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Agri-food crises and news framing of media: an application to the Spanish greenhouse sector

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The contemporary media narratives frequently exhibit significant contradictions due to the influence of diverse interests. In this context, the framing of information assumes critical importance in shaping consumer opinions, necessitating a comprehensive examination of its management. This article investigates the portrayal of crises in the agri-food sector within the mass media when not anchored in objective and verifiable facts, thereby exerting a consequential impact on the sector's reputation and public image. Specifically, a detailed analysis is conducted on the greenhouse horticulture sector in southeast Spain, recognized as the primary European supplier. Examination of these news items uncovers a discernible bias in the disseminated information, resulting in an information asymmetry between farmers and consumers. As a remedy for the affected sector, the current study advocates the implementation of a proactive crisis detection and management model grounded in the development and dissemination of verifiable information.

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Introduction

When addressing crises, the media's ability to recognize and utilize suitable news sources is crucial for delivering effective and trustworthy news coverage. Consequently, it is imperative to identify the factors influencing this ability and to discover methods for improving and optimizing these source choices. In general, the media is presumed to bear the responsibility of determining which information will be disseminated as news and which will remain undisclosed to the public.

Within this framework, the present study analyzes how crises in the agri-food sector are reflected by general media outlets in Europe and how they can affect its image and reputation. This article contends that the management of information by the media can be an influential source of crises, particularly in instances related to health standards and sustainability. To analyze the scope of information published in the media, this article compares news items with the opinions of affected sectors while also examining pertinent academic studies.

More specifically, this study centers on Spanish greenhouse horticulture production, a model barely 60 years old, exemplifying endogenous economic development from severe conditions of poverty, whose maximum expression is in the province of Almeria (Galdeano-Gómez et al., 2017). European mass media and academia only began to focus on this area when exportation commenced in the early nineties (Tout (1990)). Characteristics such as the harsh arid climate, the world's highest concentration of plastic-covered greenhouses, and its geographical location along illegal migration routes further heightened the region's appeal. However, the sector's growth was marred by issues such as the widespread use of pesticides and local environmental degradation (Izquierdo et al., 2004).

A pivotal turning point occurred in 2007 when major chain supermarkets, primarily from Germany, declined to purchase from Almeria due to chemical presence in vegetables. Consequently, the sector swiftly responded, making southeast Spain the world's largest user of Integrated Pest Management within a year, completely abandoning uncontrolled chemical use (Van der Blom et al., 2010). Despite this, the sector has been stigmatized since then. In 2011, the Hamburg government falsely attributed responsibility for E-coli cases to Spanish vegetables, resulting in substantial economic repercussions (Pérez-Mesa et al., 2019) and widespread negative media impact (Van Asselt et al., 2017). Subsequently, the horticultural sector faced unjustified campaigns by the European press. In the ensuing years, mass media and academia directed attention toward environmental issues and social inequality. Overall, this situation has influenced consumer opinions, with beliefs that greenhouse products from southeast Spain are of inferior quality and generate negative externalities (Sirieix et al., 2008; Serrano-Arcos et al., 2020).

Currently, Spain exports greenhouse vegetables to the European Union (EU) valued at €6.2 billion (ICEX, 2021), with nearly 300 million consumers in Spain, constituting 40% of the European population. The Spanish horticulture sector's production exceeds 4.5 million tons, cultivated across 42,000 hectares of greenhouse, primarily in the province of Almeria (31,500 ha). Approximately 75% of the production is earmarked for export, with 27% to Germany, 16% to France, 15% to the United Kingdom, and 9% to the Netherlands, while only 25% remains in Spain.

The principal distribution channel involves major European retailers (e.g., Aldi, Edeka, Tesco, Carrefour, and Lidl), accounting for 70% of Spanish producers' sales (Pérez-Mesa & Galdeano-Gómez, 2015). These retailers establish stringent production quality standards and promote social responsibility and environmentally sound practices. However, these practices, often

unknown to the end consumer, may be misrepresented by the mass media, generalizing inadequate management by a minority in the sector. This, coupled with growing environmental awareness and consumer concerns about food safety, poses a potential threat to the sector's image and reputation (Pérez-Mesa et al., 2019).

Negative news, much of it from academic sources (Días & Reigada, 2018), has significantly influenced consumer perceptions of the sector. Despite this, there exist contrasting facts, including scientific evidence supporting the health standards, sustainability, and efficiency of the sector (Castro et al., 2019).

The primary objective of the present study is to investigate whether the framing of news, influenced by the choice of information sources, can contribute to the emergence or propagation of crises in the agri-food sector. Such crises can significantly impact the sector's viability, highlighting the influential role of the media compared to objective and accurate information provided by the sector or specialized academic studies. In this context, a potential monitoring and control scheme is proposed, which could be implemented by the affected sector. A comprehensive analysis of how media framing can lead to image crises in the horticultural sector is crucial for an effective and efficient response to mitigate its effects.

Specifically, this article aims to ascertain whether the damaged external image and reputation of the Spanish greenhouse horticulture sector result from negative news that neglects to analyze solutions and opinions presented by the sector itself or those endorsed by credible and verifiable sources.

Beyond the specific case study, this paper contributes to the literature in several ways: (i) by extending the understanding of the consequences of news framing generated by mainstream media, with a focus on their role in agri-food crisis creation and propagation; (ii) by analyzing the origins of bias in this framing and how sources are utilized; and (iii) by proposing a monitoring and control scheme, managed by the affected sector, grounded in a comprehensive comprehension of the aforementioned aspects.

Conceptual framework: media framings and image agricultural crisis

Media framing theory in agriculture. This study examines the influence of media and communication on individuals' perceptions and interpretations of information, potentially leading to image crises affecting companies or sectors. Framing Theory (FT) serves as a fundamental theoretical framework for addressing this issue, positing that the presentation or "framing" of information can shape people's understanding and reactions (Shaw, 1979). In essence, the media can manipulate discourse to set agendas (Adams et al., 2014; Rust et al., 2021). In summary, FT asserts that how information is presented in the media influences how people perceive and understand it. Frames can also impact perceptions by manipulating tones, thereby altering public support for policies (Rust, 2015). Media frames, crafted by journalists and other actors, simplify and direct attention to specific aspects of a topic, influencing public perception and decision-making. The framing process encompasses three stages: inputs (objectives, ideologies, other media features), processes (frame construction by journalists, including sources used), and outcomes (public perceptions of the information).

In general, the literature has paid limited attention to the influence of specific newspaper characteristics on reporters' performance. Research suggests that reporters, information subsidies, newspaper circulation size, and location impact the attributes of sources and the type of information provided. For instance, studies have highlighted the reliance of reporters for

larger regional and national newspapers on news subsidies (Lehman-Wilzig & Seletzky, 2012). Conversely, larger newspapers statistically use a greater number of scientists and agricultural scientists as sources (White & Rutherford, 2012). Newspapers in larger and more diverse communities tend to provide greater coverage of controversial science topics, such as environmental contamination, and trending topics like immigration. This holds implications for specific agricultural sectors involved with controversial subject matter in their respective areas (Perez-Mesa et al., 2019). Some studies argue that there is an imbalance in the media due to a higher frequency of negative messages (Boehm et al., 2010). In response, the farming press has recently tended to use more positive tones when covering sustainable agricultural practices (Rust et al., 2021), which, unfortunately, has led to misdiagnosis at times (Gibson et al., 2020; Jones et al., 2022).

In summary, this study elucidates the actions of the media through the framing of news, shaped by several factors: i) in the initial stage, the media's ideological orientation, scope of coverage, expected impact, etc., exert significant influence; ii) during the second stage (frame construction by journalists), the journalist's individual perspective and their selection of sources become crucial; iii) ultimately, this framework evolves into a simplified and recurrent idea, impacting consumer perception. Moreover, recognizing these ideas is a crucial aspect in identifying unresolved issues.

Media influence on food crisis. According to Van Asselt et al., 2017, the term 'crisis' is defined as "an urgent, dynamic situation that is rapidly changing with unpredictable outcomes, poorly understood, and has an impact on society and politics." Crises are considered negative changes in security, economic, political, social, and environmental affairs, especially when they occur unexpectedly and with little warning (Çesmeci et al., 2013). Generally, a crisis event involves uncertainty about what has occurred, its causes, and what might occur later (Broekema et al., 2018). Common consequences of crises include a decrease in sales and market shares and widespread negative publicity (Vassilikopoulou et al., 2009). Specifically, in the case of agri-food, economic impact analyses are limited, and measuring said impact is a complex task (Hu & Baldin, 2018).

In the food industry sector, the Codex Alimentarius defines the term 'food crisis' as "a situation, whether accidental or intentional, that is identified by a competent authority as constituting a serious and as yet uncontrolled foodborne risk to public health that requires urgent action". Notably, a food safety event can be categorized as an 'accident' or 'incident,' evolving from a minor occurrence to a major crisis at any moment (Chammem et al., 2018). Incidents can result in significant health risks or a decline in consumer well-being, causing widespread consumer concern and disrupting national and international trade, as demonstrated by the severe *Escherichia coli* outbreak in Germany in 2011 (Van Asselt et al., 2017). In this case, the Hamburg authorities incorrectly attributed the outbreak to cucumbers from Spain, prompting an alert against the consumption of tomatoes, lettuce and cucumbers and impacting all horticulture products from the region. Despite later acknowledgment that the outbreak did not originate in Spain, the damage was done as the "official" source had already been reported in the press (Pasillio, 2012). Consumption was severely affected, leading to a drastic fall in prices in both national and export markets (Pérez-Mesa et al., 2019).

Several studies follow a similar pattern, analyzing how the framing of news stories influences sector states. For example, the German press's treatment of the BSE crisis, where media coverage tended to politicize food hazards affecting industrial agriculture

(Feindt & Kleinschmit, 2011), or the contemporary impact on the livestock sector of the media's treatment of red meat consumption (Sievert et al., 2022). Research by Gibson et al. (2020) reveals that consumers primarily rely on the media for agricultural information, leading to misconceptions about its environmental impact. Ideology and political trends, in conjunction with media influence, limit the introduction of solutions beneficial to both consumers and producers. This is evident in discussions about Genetically Modified Organisms (GMOs), where public discourse is heavily influenced by vested interests without scientific basis (Mathur et al., 2017; Varzakas et al., 2007).

While a food safety incident is unintentional, food fraud is intentional and driven by economic interests (Chammem et al., 2018). In either case, a lack of specific information, fueled by mass media coverage, can heighten consumers' risk perceptions, potentially leading to reduced demand for affected food products (Frewer et al., 2002; Verbeke, 2005). Consequently, food crises can trigger strong consumer reactions, significantly impact food export markets, and have important political implications (Swinnen et al., 2005). Sometimes, a crisis may involve an entire category of products, as seen in the mad-cow disease crisis (Van Heerde et al., 2007).

Within the context of food crises, it is crucial to highlight those related to food safety, which frequently occur and can affect a wide variety of food products. Food safety concern is defined as "the degree of consumers' anxiety regarding the quality of processed foods, food additives, and pesticide residues that could jeopardize their physical health". Potential impacts on consumer demand extend beyond the directly affected products to other categories. In recent years, consumers have become increasingly concerned about health risks associated with food consumption (Röhr et al., 2005). However, assessing risks related to food safety has become challenging for the general public. Consequently, consumers must rely on producers, retailers, regulators, and even the media to minimize potential health impacts (Lobb et al., 2007).

Simultaneously, another type of crisis exists, originating not from a specific food safety risk but from events or factors that directly influence consumers' perceptions. These situations are commonly related to production and resulting negative externalities (e.g., environmental impact, working conditions, etc.). Agricultural crises can be categorized based on their relationship with environmental impact, social well-being, and/or economic profitability (Reganold & Wachter, 2016). Ultimately, crises can compromise the economic viability of a company or sector, adversely affecting its future sustainability. Such crises may result from temporary or structural changes (e.g., price or demand decreases, increased competition, and overproduction). It's essential to note that environmental or social crises, if chronic, can impact the economic viability of the company or sector. Additionally, these crises may arise from mass media coverage or, on other occasions, emerge from the media due to preconceived or biased ideas, equivalent to smear campaigns (Fig. 1).

Methodology

First, given the growing body of evidence on image crises in the Spanish horticulture sector, it is essential to identify how these crises are addressed in European media. A compilation of news has been conducted using various sources: (1) a bibliographic review of press news related to the sector (European Newsstream); and (2) information requested from press departments of sectoral associations (APROA, HortiEspaña). The Newsstream search included the terms: Almeria AND greenho*, resulting in a total of 19 documents. The database compiled by APROA and HortiEspaña had a total of 30 news references. From the joint

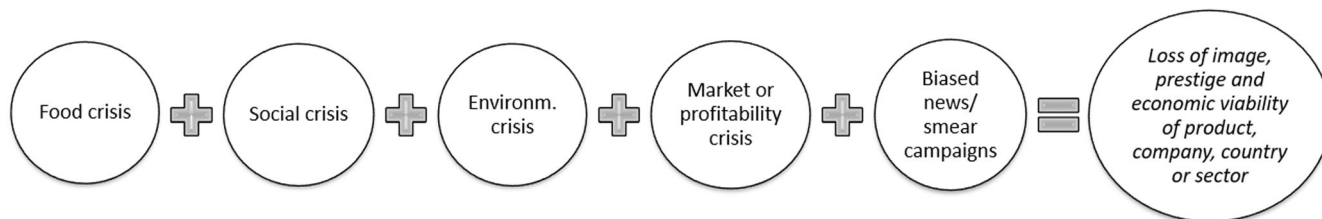


Fig. 1 Types of crises affecting the agricultural sector. The figure illustrates that various types of crises can occur in the agri-food sector, often in combination, resulting in a loss of prestige and reduced profitability. Source: adapted from Pérez-Mesa et al. (2019).

1		2	
Web of Science n=102	+	Scopus n=44	
Total references n=146		Exclusion by title & type of journal (*) n=52	+ Duplicate references n=32
Second screening n=34		First screening n=72	
3		4	
Exclusion by abstract n=25	+	Exclusion by full text n=13	
FINAL SAMPLE n=42		Third screening n=34	+ Snowball references & grey literature n=8

Fig. 2 Summary of the systematic literature review. The figure illustrates the systematic review process, following the PRISMA scheme, summarized in four phases. Out of an initial total of 146 references selected, only 42 were deemed relevant for the research. These references were limited to journals related to the fields of Ecology, Agriculture, Science Technology, Water, Energy, Business, Economics, and Engineering.

review, a total of 34 news items were obtained, to which 2 additional items were added as a result of a more general search in Google News. The total number of news items analyzed was 36. It is at this point that FT becomes relevant as a method for understanding the motivations and simplifications applied in news reporting. This approach enables the extraction of recurrent ideas or frames used by the media, serving as indicators of unresolved problems.

Second, to better understand whether there is any bias in the construction of the information framework, we contrast whether journalistic information aligns with that obtained from academic sources. With the aim of studying the collective analysis conducted in the academic literature on this phenomenon, searches were carried out in the Web of Science and SCOPUS databases using the following keywords: [Almería* AND Susta* AND Agri* OR greenho* (Abstract, Topic)]. This search was conducted for the period 2010–2020. Also, the cross-referencing method, also known as “snowballing,” was employed by examining the references and citations of the previously selected articles. It was completed with a general review in Google Scholar to detect any gray literature. Finally, only 42 publications were included. The search followed the PRISMA scheme for a systematic literature review. The summary of the process can be seen in Fig. 2.

Third, as an alternative position, the production sector maintains a different view that attests to the efforts made in recent years to counteract the criticism presented in the general media. This information was compiled from in-depth interviews with the directors of associations representing the sector (APROA, HortiEspaña) as a means of gathering counterarguments. Furthermore, an attempt was made to corroborate the data supplied with official statistics sources or specialized bibliography. It is

important to note that during this phase, the process of reviewing the scientific and gray literature was revisited. Combining the news items, research articles, and face-to-face interviews provides a more comprehensive understanding of factual accuracy. We recognize that news items are simplifications or “frames” of reality, which may, therefore, contain biases. These biases can be identified by contrasting said frames with the academic and sectorial perspectives on the same subject.

Fourth, to conclude, based on the previous analysis, we are in a position to propose a proactive crisis detection and management model that could be used by the sector to counteract news framing that may lead to agri-food crises. As a summary, the methodology used can be seen in Fig. 3.

Results and discussion

The position of the European media and its relation to the academic literature. The mass media sector in Spain has undergone several crises in the last decade, significantly impacting its perceived image. The Spanish greenhouse sector consistently faces crises that pose both threats and opportunities, requiring organizations to adeptly respond. Despite concerted efforts, recurring crises stem from the ineffective management of common issues within the Spanish horticulture sector.

Table 1 outlines the crises experienced by the sector, with a notable focus on immigrant workers’ status and environmental concerns. It is crucial to note that health issues related to pesticide traces ceased to be the dominant topic after 2011, following a false accusation of deaths attributed to E. coli-contaminated Spanish vegetables (Pasiliao, 2012). Over the past decade, a single Rapid Alert System for Food and Feed (RASS) incident occurred, involving pesticides in Spanish fruit and vegetables, specifically melons.

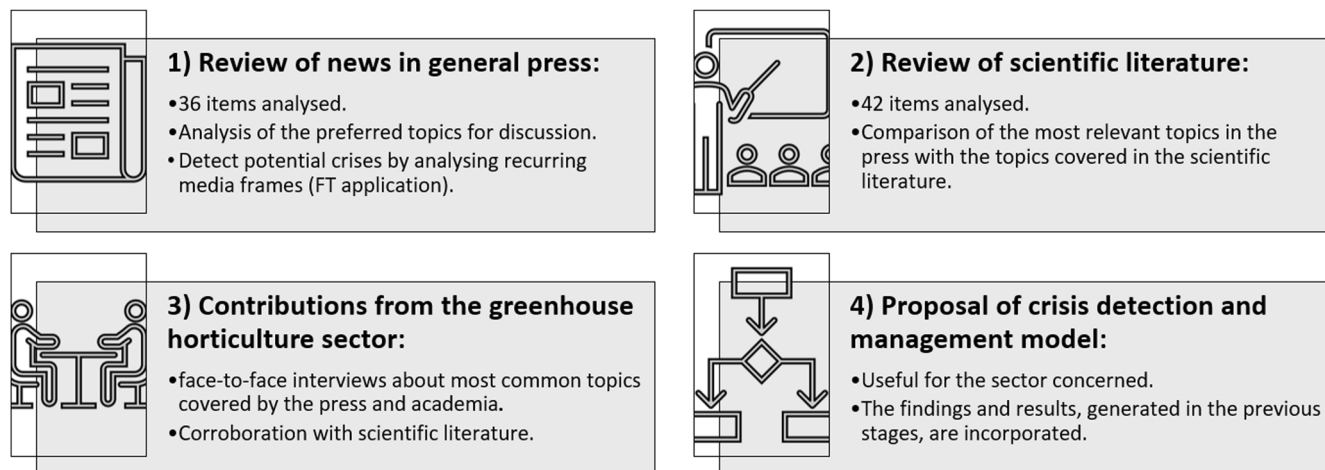


Fig. 3 Summary of the methodology used. The figure shows the methodology followed. It starts with a review of the general press to obtain the most relevant topics. This information will be contrasted with scientific literature and the opinion of representatives of the greenhouse sector. By analyzing the findings from these phases, a response model can be developed for the sector to address crises stemming from biased news framing, among other factors. Source: Authors' own elaboration.

Analysis of news headlines and content reveals subjective approaches, including the defense of tomatoes grown in France, Spain's top competitor in organic horticulture, and support for local crops during Brexit negotiations in the United Kingdom. Some topics exhibit eclecticism. International news is primarily disseminated in importing countries, reflecting strong loyalty to the "local" production sector. These patterns align with a well-established ethnocentric tradition, where the commitment to purchasing domestic products and boycotting foreign products is expressed economically (Ma et al., 2020).

In this context, numerous local companies strive to promote ethnocentrism, aiming to foster consumer preferences for local goods, encompassing products, services, and brands. The Spanish case serves as a paradigm, illustrating these practices and highlighting that news originates from media sources with clearly defined politically oriented editorial perspectives. Nevertheless, it is evident that this type of news generally lacks the inclusion of opposing opinions outside the mainstream.

Alternatively, prevalent news frames may suggest an unresolved problem. Figure 4 affirms that issues like "denunciations of illegal working conditions," the management of "plastics," and other environmental concerns are noteworthy points of conflict deserving special attention. Additionally, the sources used in the news (Fig. 4, right) indicate a focus on accusations made by immigrant workers or labor associations on behalf of this group. It is crucial to note that many news items are indirectly derived from previously published stories. Unfortunately, business sector associations, academia, and experts are seldom consulted when addressing such issues, contributing to a prevailing sensationalistic approach in the media's treatment of the sector.

In this context, FT elucidates why the media provides increased coverage to contentious science topics, such as environmental contamination, and trending subjects like immigration. Indeed, the study area itself possesses distinctive features that attract media attention: (i) extremely arid and desert landscapes, (ii) an exaggerated concentration of greenhouses ("the sea of plastic") consuming water resources and generating waste, and (iii) a geographical location amidst illegal immigration routes from northern Africa, characterized as one of the most unequal borders globally. These elements collectively create an ideal context to amplify the content of any given news item. In essence, southeast Spain emerges as an optimal focal point for media attention, irrespective of the conveyed message, capturing considerable

interest from followers of major media outlets, as indicated in Table 1.

Similarly, it is noteworthy that a relationship seems to exist between the number of scientific articles and news coverage in the general press (refer to Fig. 5). An examination of the origins of the authors of scientific articles, primarily affiliated with local universities and supportive of the greenhouse horticulture system, suggests that the surge in publications in recent years (2018–2020) may be a reactionary response aimed at justifying the prevailing production model within the sector.

The analysis of academic documents revealed a series of investigations highlighting various negative aspects associated with the sector: (i) substandard social conditions for immigrant workers (Du Bry, 2015; Chesney et al., 2019; Medland, 2016; Pumares & Jolivet, 2014); (ii) environmental degradation (Grindlay et al., 2011; Juntti & Downward, 2017); (iii) excessive use of fertilizers and pesticides leading to diminished production and consumption quality (Wainwright et al., 2014); and iv) adverse synergies arising from the intensive agriculture model (Díaz & Reigada, 2018).

In addition to the negative aspects, some findings indicate improvements made by the sector in recent years concerning economic, social, and environmental sustainability. In summary, while there are insightful articles addressing each dimension individually, there is a noticeable absence of integrative analyses addressing the overall sustainability of the sector. This gap suggests a potential avenue for future research. These references have been compiled in Table 2 to substantiate the arguments presented by sector leaders.

Position of local grower associations and its relationship with the academic literature. Table 2 displays the opinion of the sector summarized in terms of socio-economic and environmental achievements. It is worth highlighting that these positive arguments are published in local and specialized media, yet seldomly in general national and international media. This discrepancy then poses the question of whether this imbalance is the result of inaction on the part of the sector at origin to improve their marketing efforts or, instead, the information bias of the media. As far as the sector is concerned, in most cases, attempts have been made to contact the authors/editors of the negative news with the aim of providing an alternative viewpoint.

Table 1 Classification and examples of crises: a chronological review of the Spanish horticulture sector.

Country	Media	Date	Description
England	The Guardian (Newspaper)	Feb-11	The report criticized English supermarkets for selling Almerian vegetables because this production area was taking advantage of the economic crisis to "exploit" illegal immigrants.
Holland	Omroep NI TV	Mar-11	Under the title "Pact Van de Stille", a report was issued which presented an unfavorable image of illegal immigration in the province of Almeria.
Germany	ZDF TV	May-11	A report on the outbreak of infections caused by E. coli bacteria in cucumbers, noting that the problem was in the handling process of Spanish companies.
Germany	FOCUS (Magazine)	Jan-15	Spanish-origin tomato was associated with high use of pesticides. They linked the production system to the employment of mostly illegal immigrants.
England	Channel 4 TV	Apr-15	An unfavorable report alleging situations of labor abuse by commercialization companies on the farms of Murcia and Almeria.
Germany	3 SAT TV	Jan-16	The report questioned the working conditions of migrant workers in greenhouses, qualifying the production area as a slave sector.
France	France 2 TV	Feb-16	A news report presented the situation that Andalusian farmers were experiencing due to price drops, highlighting the misuse of income generated in the past.
Spain	La Sexta TV	Apr-16	Serious accusations regarding the destruction of millions of kilos of fruit monthly and the production systems in El Ejido (Almeria, Spain).
France	France 5 TV	Apr-16	This news report dealt with the recent evolution of organic farming in the area of Almeria. It was addressed from a biased point of view.
France	Franc 5 TV	Oct-16	"The dark side of low-cost organic production" (La face cachée du bio low cost) criticizes the organic production system in southeast Spain.
England	The Grocer (Magazine)	Feb-17	A report that supply problems due to poor farming conditions (cold) in the south of Spain caused the increase in prices in British stores. The consumer was led to believe Spain did not want to supply the United Kingdom.
Germany	ARTE TV	Apr-17	The main idea of the report was: "Fruits and vegetables in supermarkets thanks to an exploited workforce".
Spain	El Confidencial (newspaper)	Jul-17	"The Black Market of pesticides: how your shopping cart is poisoned".
Switzerland	Schweizer Radio und Fernsehen (SRF)	Mar-18	"Vegetables in Spain: miserable salaries for harvesters", denounces the illegal hiring of immigrants.
Germany	ARD Das Erste TV	Jul-18	The report accused Spanish and Italian farmers of selling cheaply thanks to the exploitation of workers
Holland	Financiële Dagbla (newspaper)	Aug-18	This report denounces the exploitation of immigrant manual labor.
England	BBC 2 TV (documentary)	Oct-18	A report denouncing the dumping of greenhouse plastics into dry riverways and the working conditions for immigrants.
Spain	Cuatro TV	Nov-18	Program <i>Punto de Mira</i> : aims to demonstrate the massive consumption culture throughout the year, at the cost of taste and quality of vegetables.
Spain	Al rojo vivo, La Sexta TV	Dec-18	A report denouncing the living conditions of immigrants.
Spain	Julia en la Onda (Onda Cero radio station)	Dec-18	Panel speakers denounce "the increasing wealth of farmers thanks to the immigrant labor force".
Spain	El Mundo (Newspaper)	Dec-18	An article denouncing the illegal hiring of immigrant workers and the existence of shanties.
Germany	Die Tageszeitung (Newspaper)	Jan-19	It dealt with the bad relationship between immigrants (working in greenhouses) and the local population in Almeria (Spain)
France	Canal M6 TV	Feb-19	This report denounces how cooperatives abuse their workers (food handlers and packagers)
Germany	Deutsche Welle (Radio station)	Feb-19	A report about the problem of migratory flow in the region (southeast Spain) and farmers
Germany	Der Spiegel (Magazine)	May-19	"Hell in the greenhouse: grave working conditions of workers in plastic greenhouse farms".
Spain	El Pais (Newspaper)	Jul-19	Article denouncing the plastic waste generated by intensive vegetable farming in southeast Spain.
France	Le Monde	Sep-19	"Hell in organic tomato greenhouses" denounces the conditions of organic produce in Almeria.
France	France 24 TV	Oct-19	A report denouncing the water usage and the contamination caused by the plastics in greenhouse agriculture.
International	Al Jazeera TV	Nov-19	A report on the working conditions of immigrant workers in greenhouses in Almeria.
Spain	Publico (Newspaper)	Nov-19	News article describing how immigrant manual labor generates farming wealth in southeast Spain
France	ARTE TV	Nov-19	A report denouncing the water usage and contamination caused by plastics in greenhouse agriculture
France	Publico (Newspaper)	Mar-20	This article denounces the horticulture production system in Almeria (Spain): "Taste, contamination: Stop tomato farming in winter!"
Spain	ABC (Newspaper)	Apr-20	Article highlighting the presence of shanty towns near greenhouses, linking agriculture with illegal immigration.
England	BBC (Webside)	Apr-20	This report denounces the working conditions of the immigrant work force. Defends local production in the United Kingdom versus imports to combat COVID food shortages.
England	The Guardian (Newspaper)	May-20	This report denounces the existence of shanties and links them to agricultural labor in southeast Spain
Spain	El Pais (Newspaper)	Jul-20	Denounces the existence of pesticides in vegetables from southeast Spain

Source: authors' own elaboration.

Findings and discussion. The comparison between press information and the verified opinion of the greenhouse-producing sector reveals the presence of information biases in mass media, potentially influencing the image and reputation of a business sector abroad. The analysis of this specific case highlights conflicting perspectives, with the general media denouncing the situation while representative sector organizations and scientific articles defend it.

The examination of news reports in the press (Table 1) indicates that, in some instances, they are based on academic

studies analyzing crises within the Spanish horticulture sector. However, in other cases, they seem to stem from preliminary information, reflecting opportunistic scenarios. To enhance impartial reporting and confirm accuracy, it is advisable for the mass media to approach the sector of origin, seeking contrasting positions or alternative views, and potentially consulting opposing academic viewpoints. Such actions would contribute to countering the emerging trend of biased news. From the sector's perspective, verifiable facts attest to ongoing efforts to improve and evolve, which unfortunately remain unknown to end

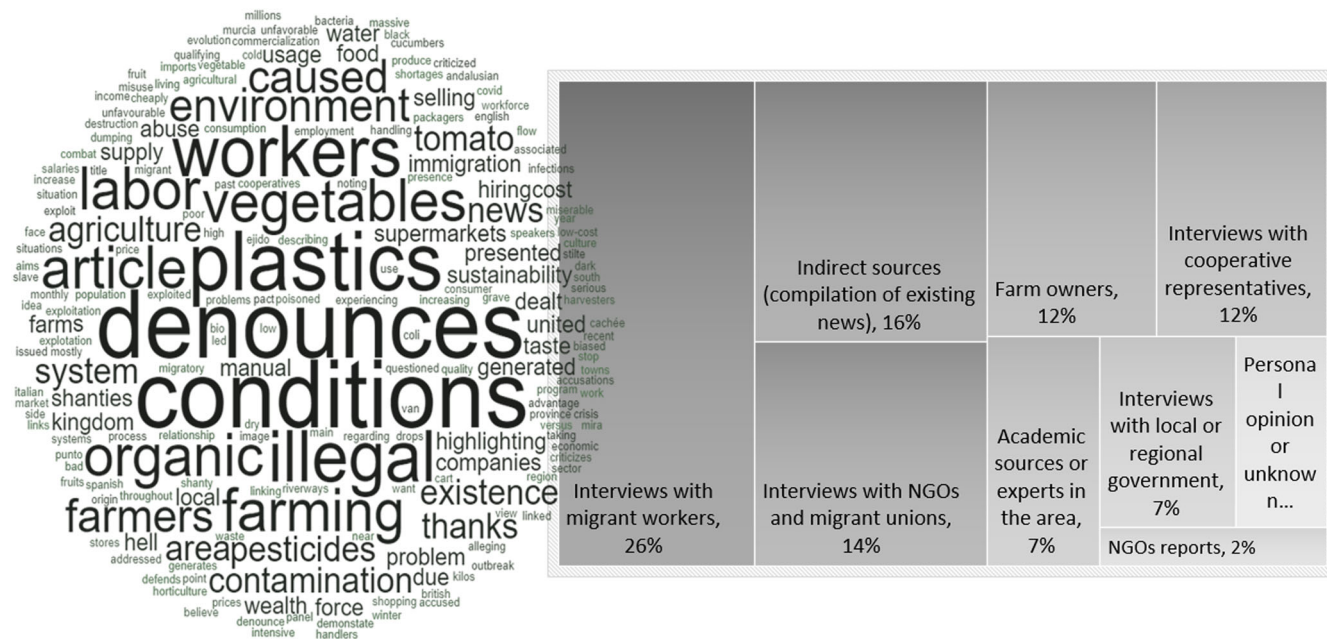


Fig. 4 Most important issues covered by the media (left) and sources of data used (right). Figure on the left, shows a cloud of concepts most frequently used in the news. Social aspects and waste generation are the most relevant issues. On the right, the sources referenced in the news items have been summarized. Interviews with migrant workers and the compilation of past work are the most common news sources.

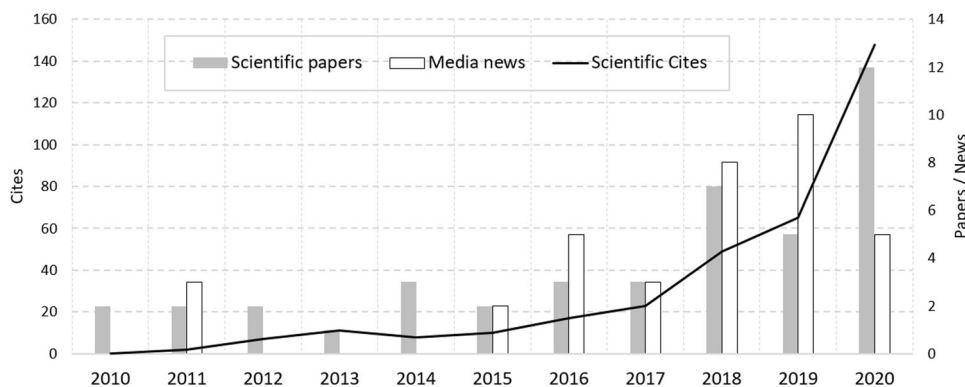


Fig. 5 Evolution of scientific articles and news in press related to greenhouse horticulture in southeast Spain. The figure shows the relationship between the number of scientific articles and news in the general press. A certain similarity can be detected between the evolution of the two sources. Source: authors' own elaboration.

customers due to the gradual nature of the process and its lack of newsworthiness.

Despite academic literature presenting a balanced view of arguments for and against the sustainability of the horticulture sector, the news analysis conducted herein indicates a general focus on negative aspects in the media. This aligns with previous research indicating a relationship between news framing and consequences for the involved sector (Feindt & Kleinschmit, 2011; Rust et al., 2015; Sievert et al., 2022). Biased utilization of news toward negative aspects is evident, impacting the sector (Gibson et al., 2020; Rust et al., 2021; Jones et al., 2022). The study also verifies the partial use of academic sources (White & Rutherford, 2012). Notably, the study identifies general factors beyond individual interests that explain the negative bias in news, suggesting biases may exist across sectors. In the case study, negative and biased opinions toward the greenhouse sector are evident in media from countries with competing agricultural production, such as France and the Netherlands. The German

and British press, on the other hand, seem influenced by strong non-governmental environmental organizations. In the Spanish case, media opposing the sector exhibit more progressive editorial lines, with some leaning toward liberal tendencies.

From a theoretical perspective, this article adopts a holistic view of a complex process that resists isolated study. Although news and ideology, news framing, news coverage, and image repair are sometimes considered different theoretical perspectives, we argue that they form a closely connected set of concepts.

Proposition of a proactive image crisis detection and management model

Regarding additional considerations, it is evident that associations representing agricultural sectors should establish a response protocol aimed at disrupting the information asymmetry existing between farmers and consumers. Achieving this requires consumers to be aware of the efforts made by farmers, introducing a new field of study beyond the conventional concept of

Table 2 Socio-economic and environmental achievements of Almeria (Southeast Spain) defended by producers and sector associations.

SOCIO-ECONOMIC ASPECTS	ENVIRONMENTAL ASPECTS
<p>SOCIAL MODEL (Giagnocavo et al., 2018; Aznar-Sánchez et al., (2011))</p> <ul style="list-style-type: none"> - Key role in organizing the small-scale producers (less than 3 hectares per farmer). - Family-operated farms maintain the economic viability of local communities, favoring business entrepreneurship, social capital and equality. - Model based on Cooperatives (62%): <ul style="list-style-type: none"> o Important element in the continuing education, training and work integration of farmers and workers. o Their objectives go beyond merely maximizing profits (generator of employment and equality). o Offer specialized courses and work integration programs for disadvantaged groups. 	<p>WATER (Piedra-Muñoz et al., 2018; IFAPA. 2016; Galdeano-Gómez et al., (2016))</p> <ul style="list-style-type: none"> - Crop production on Almeria farmland was made possible thanks to the presence of underground water resources. However, over time, the availability of water was diversified with alternatives, such as the use of wastewater (to recharge aquifers or for direct use, after being properly treated), as well as the use of desalination plants. - There are continuous investments in technologies and environmentally-friendly practices. - The producers have clearly understood that water is a very valuable resource, which is why they have introduced techniques designed to reduce consumption during the transformation of the local agricultural model: <i>enarenado</i> (method using surface sand layer to trap moisture), drip irrigation and fertigation, rainfall capture - utilized on practically all farms. - Almeria consumes half the water than the average of all other Spanish agriculture, with a water footprint that is 20 times smaller.
<p>EMPLOYMENT & IMMIGRATION (MESS, Ministerio de Empleo y Seguridad Social (2017); Livre Blanc, 2017; OPAM, Observatorio Permanente Andaluz de las Migraciones (2017))</p> <ul style="list-style-type: none"> - 65% of contracted workers are foreigners, a testament to the legal integration of immigrant workers. - An average of 31,500 foreigners work in agriculture in Almeria, with more than 100 nationalities. - Source of employment for women: 70% of workers are women; 30% among cooperative agricultural engineers. - The wages for manual labor in Spain for vegetable production are in line with other European countries, and are even higher than in countries like Italy and Belgium). Outside the EU, countries like Morocco (direct competitors) pay up to 90% less than Spain for manual labor. - 100% of farms and commercialization companies follow labor risk prevention plans. - Located in one of the largest illegal immigration routes in the world. (It is one of the most unequal borders worldwide in economic terms, more so than that existing between Mexico and the USA). - Almeria has drastically decreased infractions related to "Employment and Immigration Laws" (illegal hiring). - The law imposes fines of over €100,000 and prison sentences (up to 5 years) for illegal hiring. - All illegal immigrants have immediate access to free healthcare protection and education for minors under their tutelage. 	<p>DECREASING PESTICIDES: (CAP, 2020; Castro et al., 2019; EFSA, European Food Safety Authority (2017); IFAPA. 2016; CAP, 2016 Van der Blom et al., 2010)</p> <ul style="list-style-type: none"> - Integrated Pest Management (IPM) has been in constant evolution and Almeria became the world leader in the successful use of this practice, although now they invest in other biological solutions as well. - One of the key goals of implementing biological control, which has been achieved, is the tremendous decrease in chemical waste, which is under the values of other European agricultural systems. - Biological control has led to the presence of 15% organic production among the entire land area, making it the European leader in this segment. - More than 90% of farmers comply with certification systems and good agricultural practice standards in the field (Global GAP, etc.) - Almeria has become the region with the highest concentration of agricultural analysis laboratories in Europe because of the large number of tests that must be conducted on samples to comply with the demands of quality standards imposed by customers. - 100% of companies have their own traceability system - the result of demands from large distribution chains, European regulations and certification standards - which can trace each product from the farm to fork.
<p>TERRITORY MANAGEMENT (Galdeano et al., (2013)):</p> <ul style="list-style-type: none"> - Intensive production models optimize the use of land, water and inputs in relation to extensive farming. - Greenhouses only occupy 3% of the province of Almeria, 50% of which is protected land. - Population growth contrary to rural depopulation across Europe. 	<p>WASTE MANAGEMENT (Duque-Acevedo et al., 2020; Giagnocavo et al., 2018; Egea et al., 2017; Tolón & Lastra, 2010):</p> <ul style="list-style-type: none"> - Decreasing ecological footprint is also found in the Rural Hygiene Plans - Plant waste generated in Almeria has great potential to be reutilized following the principles of circular economy- - Revaluation of approximately 25% of total biomass managed; for example, to produce electric energy. - Practically all plastics are properly removed, of which 80% undergoes revaluation.

Table 2 (continued)

SOCIO-ECONOMIC ASPECTS	ENVIRONMENTAL ASPECTS
<p>ECONOMIC VIABILITY & EQUALITY (Giagnocavo et al., 2018; EU, 2017):</p> <ul style="list-style-type: none"> - Relatively equitable distribution of income: moved Almeria from last position of per capita income (1950s) to the national average - Intensive horticulture in southeast Spain has been developing thanks to family investments and capital, with scarce to no subsidies. - The subsidies for European horticulture production represent 1.9% of total revenue – a value which is quite inferior to the cases of other crops: cereals (52.7%) or olives (33.3%). - Family farms maintain the economic viability of the local communities, favoring business entrepreneurship, social capital and equality. 	<p>ENERGY & CLIMATIC CHANGE (Carreño-Ortega et al., 2017; MAPA, Ministerio de Agricultura (2015); Valera et al., 2014):</p> <ul style="list-style-type: none"> - Major concerns for improving the use of resources and infrastructures (exploiting renewable energy), for example, photovoltaic. - Most of the existing greenhouses in Almeria operate on the exclusive use of natural ventilation and the technique of whitewashing rooftops as climate control systems, creating “solar greenhouses” that do not require heating from fossil fuel energy. - The total energy needs of greenhouses in northern Europe are up to 30 times higher than the solar greenhouses in Almeria. - Each hectare of greenhouses in Almeria is capable of fixing 8-10 tons of CO₂ annually, or, in other terms, each hectare absorbs the daily emissions of 8 cars.
<p>Source: Authors' own elaboration.</p>	

information asymmetry in the agricultural sector (Minarelli et al., 2016; Verbeke, 2005). To address this, it is proposed to implement an action plan based on controlling, tracking, and rectifying potential crises affecting an agricultural sector while countering biased news in the media (Fig. 6). Numerous studies have explored how organizational or sectoral crises should be managed, considering internal factors (organizational preparedness and learning processes) and external factors (stakeholder relationships) (Bundy et al., 2017). Crises can be reactive, occurring post-crisis, or proactive, with managers anticipating crises (Batorski, 2021). The proposed model seeks to integrate internal and external perspectives in a proactive approach, recognizing that crisis response strategies are more effective when coupled with sincere efforts to address underlying issues (Gillespie & Dietz, 2009). Additionally, emerging research explores the influence of social media on an organization's crisis management efforts (Utz et al., 2013; Sellnow & Seeger, 2021).

In practice, this Proactive Crisis Detection and Management Model (PODM) must initially establish a classification of potential crises that pose risks to image and economic viability (Pérez-Mesa et al., 2019). Crises may be predictable and detectable in advance through the use of indicators. In some cases, a single factor, such as the detection of trace chemicals exceeding allowed limits, could trigger an unforeseen crisis. The use of indicators and diagnostics aids in predicting random crises, imbuing the model with a proactive nature. Aligning with Alpaslan et al. (2009): “Get the worst about yourself out on your time before the media dig it.” For negative news, tracking such information, as illustrated in Table 1, serves as a detection strategy (indicator) for other potential crises (e.g., health-related, environmental, or social) that become chronic occurrences. Recurrent frames signal unresolved problems guiding the sector toward image restoration. These indicators prompt the implementation of corrective measures in the medium or short term, such as increased chemical analysis controls and reporting illicit activities to authorities.

These actions should be communicated and disseminated promptly by the sector, balancing speed with strategic precision. Proactive communication is essential, with emergency reactive responses launched when necessary, always ensuring that information is received and assimilated by end consumers. Social media, in particular, can effectively inform the public about risks, preventing confusion and scaremongering (Regan et al., 2016). In cases where indicators reveal chronic situations, a long-term or partial redefinition of agricultural activity

becomes necessary. This requires coordination among companies, authorities, and other stakeholders to define the desired future and establish a comprehensive long-term strategic plan for successful implementation. The described steps aim to contribute to a body of scientific knowledge, fostering collaboration with academic institutions (universities or research centers) to publish scientifically supported arguments validating the implemented structural improvements. These verifiable arguments should form the foundation of a stable communication strategy over time, progressively reducing the information asymmetry between the actual work carried out by growers at the origin and the perceived image by end consumers. The objective is to establish a unique production-consumer identity through multimodal communication (Coombs, 2014; Knight & Tsoukas, 2019), encompassing newspapers, television, social media, and rallies.

During the model's implementation, information generated by the sector should be verified with other stakeholders (customers, society, research centers, etc.) to incorporate diverse perspectives (Alpaslan et al., 2009). Comparative studies must also be conducted to compile data on other production circumstances (in other countries, with different systems, etc.).

The proposed scheme aligns with lessons learned from past sectoral crises (Crichton et al., (2009); Batorski, 2021), involving: (i) analyzing cumulative information on incidents and assessing the success of interventions and modifications; (ii) efficiently disseminating information on incident causation and suitable interventions/modifications to all stakeholders; (iii) implementing a system to ensure that lessons learned endure; iv) acknowledging that this process demands substantial resources, dedicated effort, and commitment from the involved entities; and integration into the organizational or sectoral culture.

Conclusions

Traditionally, the term “crisis” in the agrifood sector has been linked to situations affecting consumer health. Over time, the concept has broadened to encompass negative situations related to environmental sustainability, social issues, and economic challenges. These crises significantly impact the perceived image of products, sectors, or even entire countries among consumers. In today's digital age, the role of information is pivotal in shaping consumer opinions. The biased use of such information can trigger substantial crises in the agrifood sector, necessitating an exploration of effective crisis management strategies.

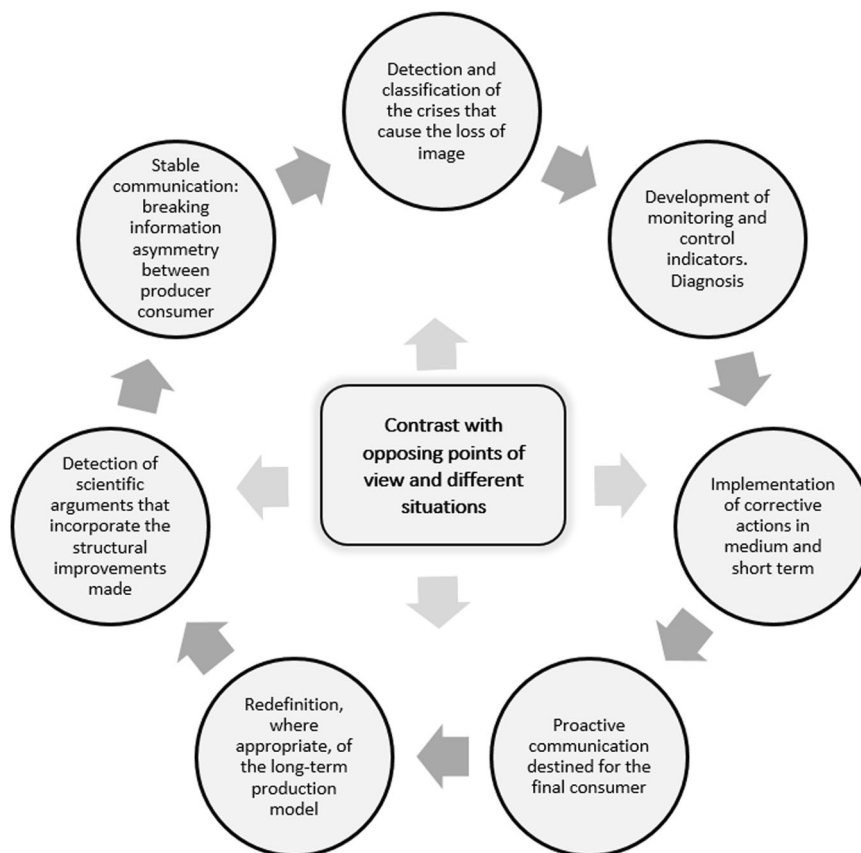


Fig. 6 Proactive crisis detection and management model (PCDM) applicable to agri-food sector. The figure shows the stages of the PCDM model. It is about detecting, quantifying, diagnosing, implementing solutions and being able to communicate accurate and scientifically verifiable information to consumers. Source: own elaboration.

Citizens' and consumers' information consumption habits are undergoing significant transformations. The complexity of obtaining impartial information is exacerbated by the multitude of available sources. General media outlets, facing digital competition and traditional format challenges, may succumb to pressures to maintain audience levels, potentially resulting in biased information dissemination. For sectors or companies, the presence of negative news can lead to irreparable damage, particularly in the highly sensitive agrifood sector, where consumer health is a central concern. While much negative news is well-researched and tied to food crises, there is a growing body of information addressing environmentally and socially detrimental situations. It is important to note, however, that some news items may be spurious and biased, intentionally seeking to denigrate a company or sector. This approach aligns with the post-truth mechanism, aiming to manipulate consumer opinions.

In the specific case of the analysis of greenhouse horticulture in southeast Spain, the news draws on topics previously addressed in the scientific bibliography. However, a significant portion of the presented news exhibits a negative bias, often lacking the alternative perspective provided by growers' representatives, which is verifiable through official sources and academic literature. Instead, this alternative viewpoint tends to be relegated to local and specialized media outlets, contributing to information asymmetry between producers and consumers. In response, it is imperative for producers, companies (cooperatives), and sector associations to establish an action plan, such as a Proactive Crisis Detection and Management (PCDM) model, to detect, quantify, diagnose, implement solutions, and communicate scientifically verifiable information to consumers. The ultimate aim is to

empower consumers to form their own objective opinions. Within this context, social media should assume a crucial role, incorporating the opinions of producers and their representatives by default in their news. Media outlets should also juxtapose their information with alternative competitive situations, such as showcasing the state of similar production areas in France, Holland, Morocco, Turkey, Senegal, Egypt, etc. This benchmarking process, if maintained objectively, would mitigate subjectivity in the presented information.

This article exhibits notable limitations as it grapples with a complex situation requiring the inclusion of multiple perspectives, encompassing not only economic considerations but also sociological, journalistic, agronomic, and environmental viewpoints. While applied specifically to greenhouse horticulture, the analysis methodology could be extended to other agrifood production sectors to evaluate media coverage regarding their specific environmental concerns. A pertinent example could be the meat sector, which faces significant pressure in both social and academic spheres (Moran & Blair, 2021) and is confronted with an existential threat to livestock production due to evolving consumption decisions and investors seeking to mitigate potential liabilities related to greenhouse gas emissions.

Data availability

Bibliographic data analyzed and used are reflected in the article or come from open access databases for researchers. The collection of press releases made available to researchers by the agricultural sector associations (APROA-HortiEspaña) is considered

confidential. Nevertheless, any clarification on further details can be requested from the corresponding author.

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Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

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