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

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Abstract

Nowadays the narratives presented in the media often display serious contradictions due to the fact that various interests are at play. Within this framework, information framing becomes paramount in the shaping of consumer opinions and, therefore, how that is managed must be analyzed. This article studies how crises in the agri-food sector are reflected in the mass media when they are not based on objective and verifiable facts, ultimately affecting the sector's reputation and public image. More specifically, an analysis is conducted of the greenhouse horticulture sector in southeast Spain - the leading European supplier. The analysis of these news items reveals a stream of bias in the information being supplied, thereby fostering an asymmetry in the information between the farmer and the consumer. As a solution for the sector concerned, the present study proposes the implementation of a proactive crisis detection and management model based on the development and dissemination of verifiable information.

Keywords: image crisis, reputation, mass media, sustainability, information management, vegetables, framing news theory

1. Introduction

When addressing crises, the ability of the media to recognize and utilize suitable news sources is crucial for delivering effective and trustworthy news coverage. Consequently, it is imperative to identify the factors that influence 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 taking place in the agri-food sector are reflected by general media outlets in Europe and how they can affect its image and reputation. In fact, this article defends the argument that the management of information by the media can prove to be an influential source of crises on many occasions, as occurs with crises concerning aspects related to health standards and sustainability. With the aim of analyzing the scope of the information published in the media, this article compares these news items with the opinion of the affected sectors while also examining any existing academic studies that may be pertinent.

More specifically, the study focuses on Spanish greenhouse horticulture production. This production model (with its maximum expression in the province of Almeria) is barely 60 years old, and it is also an example of endogenous economic development starting from drastic conditions of poverty (Galdeano-Gómez et al., 2017). Not until exportation began in the early nineties did European mass media and academia begin to pay attention to this area (Tout, D. 1990). Characteristics such as its harsh arid climate, the highest concentration of plastic cover greenhouses in the world, and its geographic location along illegal migration routes increased the region's allure even further. Unfortunately, the sector's growth was not without its flaws, namely the rampant use of pesticides and local environmental degradation (Izquierdo et al., 2004). A pivotal turning point came in 2007 when large chain supermarkets, mainly from Germany, refused to purchase from Almeria due to the presence of chemicals in vegetables. Consequently, the sector promptly reacted to this dire scenario and in only one year southeast Spain became the largest user of Integrated Pest Management in the world and completely abandoning the uncontrolled use of chemicals (Van der Blom et al., 2010). Nonetheless, the sector has been stigmatized ever since. In 2011, the Hamburg government falsely attributed responsibility for several E-coli cases to Spanish vegetables, resulting in substantial economic repercussions for the sector (Pérez-Mesa et al., 2019), as well as widely negative media impact (Van Asselt et al., 2017). From that point forward, the horticultural sector in question found itself the object of unjustified campaigns conducted by European press. In the years that followed, the attention of mass media and academia focused on environmental issues and social inequality. On the whole, this situation has affected the opinions of consumers, who believe that greenhouse products from southeast Spain are of inferior quality and generate negative externalities (Sirieix et al., 2008; Serrano et al., 2020).

At present, Spain exports greenhouse vegetables to the European Union (EU) worth €6.2 billion (ICEX, 2021). Almost 300 million people are consumers of vegetables from Spain, which is 40% of the European population. Currently, the production of the Spanish horticulture sector exceeds 4.5 million tons, cultivated in 42,000 hectares of greenhouse, mainly in the province of Almeria (31,500 ha). Most production is destined for export (75%): 27% to Germany, 16% to France, 15% to the United Kingdom, and 9% to the Netherlands, while merely 25% remains in Spain. With respect to the distribution channel, the main customers are the largest European retailers (e.g., Aldi, Edeka, Tesco, Carrefour, and Lidl, among others), accounting for 70% of Spanish producers' sales (Pérez-Mesa & Galdeano-Gómez, 2015). These retailers establish high production quality standards, as well as encourage social responsibility and respectable environmental practices. Nevertheless, those practices, many of which the end consumer is unaware of, can be distorted by the negative influence of the mass media through the generalization of inadequate management on the part of a minority in the sector. This aspect, combined with growing environmental awareness and concern about food safety by end

consumers, may gradually deteriorate the image and reputation of this sector (Pérez-Mesa et al., 2019). In fact, it can be observed that a great deal of negative news has affected how consumers perceive the sector's image, and much of this information comes from academic sources (Días & Reigada, 2018). Nonetheless, there are also facts which reflect a different reality, such as scientific evidence defending the health standards, sustainability and efficiency of the sector (Castro et al., 2019).

The primary objective of the present study is to determine whether the framing of news, based on the information sources used, can influence the creation (or spread) of crises in the agri-food sector. Such situations can affect the sector's viability, revealing that the role of the media is much more influential than any objective and accurate information that can be supplied by either the sector or specialized academic studies. In this regard, a potential monitoring and control scheme is presented, which could be managed by the affected sector. The quality of the problem analysis, specifically examining how media framing can lead to image crises in the horticultural sector, can favor the likelihood of an effective and efficient response to correct its effects. More specifically, this article seeks to determine whether the damaged external image and reputation, in the case of the Spanish greenhouse horticulture sector, is due to negative news that fails to analyze solutions and opinions supplied by the sector itself or those supported by credible and verifiable sources.

Apart from the specific case study, this paper contributes to the literature in several ways: i) extending the consequences of the framing of news generated by mainstream media, focusing on their role in the creation and propagation of agri-food crises; ii) analyzing the origin of bias in this framing and how sources are used; and iii) proposing a monitoring and control scheme, managed by the affected sector, based on a more comprehensive understanding of the aforementioned aspects.

2. Conceptual framework: media framings and image agricultural crisis

2.1. Media framing theory in agriculture.

This work explores how the media and communication shape the way people perceive and interpret information, potentially leading to image crises that may affect companies or sectors. One of the fundamental theories that addresses this issue is Framing Theory (FT). It suggests that the way information is presented or "framed" can influence how people understand and react to it (Shaw 1979). In other words, the media can manipulate discourse to set agendas (Adams et al., 2014; Rust et al., 2021). In summary, FT suggests that how information is presented in the media influences how people perceive and understand it. Frames can also alter perceptions of topics by manipulating tones, which can alter public support of policies (Rust, 2015). Media frames, created by journalists and other actors, simplify and direct attention to certain aspects of a topic, affecting public perception and decision-making. The framing process involves three stages: inputs (objectives, ideologies, other media features), processes (frame construction by journalists, including sources used), and outcomes (how the public perceives the information).

In general, scant attention has been devoted in the literature to the influence of specific newspaper characteristics on the performance of their reporters. Research indicates that reporters, information subsidies, newspaper circulation size, and location have an impact on the attributes of sources and the type of information provided. For example, research has highlighted the reliance of reporters for larger, regional, and national newspapers on news subsidies (Lehman-Wilzig & Seletzky, 2012). On the other hand, it is also shown that larger newspapers use a statistically significant greater number of scientists and agricultural scientists as sources (White & Rutherford, 2012). Also, newspapers in larger and more diverse communities give greater coverage to controversial science topics, such as environmental contamination, and trending topics like immigration. This can have implications for specific agricultural sectors that are somehow involved with controversial subject matter in their respective areas. (Bart et al., 2012, Pérez-Mesa et al., 2019). In this regard, some studies have argued that there is an imbalance in

the media due to a higher frequency of negative messages (Boehm et al., 2010). In response, recently, the farming press has tended to use more positive tones rather than negative ones when covering sustainable agricultural practices (Rust et al., 2021), which, unfortunately, has aggravated matters at times due to misdiagnosis (Gibson et al., 2020; Jones et al., 2022).

In summary, we explain the media's actions through the framing of news, influenced by various factors: i) In the initial stage, the media's ideological orientation, scope of coverage, expected impact, etc., play a significant role; ii) in the second stage (frame construction by journalists), the journalist's own perspective and their selection of sources become crucial; iii) ultimately, this framework becomes a simplified and recurring idea, which affects consumer perception. Additionally, the identification of these ideas can be a key point in detecting unresolved problems.

2.2. Media influence in 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, it is poorly understood and has an impact on society and politics*”. Crises are deemed to be negative changes in security, economic, political, social and environmental affairs, especially when they occur unexpectedly and without hardly any warning (Çesmeçi et al., 2013). Generally, a crisis event involves uncertainty about what has occurred, its causes, and what might occur later (Broekema et al., 2018). Some of the most common consequences of crises are the decrease in sales and market shares and widespread negative publicity (Vassilikopoulou et al., 2009). More specifically, in the case of agri-food, the economic impact analyses are few and the task of measuring said impact is complex (Hu & Baldin, 2018).

In the food industry sector, the *Codex Alimentarius* describes 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*” (FAO/WHO, 2013). It is noteworthy that a food safety event can be classified as an ‘accident’ or ‘incident’, which, in turn, can evolve from a minor incident to a major crisis at any moment (Chammem et al., 2018). In this sense, incidents can result in serious health risk or a decrease in well-being to consumers and may lead to widespread consumer concern. It may also generate a disruption of national and international trade, as was demonstrated by, for example, the serious outbreak of the *Escherichia coli* bacteria in Germany in 2011 (Van Asselt et al., 2017). In this particular case, the authorities of the state of Hamburg attributed an infectious outbreak of *E. coli* to cucumbers from Spain, prompting an alert against the consumption of tomatoes, lettuce and cucumbers, which quickly affected all horticulture products from this origin. The large distribution chains cancelled their orders. Although nearly three weeks later the German authorities recognized that the origin of the outbreak was not in Spain, these highly perishable products were no longer marketable. The "official" source had already been reported in the national and international press (Pasiliao, 2012). Consumption was so widely affected that prices fell drastically in both the national and export markets (Pérez-Mesa et al., 2019). In general, following the same pattern, there are several studies that analyze how the framing of a news story influences the state of a sector, for example, the treatment of the German press in the BSE crisis, in which media coverage tended to politicize food hazards affecting industrial agriculture (Feindt & Kleinschmit, 2011); or the present-day impact on the livestock sector of the media’s treatment of red meat consumption (Sievert et al., 2022). For Gibson et al., 2020, research has shown consumers rely primarily on the media for information about agriculture, resulting in misconceptions about its impact on the environment. In this sense, ideology or political trends complement the action of the media and limit the introduction of solutions that are useful for both consumers and producers. This is the case with the use of Genetically Modified Organisms (GMOs), where the public discussion is largely influenced by vested interests without any scientific base (Mathur et al., 2017; Varzakas et al., 2007).

While a food safety incident is an unintentional event, food fraud is intentional and is motivated by economic interests (Chammem et al., 2018). In either case, a lack of specific information, fuelled by mass media coverage, can cause consumers' risk perceptions to be intensified and, consequently, may lead to lower demand for the affected food products (Frewer et al., 2002; Verbeke, 2005). Therefore, food crises can result in strong consumer reactions, significant effects on food export markets, and important political implications (Swinnen et al., 2005). At times, a crisis may also involve an entire category of products, as occurred with the mad-cow disease crisis (Van Heerde et al., 2007).

Within the framework of food crises, it is important 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*" (Hsu et al., 2016). The potential impacts on consumer demand affect the consumption of other product categories as well, in addition to those directly affected. It must be noted that in recent years consumers have become increasingly concerned about the health risks posed by food consumption (Röhr et al., 2005). However, it has become difficult for the general public to assess risks regarding the safety of food. Thus, consumers have to trust producers, retailers, regulators, even the media, to ensure potential health impacts are minimized (Lobb et al., 2007).

In parallel, another type of crisis exists that must be addressed. In this case, its origin does not lie in a particular food safety risk, but rather in the consequences of events or factors that ultimately affect consumers' perception more directly. These situations are most commonly related to production and resulting negative externalities (i.e., environmental impact, working conditions, etc.). In fact, agricultural crises can be categorized according to their relationship with environmental impact, social well-being and/or economic profitability (Reganold & Wachter, 2016). Ultimately, crises can also arise which compromise the economic viability of a company or sector, thereby adversely affecting its future economic sustainability. Such crises may be the result of temporary or structural changes (e.g., decreases in prices or demand, increased competition, and overproduction). It is important to highlight that environmental or social crises, should they become chronic, will have an impact on the economic viability of the company or sector. Similarly, these crises can be the result of mass media coverage. However, on other occasions, crises can emerge from the media due to preconceived or biased ideas, which is equivalent to smear campaigns (Figure 1).

3. Methodology

First, considering the increasing body of evidence on image crises and the Spanish horticulture sector, it is necessary to identify how these crises are addressed in European media. A compilation of news has been carried out using various sources: 1) 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*, yielding a total of 19 documents. The database compiled by APROA and HortiEspaña had a total of 30 news references. From the joint 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 makes it possible to extract the recurrent ideas or frames used by the media, which may serve 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 grey literature. Finally, only 42 publications were included. The search was carried out following the PRISMA scheme for systematic literature review. The summary of the process can be seen in Figure 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 grey literature was revisited.

Combining the news items, research articles, and face-to-face interviews provides a more comprehensive understanding of factual accuracy. We know 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 Figure 3.

4. Results and discussion

4.1. The position of the European media and its relation to the academic literature

The following table lists several crises the sector has undergone in the last ten years in the mass media which have affected its perceived image. In general terms, the Spanish greenhouse sector has continually experienced crises which imply both threats and opportunities, and organizations must know how to respond to these situations. In this sense, despite all efforts, this sector has been affected by recurring crises, many of which arise from the ineffective management of problems common to the Spanish horticulture sector.

Table 1 shows that most of the news is related to the status of immigrant workers and environmental issues. It is important to highlight that health issues (traces of pesticides) have ceased to be the dominant topic since 2011, the year which saw an accusation of deaths attributed to Spanish vegetables contaminated with *E. coli*, which was subsequently proven to be false (Pasillao, 2012). In fact, there has only been one RASS incident (Rapid Alert System for Food and Feed) in the last 10 years, involving the existence of pesticides in Spanish fruit and vegetables (in that case melon). By observing the headlines and reading/viewing the content of the news, certain subjective approaches can be detected. These include the defense of tomatoes grown in France, Spain's top competitor in organic horticulture production; and the defense of local crops grown in the United Kingdom, precisely during the Brexit negotiation process. In other cases, the topics become more eclectic. Apart from the issues already mentioned, it is observed that the international news is exclusively disseminated in importing countries, where there is strong loyalty to the "local" production sector. On the whole, such cases can be explained by the existence of a well-established ethnocentric tradition, which essentially transfers "*the superior feeling of one's own national group into economic actions, expressed in a commitment to purchase domestic products and to boycott foreign products*" (Ma et al., 2020). In this sense, many local companies attempt to promote ethnocentrism in order to encourage consumers to develop a preference for local goods (i.e., products, services and/or brands). The Spanish case is paradigmatic of such practices, demonstrating that the news comes from media sources with clearly defined politically based editorial lines. In any case, it is evident that this type of

news does not openly include opposing opinions that are outside the mainstream.

Alternatively, the most common frames that appear in the news might be indicative of an unresolved problem. In this regard, Figure 4 confirms that “denounces of illegal working conditions”, the management of “plastics” and other issues related to the “environment” are points of conflict which must receive special attention. Furthermore, the sources used in the news (Figure 4, right) reveal an emphasis on accusations made by immigrant workers or labor associations for said group. Moreover, it is important to highlight that many news items are indirectly generated using previously published stories. Regrettably, business sector associations and academia and experts are rarely consulted when such issues are addressed. In short, there is a prevalent sensationalistic approach in the media’s treatment of the sector. In this regard, FT explains why the media give greater coverage to controversial science topics, such as environmental contamination, and trending topics, like immigration. Indeed, the study area itself displays certain features that attract media attention: i) extremely arid and desert landscapes, ii) the existence of an exaggeratedly high concentration of greenhouses (“the sea of plastic”) that consume water resources and generate waste, and iii) a geographical location amidst illegal immigration routes from northern Africa (one of the most unequal borders in the world). Together, these elements create the perfect context to help accentuate the content of any given news item. In other words, southeast Spain is an ideal place on which to focus media attention, regardless of the message conveyed, as it incites considerable interest among the followers of large media outlets, such as those included in Table 1.

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 Stilte", 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 unfavourable 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	Francia 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	Francia 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	France 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

Similarly, it must be noted that there appears to exist a relationship between the number of scientific articles and news in the general press (see Figure 5). The analysis of the origin of the authors of the scientific articles, who are mostly from local universities and favor the greenhouse horticulture system, seems to reveal that the increase in such publications in recent years (2018-2020) is a reactionary response to justify the production model used in the sector.

Figure 4. Most important issues covered by the media (left) and sources of data used (right)

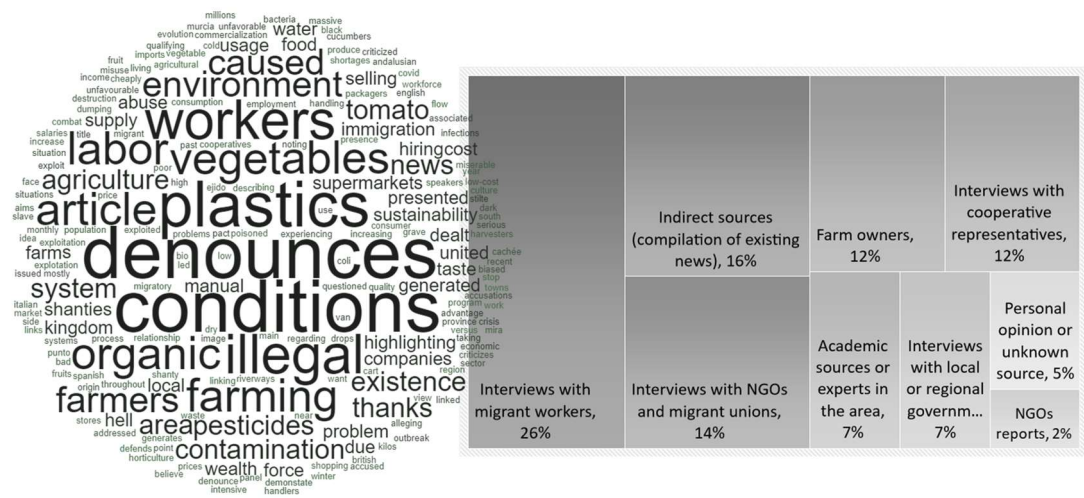


Figure 4 on the left shows a cloud of concepts most frequently used in the news. Social aspects and waste generation are the most relevant issues. On the right, the sources referenced in the news items have been summarized. Interviews with migrant workers and the compilation of past work are the most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

The analysis of academic documents found the existence of a series of investigations that illuminated the following negative aspects related to the sector: i) poor 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) the excessive use of fertilizers and pesticides, resulting in low-quality production and consumption (Wainwright et al., 2014); or even iv) the negative synergies due to the intensive agriculture model (Díaz & Reigada, 2018). Beyond the negative aspects, there were also findings that reflected the improvements made by the sector in recent years in terms of economic, social, and environmental sustainability. In short, although there are very interesting articles on each of the dimensions individually, there is a lack of integrative analyses of sectoral sustainability as a whole. This could be the starting point for future work. These references have been included in Table 2 to corroborate the arguments put forth by sector leaders.

4.2. 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 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 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-Gomez, 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, 2017; Livre Blanc, 2017; OPAM, 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, 2021; Castro et al., 2019; EFSA, 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 Gómez 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.
<p>ECONOMIC VIABILITY & EQUALITY (Giagnocavo et al., 2018; EU, 2017; FEAGA 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, 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.

Source: Authors' own elaboration

4.3. Findings and discussion

The comparison between the press information and the verified opinion of the greenhouse producing sector demonstrates the existence of information biases in the mass media, which could become a key factor in determining the image and reputation abroad of a business sector. The analysis of the specific case identifies the opposing views of the situation, which, on one hand, is denounced by the general media and, on the other, is defended by both the representative organizations of the sector and scientific articles published on the subject.

The analysis of the news reports in the press (Table 1) indicates that only in some cases do they stem from academic studies that have analyzed crises occurring in the Spanish horticulture sector. On other occasions, they are the reflection of merely preliminary information and seem to be the result of opportunistic scenarios. In any case, it would be advisable that the mass media approaches the sector of origin to determine whether contrasting positions or alternative views exist, with the aim of increasing impartial reporting and confirming the accuracy of what is published, or even consulting the opposing academic point of view, if one exists. Such a course of action would undoubtedly help to combat the rising trend of biased news. From the point of view of the sector of origin, verifiable facts exist that confirm an ongoing effort within the sector to continuously improve and evolve, which, unfortunately, is unknown to end customers on most occasions as “it is not news” and is a slow and gradual process. This perspective is corroborated upon analysis of the academic literature. Even if the literature is divided almost equally between arguments in favor of and against the sustainability of the horticulture sector, the results of the news analysis conducted herein indicates that the general news only covers negative aspects.

In general, the findings of this study lend support to previous research showing that there is a relationship between news framing and consequences for the sector involved (Feindt & Kleinschmit, 2011; Rust et al., 202; Sievert et al., 2022). In this regard, a biased utilization of the news towards negative aspects is demonstrated, which ultimately has an impact on the sector

(Gibson et al., 2020; Rust et al., 2021; Jones et al., 2022). Nonetheless, the partial use of academic sources has also been verified (White & Rutherford, 2012). It is also worth highlighting that this study identifies general factors, beyond individual interests, that explain the negative bias in news, aiming for a greater impact on the target audience. In other words, biases are likely to exist regardless of the sector covered by the news. Despite the aspects mentioned, in the case study, a negative and biased opinion towards the greenhouse sector is evident in media originating from countries with competing agricultural production, such as France and the Netherlands. The interest of the German and British press seems to be driven by the strong presence of non-governmental environmental organizations. In the Spanish case, most of the media arguing against the sector have more progressive editorial lines, but there are also some with more liberal tendencies.

From a theoretical perspective, this article incorporates a holistic view of a complex process that defies isolated study. It is sometimes thought that news and ideology, news framing, news coverage and image repair necessitate different theoretical perspectives. However, we contend that they are a set of closely connected concepts.

5. Proposition of a proactive image crisis detection and management model

As for other considerations, it is clear that the associations representing the sectors should establish a response protocol that seeks to disrupt the asymmetry of information existing between the farmer and the consumer. To achieve this, it is necessary for the consumer to be aware of the efforts made by the farmer. This approach opens up a new field of study with respect to the usual concept of information asymmetry in the agricultural sector (Minarelli et al., 2016; Verbeke, 2005). With this aim in mind, it is proposed that a plan of action be implemented that is based on the control, tracking and rectification of possible crises that may affect a given agricultural sector and, at the same time, counteract the biased news appearing in the media (Figure 6). Many studies have analyzed how organizational or sectoral crises should be managed (see review in Bundy et al., 2017) from an internal point of view (organizational preparedness and even learning process) and external (stakeholder relationships). Crises can also be reactive, when anti-crisis actions are made post-crisis, or proactive, when managers anticipate crises (Batorski, 2021). We attempt to unite the internal and external perspectives in a proactive model since crisis response strategies are more effective when paired with sincere efforts to remedy the problems that led to the crisis (Gillespie & Dietz, 2009). Additionally, research is beginning to consider 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 first establish a classification of the potential crises that constitute sources of image loss and, ultimately, economic viability (Pérez-Mesa et al., 2019). In this regard, the crises could be predictable, in as much as they can be detected beforehand through the use of indicators. In certain cases, simply one aspect, for example, the appearance of trace chemicals above allowed limits could trigger an unexpected crisis. In any case, the use of indicators and their diagnostics helps to predict random crises, which imbues this model with a proactive nature. In line with Alpaslan et al., 2009: "*Get the worst about yourself out on your time before the media dig it*". In the case of negative news, the tracking of such information (for example, through the constant monitoring and compilation of news, precisely as shown in Table 1) constitutes a detection strategy (indicator) for other possible crises (e.g., health related, environmental or social) that have become chronic occurrences. Frames become recurrent news, and, most importantly, they are indicators of unresolved problems that can help guide the sector towards image restoration. The indicators would be the signal to implement corrective measures in the medium or short term, for example, an increase in chemical analysis controls and the reporting of illicit activities to the authorities.

Such actions must be communicated and disseminated by the sector quickly (but not haphazardly) and proactively, even if on occasions it is necessary to launch an emergency reactive response, always ensuring that the information be received and assimilated by the end consumer. In this

situation social media can be a good way to inform the public about a risk and avoid confusion and scaremongering (Regan et al., 2016). In the event that the indicators reveal a chronic situation, it would require a redefining of agricultural activity in the long term or at least partially. This measure involves the coordination of companies, authorities and other stakeholders to define the desired future and establish a long-term strategic plan to successfully achieve it. The previously-described steps should serve to create a body of scientific knowledge, for example, through collaboration with academic institutions (universities or other research centers) to publish scientific arguments that corroborate the successfully implemented structural improvements. These verifiable arguments must be the basis of a stable communication strategy over time, one that also progressively undoes the asymmetry of the information between the true labor carried out by growers at origin and the image perceived by the end consumer. The objective will be to create a unique production-consumer identity using its own system, that is, multimodal communication (Coombs, 2014; Knight & Tsoukas, 2019): newspapers, television, social media and rallies. During the implementation of this model the information generated by the sector must be verified with other stakeholders (customers, society, research centers, etc.) to incorporate other points of view (Alpaslan et al., 2009). In addition, comparative studies must be conducted to compile data on other production circumstances (other countries, other systems, etc.).

The implementation of this scheme is in line with lessons learned from past sectoral crises (Crichton, 2009; Batorski, 2021): i) analyzing cumulative information on incidents and evaluating the success or otherwise of interventions and modifications; ii) a process for disseminating information on incident causation and suitable interventions/modifications to all stakeholders, as quickly as possible; iii) a system to ensure that lessons learned stay learned; iv) not forgetting that this process requires substantial resource and dedicated application of effort and commitment on the part of the entities involved; and “absorption” into the organizational or sectoral culture.

6. Conclusions

Traditionally, the term crisis in the agrifood sector has been associated with situations that affected consumer health. The concept gradually expanded to negative situations related to environmental sustainability and social and economic issues. These crises have an impact on the image perceived by consumers of a product, a sector or even a country. In today’s world, information plays a key role in shaping consumers’ opinions. The biased use of such information can provoke major crises in the agrifood sector, which warrants investigation into how these situations can be managed.

The way in which citizens/consumers obtain information is drastically changing. Obtaining impartial information is complicated by the existence of multiple sources. The general media need to maintain their audience levels regarding digital competition and other traditional formats. This pressure, along with the existence of multiple alternative points of view, can lead to bias in information provided. In relation to the sector or company, the presence of negative news can ultimately cause irreparable damage. The agrifood sector is highly sensitive to negative news, given that consumer health is being questioned. Most of the negative news linked to the sector is well researched and related to food crises, but there is increasingly more information addressing environmentally and socially detrimental situations. However, it must be considered that there are also spurious and biased news items that intentionally seek to disparage a company or sector. This method of action equates to the post-truth mechanism that attempts to manipulate consumer opinion.

In the specific case of this analysis of greenhouse horticulture in southeast Spain, the news is based on previous topics addressed in the scientific bibliography. However, much of the news presented is characterized by negative bias, as the information on many occasions fails to include the alternative perspective supplied by the representatives of the growers, which can be verified through official sources and academic literature. Instead, this alternative perspective is relegated to local and specialized media outlets. This situation is creating asymmetry in the information

found between producers and consumers. In this regard, it is vital that producers, companies (cooperatives) and sector associations establish an action plan, for example, a PCDM model, that detects, quantifies, diagnoses, implements solutions, and can communicate to the consumers accurate information that is scientifically verifiable. The ultimate goal is to allow the consumer to be able to form their own objective opinion. Within this framework, social media should play an important role, incorporating into their news by default the opinion of producers and their representatives. The media should also contrast their information with the alternative competitive situations, for example, showing the state of similar production areas: France, Holland, Morocco, Turkey, Senegal, Egypt, etc. This benchmarking process, as long as it remains objective, would eliminate signs of subjectivity in the information presented.

This article features some notable limitations as it approaches a complex situation which requires the inclusion of multiple points of view, not only economic perspectives, but also sociological, journalistic, agronomic and environmental. Although applied herein to greenhouse horticulture, the analysis methodology could be applied to other agrifood production sectors to assess media coverage in relation to their particular environmental concerns. One such example could be the meat sector, which receives considerable pressure in both social and academic spheres (Moran & Blair, 2021) and is marked by an existential threat to livestock production as consumption decisions change and investors seek to avoid potential liabilities related to greenhouse gas emissions.

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Data Availability

All bibliographic data analysed and used are reflected in the article or come from open access databases to researchers. Any clarification on further details can be requested from the corresponding author. The collection of press releases made available to researchers by the agricultural sector associations (APROA-HortiEspaña) is considered confidential. Although it has been made available to referees.

Author Contributions

Conceptualization: JCPM. Methodology: JCPM. Sourcing for research materials: JCPM, MCGB, MMSA and RSF. Writing—original draft: JCPM. Writing—review and editing: JCPM, MCGB, MMSA and RSF.

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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.

Informed consent

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

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).

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.

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.

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 in WOS+Scopus 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.

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.