in the European region is truly more in-depth than in the U.S. region, or whether there are potential spill-over effects. In a few years, it will also be interesting to see to what extent the stronger reporting requirements in the EU area affect these differences. According to Stewart and Niero [2], an analysis of the role of institutional factors, e.g., laws, norms or beliefs in specific regional contexts, in relation to circular economy adoption in the sector would also be particularly interesting.

Future work is also needed based on longitudinal and primary data to draw better conclusions at the company level. Given the possibility that there is a “gap between practice and reporting,” it would be informative to examine how companies are actually implementing circular economy principles. Such an analysis is essential to understand the extent to which circular economy principles are integrated into organizational practices to provide a micro-level view of the engagement and transformation of circular economy factors [4]. Furthermore, given the possibility of greenwashing, scholars point to the need of using new models, such as Paid, Earned, Shared and Owned Media (PESO), rather than relying solely on corporate reports to provide a more holistic and reliable picture of organizations [4]. Accordingly, future research can also analyze broad media content to provide a comprehensive view of how circular economy principles are communicated. In addition, expert interviews should be conducted again in the future in order to be able to derive any recommendations in good time so that companies are able to prepare themselves in the best possible way and to identify problems with implementation at an early stage. Suggestions for improvement should also be implemented at an early stage to give the legal acts the best possible degree of effectiveness.

In summary, future reporting requirements are to be considered as part of a bundle of measures to promote the circular economy, whose potential as a vehicle depends on various factors. These are to be identified and analyzed based on future research work and

brought to the attention of legislators and obligated parties accordingly to guarantee the implementation of a circular economy in key sectors, such as the agricultural and food sector, in the best possible way.

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### Appendix A



Figure A1. Method of literature review based on Poponi et al. [3] and Gunarathne et al. [4].

Table A1. Selected sustainability reports.

Company	Selected Reporting Years
Arla Foods	2007, 2012, 2017, 2021
Agrana	2015, 2017, 2019, 2021
Associated British Foods	2013, 2016, 2019, 2021
Nestle	2008, 2012, 2016, 2021
Cargill	2015, 2017, 2019, 2021

Table A2. Overview of all key terms based on Gunarathne et al. [4] and own content analyses.

Type of Keywords	Terms Used
Direct keywords	‘circular* economy’ or ‘circular business model’ or ‘circularity’ or ‘circular principles’ or ‘circular loop’ or ‘circular example’ or ‘circular solutions’ or ‘circular packaging’ or ‘circular targets’ or ‘circular material’ or ‘circular economics’ or ‘circular ways’ or ‘circular source’ or ‘circular thinking’ or ‘cradle to cradle’ or ‘resource circulat*’ or ‘material circulat*’ or ‘nutrient circulat*’. ‘service economy’ or ‘access-over-ownership’ ‘access-over-ownership’ or ‘product service system’ ‘nutrient cycle*’ or ‘biological nutrient*’ or ‘industrial nutrient*’ or ‘material cycle*’ or ‘nutrient cycle*’

Table A2. Cont.

Type of Keywords	Terms Used
Direct keywords	<p>'product shar*' or 'product exchange' or 'product-service' or 'repair economy' or 'product remanufacture'</p> <p>'design for disassembly' or 'design for remanufacture*' or 'design for R' or 'design for recycle*' or 'circular design'</p> <p>'decouple*'</p> <p>'regeneration of*'</p> <p>'retain value of resources' or 'value retention'</p> <p>'durability' or 'longevity' or 'exten*' or 'prolong' or 'life cycle' or 'longer life'</p> <p>'repairability' or 'repair' or 'disassembly*' or 'disassemble*'</p> <p>'remanufacturing' or 'remanufacture'</p> <p>'upgradeability' or 'upgrade'</p> <p>'sharing' or 'pay-per-use'</p> <p>'by-products' or 'co-products'</p> <p>'substitution of*' or 'substitute'</p> <p>'reduce* material*' or 'reduce* weight' or 'reduce* consumption' or 'reduce plastic' or 'reduce* resources*'</p>
Explicit keywords	<p>'recycled material*' or 'renewable material*' or 'renewability' or 'secondary material*' or 'materials used'</p> <p>'recycl*' or 'recyclability'</p> <p>'waste diver*' or 'divert waste' or 'waste reduc*' or 'reduce* waste' or 'waste reuse' or 'waste management' or 'total* waste'</p> <p>'industrial ecology' or 'industrial symbiosis' or 'waste to resource' or 'waste-to-resource' or 'waste conver*' or 'waste avoid*' or 'waste prevention*' or 'prevention* of *waste' or 'total waste'</p> <p>'renewable energy'</p> <p>'enhanced product responsibility' or 'product stewardship'</p> <p>'resource recovery' or 'material recovery'</p> <p>'reuse* material' or 'reus*'</p> <p>'resource* repurpose*' or 'repurpos*' or 'reclaimed' or 'reusab*' or 'resource efficien*'</p> <p>'sustainable* procurement' or 'sustainable* sourcing' or 'sustainable* supply chain' or 'sustainable* value chain' or 'sustainable supply' or 'sustainably* sourced' or 'bio based'</p> <p>'optimise resource use*' or 'resource use* optimisation'</p> <p>'refurbish*'</p> <p>'avoid* downcycling'</p> <p>'reduce* litter'</p> <p>'reduce* food loss' or 'reduce* food waste' or 'reduce post-harvest loss'.</p> <p>'optimize production' or 'optimize resources' or 'optimize waste'</p>
Implicit keywords	<p>'solar' or 'biomass' or 'hydro' or 'wind energy' or 'energy conservat*' or 'ISO 50000' or 'energy efficien*'</p> <p>'virgin material' or 'traditional material' or 'raw material'</p> <p>'waste generat*' or 'waste dispos*' or 'landfill*' or 'incinerat*' or 'combust*'</p> <p>'ethical sourcing' or 'corporate social responsibility'</p> <p>'Environmental* performance' or 'environmentally responsible*' or 'environmental responsibility' or 'environmentally sound' or 'environmentally friendly' or 'UN Global Compact' or 'Sustainable Development Goal*' or 'environmental impact*' or 'ISO 14001'</p> <p>'carbon footprint' or 'greenhouse gas*' or 'GHG' or 'carbon emission*' or 'eco-friendly' or 'carbon neutral'</p> <p>'waste segregat*' or 'material segregat*'</p> <p>EMAS</p>
Other keywords	<p>'single-use plastic' or 'single use plastic'</p> <p>'rainwater harvest*'</p> <p>'electric vehicle*'</p> <p>'compost*' or 'effluent*' or 'zero waste'.</p>
	(* is to be seen as a placeholder)

**Table A3.** Overview of coding categories based on Stewart and Niero [2].

Category	Definition
Conditional	The circular economy is seen as a prerequisite for achieving sustainability.
Advantageous	The circular economy is seen as a way to achieve greater sustainability.
Trade-off	The circular economy is assumed to lead to sustainability trade-offs (both positive and negative outcomes).

**Table A4.** Overview of the interviewed experts.

Name	Consulting Firm	Position
Expert 1	Think tank	Senior Manager
Expert 2	Think tank	Senior Consultant
Expert 3	Deloitte	Senior Manager
Expert 4	EY	Senior Consultant
Expert 5	EY	Senior Consultant
Expert 6	KPMG	Senior Consultant
Expert 7	SaMara	Senior Consultant

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