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COLLANA DEL DIPARTIMENTO DI ECONOMIA AZIENDALE

A cura di
MARIA CLAUDIA LUCCHETTI, MARIA FRANCESCA RENZI

QUALITÀ, INNOVAZIONE E SOSTENIBILITÀ NELLA FILIERA AGRO-ALIMENTARE

Il contributo delle Scienze Merceologiche

RomaTrE-Press
2025

Dipartimento di Economia Aziendale

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Indice

Circular economy in the agri-food sector: an environmental and social analysis from portuguese companies

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Abstract
The agri-food sector is gaining interest in the circular economy, but environmental, economic and social factors limit its adoption at the company level. To explore the adoption of the circular economy from an environmental, economic and social perspective, an empirical analysis based on 9 semi-systematic online interviews was conducted from March to June 2023 on a selected sample of Portuguese companies already implementing circularity in the agri-food sector.
The results showed that: circularity is linked to environmental and economic factors but is also limited by cultural and financial barriers; the assessment is not a primary concern in the sector, which explains the lack of knowledge on available methodologies; social value is generated to support the community and develop networks.
Therefore, it is crucial to explore the reality of the sector's operators to understand how to support companies and create tools adapted to their needs to ensure the effective adoption of circularity.

Keywords: Agri-food sector; Company level; Circularity assessment, Interviews

1 Introduction

The circular economy (CE) is gaining momentum as a paradigm able to decouple economic growth from resource exploitation (EMAF, 2015), on the way to sustainable development.

Among the critical sectors that urge to be directed to sustainability, is the agri-food system (AFS). Nowadays, the AFS is severely challenged.

On the one hand, 930 million tons of food get wasted or lost along the supply chain, on the other, 800 million people still face hunger (Abbate et al., 2023). The expected population growth of 2 billion people by 2050 will additionally increase the environmental burdens for the sector (Silvestri et al. 2022). A context in which breeding and farming sectors are already largely responsible for climate change and biodiversity loss globally (De Bernardi et al., 2023). Thus, circularity could be a valuable tool to redirect the sector towards sustainable production and consumption.

For this reason, the study of CE is now flourishing in the AFS. Focusing on the last years, studies explored e.g., CE implementation in the agro-food supply chain (Esposito et al., 2020), the main drivers and barriers to CE adoption in the agri-food context (Mehmood et al. 2021), or the identification of the critical factors for the expansion of circular food systems (De Bernardi et al., 2023). In a previous analysis, Scandurra et al., (2023) pointed out the maturity of the sector in terms of CE, since circularity's examples can be retraced to the roots of the food system.

However, several lacks still limit its uptake among companies. Among the issues, is the assessment of CE (Roos Lindgreen et al., 2022). Assessing is crucial, since it allows us to understand how the principles of CE have been implemented, quantifying the progress made (Fassio and Chirilli, 2023). Several types of indicators are proposed in the literature for measuring CE impacts in the AFS. However, such fragmentation makes it difficult for companies to monitor the circularity of their strategies (Poponi et al., 2022). For this reason, it is important to understand the company's point of view and to investigate how the companies adopt those indicators, but also which obstacles and benefits are linked to their adoption (Silvestri et al., 2022).

Moreover, literature marginally considers the social impacts of CE (Murray et al., 2017) and such marginalization is confirmed in the AFS (Scandurra et al. 2023; Atanasovska et al., 2022). Nevertheless, as pointed out by Murray et al. (2017), without including the societal needs in CE formulation it is impossible to fully address sustainability. The social dimension is already embedded into the CE logic, given the strong need for cooperation which involves several stakeholders beyond the company's supply chain (Mies and Gold, 2021). The limited consideration of the social perspective may be caused by a vague conceptualization of the social dimension in CE. This generated a lack of empirical studies reporting companies' views and integration of the social dimension of CE (Walker et al., 2021).

However new European regulations, like the Corporate Sustainability Reporting Directive (CSRD) (European Commission, 2021) indicate CE as one of their key objectives (Opferkuch et al., 2022). Therefore,

CE will offer relevant opportunities to companies able to measure and communicate the value of the circular strategies implemented.

Thus, more empirical studies are required to explore the implementation and characterization of CE in the sector. This makes it necessary to investigate the needs and opportunities of companies in the sector through empirical studies.

In this sense, Portugal offers an interesting perspective of analysis to explore the circularity of the AFS in the European context. First, the food sector has valuable weight in the country's economy; the agricultural output generated almost EUR 7.1 billion in 2018 (crop production 60% and animal output 38%), but it is also a key driver of the manufacturing industry, accounting for 14.5% of total sales in 2016 (fi-compass, 2020). Furthermore, in recent years, Portugal has demonstrated a strong interest in implementing CE for the AFS. Indeed, it has promoted initiatives like the "Alentejo Circular" project (2016-2018), or the "REiNOVA Si" project (2019-2021).

All these reasons led to the choice of Portugal as the reference context for the present empirical study. The analysis aims to explore how CE is implemented in a selected sample of Portuguese companies of the AFS, i.e., examining drivers and barriers to its adoption, the assessment, the social value creation potential. To do so, 9 semi-structured interviews were conducted with companies already adopting circularity in their activities and preliminary analysis were conducted.

The present article is articulated in four sections: an introductive section, to contextualize the frame of research; the methodological section, to explain the path followed to carry out the analysis; the results and discussion section, to critically analyze the findings; finally, the concluding section to identify limitations of the study, as well as possible future research.

2 Methodology

Nine Portuguese companies that already adopting circularity were interviewed. Specifically, they were companies involved in the non-profit association "Portugal Foods" (https://www.portugalfoods.org/en/), which comprises several actors of the national food chain, and companies that took part in the project "Alentejo Circular" project (https://alentejocircular.uevora.pt/), created by the Instituto Soldatura e Qualidade (ISQ) and the University of Évora to increase the knowledge on circularity in the olive oil, wine, and pig breeding supply chains in Alentejo (Portugal). For this, a semi-structured interview guidelines articulated into open-ended ques-

tions were developed. The semi-structured form was chosen due to its capacity to focus attention only on information directly related to the study aim (Harris et al., 2009). The interviews were conducted in written or oral modality depending on the interviewers' preference.

The following dimensions were considered during the interviews: i) CE practices implemented, drivers and barriers of adoption; ii) circularity assessment, adopted tools, benefits and barriers of measurement; iii) CE and social value generation opportunities. The interviews were conducted in English with a mean duration of 60±34.5 min through Microsoft Teams. To minimize possible lack of information, the interview sessions were recorded, and additional notes were taken by the interviewers.

An inductive thematic analysis was chosen to analyse the interviews (Braun & Clarke, 2006). Given the exploratory nature of this study, inductive coding is the most appropriate choice as it allows themes to be identified directly from the data (Joffe and Yardley, 2003). The qualitative data analysis software QSR NVivo (1.4) was used to perform the analysis. The presence of inconsistencies or discrepancies during the coding process was checked to provide a thorough understanding of the text. Note that the same text extract might be related to multiple themes.

3 Results and Discussion

3.1 Sample overview

Companies were classified according to the Portuguese official geographic localization (NUTS II), the size (following the Eurostat classification scheme for small and medium enterprises-SME and large) and supply chain stage. Specifically, 44.5% of these companies were localize is in the North, of Portugal, 33.5% in the Metropolitan Area of Lisbon, and 22% in the Centre of the country. In addition, 44.5% of them were large companies, and 55.5% were SMEs. Moreover, 78% of them were articulated into processing and packaging stages, 44% into primary production and food distribution, 33% belonging to handling and storage stage and 11% to the retailing stage. The percentage exceeds 100% since more options could be chosen for each option (Figure 1).

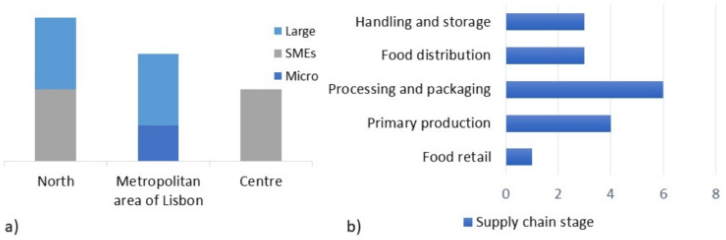

Figure 1 – Sample characteristics; a) Size and localization, b) supply chain stage

3.2 Conceptualization and implementation

In analyzing the drivers of CE adoption, the most relevant are the environmental and economic ones; companies indeed stress the importance of having a clear strategy in environmental terms and to focus on resource optimization, which allows them considerable cost reductions. This is in line with Mehmood et al. (2021), which elected environmental and economic drivers as the most popular for the AFS. Social drivers are rarely mentioned in the sample. Overall, the social driver remains the least considered of the triple bottom line, as evidenced by previous literature (Murray et al., 2017). Considered as direct support for the surrounding community (e.g., donations) but also as a potential guide for people's consumption choices. Mentioned is also the desire to generate brand value, making CE a banner of the company, and improving its market recognition. In discussing the reasons to adopt CE, companies stressed the role of company culture, expressed as management commitment to pursue CE. The lack of internal managerial purpose to implement CE negatively affects the overall organization's disposition towards CE, severely limiting its rooting into the company's mindset (Farooque et al., 2019).

At the same time, several barriers hamper CE adoption in the sector. The most relevant appear to be cultural. Primarily companies have a general skepticism about CE investments, secondly, a lack of interest is perceived by retailers and consumers. Especially consumers are reluctant to leave convenience for more responsible purchases. Finally, the uncertainty for the upcoming regulation is also perceived as a barrier among the sample (see Figure 2).

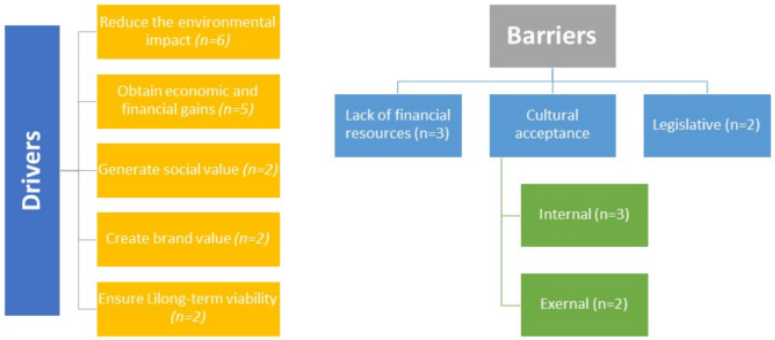

Figure 2 – Drivers and barriers to CE implementation

Regarding CE implementation, the practices described during the interviews were identified. and classified according to their final goal. Most of the practices are agricultural-related (reported by seven companies), e.g., the use of compost to obtain nutrients, the use of almonds' green peel as a natural herbicide, or water optimization technologies to save water from irrigation. Relevant are also the material-oriented practices (reported by nine companies), especially in terms of packaging. Examples are the use of compostable material to replace plastic in cheese packaging, the implementation of a deposit return system for plastic and cans in the beverage sector, the reduction of packaging material, improving product design, or the introduction of a returnable system for bottles and kegs, in which they are consumed, collected by the company, cleaned, verified and then filled again to go back on the market. Food and feed practices (referred by seven companies) e.g., the use of the company's subproducts (namely, spent grains) as animal and insect feed, the use of whey, a subproduct of cheese production, as pigs feed, or the use of cheese fat to produce butter and cream cheese. The category can be divided into food-sharing practices, namely donations to the community and company's staff and food waste reduction practices e.g., the use of IT tools to monitor the replenishment, ordering and forecast of fruit and vegetables, cost reductions for products close to expiry (pink labels), or zero waste boxes with mature and less good-looking fruit and vegetables, to incentivise customers purchase, the reincorporation of the cheese not well pressed from one production line into other cheese lines. Finally, only a few practices are energy-oriented, one in terms of biomass, to reduce the carbon emissions at factory level, the other for the reuse of steam to heat water and use it for machinery cleanings. Moreover, some practices currently under study were identified, as innovative ones

e.g., the use of Bovaer, a feed supplement that reduces enteric methane emissions of cows, or the transformation of almond shells into a compound able to replace plastic, to more conventional practices, e.g., the use of food retail surplus/waste to produce new food products like jams, chutneys, or bread, reusable cases for the transportation of cheese, implementing refill projects for detergents and pet food, including containers with an equipment for refilling. The presence of several practices for future application is, a sign that companies' efforts for CE will increase soon.

3.3 Assessment

Regarding the monitoring, 5 companies (one large and three SMEs) state of not adopting any form of CE assessment but explore the criticalities to be faced. The primary cause can be attributed to a lack of interest from companies in measuring. This is confirmed by the fact that they are not aware of the methodologies available for measurement. This is not new in the Portuguese context, where the same lack of interest in assessment was found in the public sector (Droege et al., 2021). Just the large company is on the way to CE assessment, specifically exploring the circularity of packaging.

The coding process identified several barriers to the assessment as evidenced by fig. 3. Regarding company's internal capabilities, they do not feel that they have an organization to support the monitoring phase. The size and age of the companies seem to additionally limit their capacity due to budget and social capital restraints. Moreover, the lack of any legal obligation makes companies less interested.

The assessment process as slow and complex for companies, especially for smaller ones. Finally, the lack of awareness and interest in assessment makes it difficult to involve other supply chain actors. Nevertheless, their demand and collaboration for it would be a clear push for companies. Overall, they recognise the weight that CE measurement will have in the short term due to supply chain and legislation pushes.

The remaining 4 companies, three large and one SME, indicate the use of circularity measurement tools and explore the benefits obtained. Several internal benefits were identified related to the gained process efficiency, environmental impact reduction and decision-making support. Communication benefits were linked to the improvement of company reputation, but also to increase the awareness of consumers and employees on the importance of impact reduction. Moreover, one company mentioned the importance to start measuring to be ready for possible legislation and anticipating future requirements. Another interesting point is the lack of assessment benchmarks, which limits companies' possibility to evaluate their past performance or to compare with other companies. The absence

of shared benchmarks for CE is still critical in every economic sector (Roos Lindgreen et al., 2022). The limited interest evidenced in the sample suggests the need to develop more empirical studies in the sector but also to create learning and training events aimed at increasing CE awareness and the consequent importance of its assessment.

Companies report the use of different forms of assessment and that companies could use more tools, so their number does not match with the number of assessing companies. Specifically, communication reports according to the GRI reporting standards (n=2, Large), Life-cycle tools (n=3, Large) (namely, carbon footprint and life cycle assessment), performance indicators (n=3, Large) and tailor-made indicators (n=2, Large and SME).

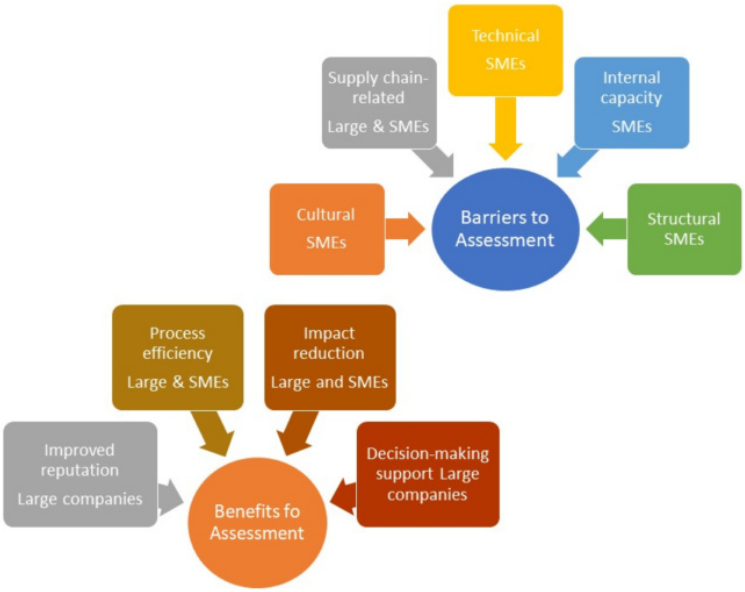

Figure 3 – Benefits and barriers to CE assessment

3.4 Social value

The capacity of CE to generate social value was investigated by analysing companies' initiatives having a social impact, answers were analysed through inductive coding. Themes classification was inspired by the framework of Labuschagne et al. (2005): a) employee conditions, b) local community enforcement, c) stakeholder participation, and d) policy. The category a) considers the overall well-being of the worker, improving in-

clusiveness and cohesion but also increasing employee awareness and involvement in decision-making . Category b) includes the generation of productive capital, through new assets; human capital, through education and sensibilization programs in schools; finally, community capital, including initiatives directly to enforce social relationships e.g., donations and supporting local new businesses. Regarding the last point, companies stressed the importance of developing collaborations with closer companies to exploit CE potential even in activities not strictly related to their core business. Category c) includes stakeholder's influence, which means the possibility to influence or be influenced by stakeholders. On the one hand, companies influence distributors and suppliers e.g., by imposing stricter supply requirements, but also clients e.g., proposing more sustainable purchase options and driving their attention to sustainable issues; on the other, could perceive pressure from retailers and consumers that willing to acquire products with certain characteristics in terms of sustainability. The category is further articulated into the provision of information and network development. The first is defined as informing the stakeholders about the initiatives promoted inside the company, e.g., in terms of corporate social sustainability, which seems a prerequisite to obtaining trust and funding from the market. Second, with the development of collaborative networks across industries; academia is perceived as a valuable partner for this kind of collaboration, given its capacity to offer new, updated insights into industry issues. CE encourages companies to collaborate with companies beyond their core business and at the initial stage of development, since they may offer potential innovative collaborations, while smaller and younger companies need the support of large enterprises to obtain support and be guided into business. Finally, d) policy implications are poorly mentioned in the sample, specifically directed to push for policy changes. Despite the limited attention, the social implications of the CE are tangible for the companies in the sample. This suggests that CE can promote social value creation and thus should be more valorised inside companies, being included in communication and education initiatives inside companies.

4 Conclusions

This exploratory study is based on 9 semi-systematic interviews conducted on a selected sample of Portuguese companies of the AFS implementing CE. The preliminary analysis shows how circularity is mainly driven by environmental and economic reasons but also that there are still significant obstacles to its uptake in the sector. Currently, the assessment is not a priority, indicating a critical lack of awareness for the companies of

the sector, whether assessing companies can already testify relevant benefits e.g., in terms of resource optimization. Social value creation is part of CE, especially in terms of commitment to the community and offers interesting collaborative opportunities with neighbouring companies. This contribution, although exploratory, gives relevant insights into the implementation of CE, investigating its assessment and the social value creation potential in companies of the AFS.

The selection of a single Country of investigation may have influenced the outcome of the analysis, thus results should be contextualized carefully. The weight of the sector in the Portuguese economy and the numerous projects for its circularity make it an interesting context to study. Given the aim to deeply analyse the features of CE in the sector, only companies with experience in circularity implementation were selected limiting the numerosity of the sample.

More studies targeted on the company's experience are recommended in the sector, to guide companies to CE valorisation and assessment following businesses' needs and capabilities. Food has a significant social and cultural value; CE is a tool able to foster sustainable practices and mindsets, directing sustainable development.

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