

ADDRESSING GREENWASHING IN THE AGRI-FOOD SECTOR: INTERNATIONAL PRACTICES, VERIFICATION MECHANISMS AND POLICY RESPONSES

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Abstract: *The phenomenon of greenwashing represents an increasingly important challenge for the agri-food sector, amid growing consumer interest in sustainable and environmentally responsible products. This article analyzes the main typologies of misleading environmental claims and the mechanisms through which they can affect market transparency, fair competition and consumer trust. The study includes an analysis of statistical indicators on the credibility of ecological claims, as well as an assessment of the tools used to verify certifications, the sources of information available to consumers and the transparency of the product life cycle. At the same time, relevant international experiences on the prevention and combating of greenwashing practices are examined, with a focus on recent legislative regulations, institutional control mechanisms and legal interventions applied in the agri-food sector. The results highlight the need to strengthen the regulatory framework, independent verification mechanisms and the level of information transparency in sustainability communication. Finally, the article formulates recommendations aimed at adapting international good practices, increasing the responsibility of economic operators, and developing effective tools to prevent greenwashing practices and support the transition to sustainable and credible food systems.*

Keywords: *greenwashing; agri-food sector; environmental claims; sustainability certifications; transparency; public policies.*

JEL Classification: *Q56, Q18, L15.*

1. Introduction

In recent years, sustainability has become a central element of the marketing and communication strategies of companies in the agri-food sector. The increase in public interest in environmental protection and responsible consumption has led to a rapid proliferation of ecological labels and claims applied to food and agricultural products. However, this development has been accompanied by a significant increase in the risk of greenwashing, a phenomenon consisting in the use of ambiguous, incomplete or scientifically unfounded ecological messages, intended to mislead consumers.

International data confirms the scale of this phenomenon and the real difficulties consumers face in interpreting green claims. The European study The Great Green Maze (BEUC, 2023) shows that 56% of respondents believe that there are too many green labels and logos, which makes it difficult to identify the credible ones. At the same time, almost a third of consumers say that they do not feel able to distinguish between real and misleading green claims, and only 3% are convinced that they can always identify greenwashing practices. These results highlight the high level of confusion among the public and the need for clear verification and communication mechanisms.

The complexity of the phenomenon is also amplified by the large volume of information used in sustainability communication. Over 230 sustainability labels are used in the European Union, and research shows that 53% of environmental claims are vague, misleading or unfounded, while 40% of them are not supported by verifiable evidence (European Commission, 2020). Furthermore, about half of green labels do not provide clear verification mechanisms, which limits the ability of consumers to correctly assess the real environmental impact of products (European Court of Auditors, 2023).

In the agri-food sector, the implications of this phenomenon are particularly relevant, as products are frequently associated with terms such as “natural”, “eco”, “bio” or “carbon neutral”, which can create misleading perceptions if not supported by transparent and standardised criteria. According to EU market monitoring, over 40% of food products labeled as “natural” contain at least one synthetic ingredient or have undergone high levels of industrial processing that contradicts the consumer's understanding of the term (BEUC, 2020).

A recent analysis of “carbon-neutral” food claims found that 80% of these products rely solely on carbon offsets (planting trees elsewhere) rather than actually reducing emissions within their own supply chain (BEUC, 2020).

Studies show that although almost half of consumers (48%) prefer products that carry an eco-label, and two out of five are willing to pay more for certified products, the level of understanding of the concepts used remains limited (BEUC, 2020). For example, a significant proportion of consumers misinterpret the term “carbon neutral”, assuming that it implies the total absence of emissions, while in reality most products labelled as such compensate for emissions, without completely eliminating them.

These trends highlight a clear contradiction between consumers' intention to make responsible choices and their actual ability to correctly evaluate the information available. Although around 70% of consumers say they trust public authorities and independent bodies to verify environmental claims, only 25% frequently seek additional information about the environmental impact of products, which underlines the essential role of regulations and international standards (BEUC, 2020).

In this context, the analysis of international experience becomes essential for identifying effective tools to combat greenwashing, especially in the agri-food sector, where information transparency and the credibility of certifications directly influence consumer trust and producers' competitiveness. Studies and practices implemented in different jurisdictions demonstrate that approaches based on clear standards, independent verification and legal accountability can significantly reduce the use of misleading claims and contribute to the consolidation of sustainable markets.

Based on these realities, this article aims to analyze relevant lessons from international experience in combating greenwashing in the agri-food sector and to highlight tools that can support the development of transparent and credible sustainability communication systems. The focus is on identifying good practices, verification mechanisms and institutional frameworks that contribute to protecting consumers and promoting fair competition in the agri-food sector.

2. Literature review

The literature on greenwashing in the agri-food sector has grown significantly in recent years. A recent bibliometric study by Nugraha et al. (2024) analyzed over 711 articles from the Scopus database, highlighting that academic interest in this phenomenon has increased

dramatically over the past decade (Nugraha et al., 2024). However, although greenwashing is a well-established phenomenon in the food industry and an emerging concern among consumers, studies specifically dedicated to this sector remain relatively few – the same research identifying only 16 articles that met the inclusion criteria for the systematic review (Nugraha et al., 2024).

The literature defines greenwashing as the misleading or superficial communication of environmental actions that do not bring real ecological benefits (Montero-Navarro, 2021; Sciortino et al., 2025). In the agri-food sector, this phenomenon has evolved from outright false claims to more subtle practices based on ambiguity, selective data and scientifically unverifiable marketing.

A 2024 systematic review analyses 16 key papers from 711 Scopus articles, highlighting factors such as advertising, transparency, labelling and consumer trust. Major subthemes include retailers, supply chains and stakeholder engagement (Montero-Navarro, 2021).

The behavioral dimension of the greenwashing phenomenon in the agri-food sector is also highlighted by a series of empirical studies that analyze how consumers perceive and interpret ecological claims associated with food products. A relevant example in this regard is the study conducted by Grinberga-Zalite et al. (2025), which investigates consumers' perceptions of sustainability claims and potentially misleading messages associated with local agri-food products. The research results highlight the fact that consumers' perception of the credibility of ecological claims is significantly influenced by their level of education, level of information and socio-economic characteristics. The study shows that people with a higher level of education demonstrate a greater capacity for critical evaluation of the information presented on labels and in promotional materials, being less susceptible to the influence of vague or insufficiently substantiated claims. At the same time, income and the level of awareness of environmental issues determine a greater predisposition to choose local products perceived as more sustainable (Grinberga-Zalite et al., 2025).

The literature review highlights the existence of three major types of greenwashing practices in the agri-food sector.

First, general claims about environmental impact are common, which are not supported by concrete evidence. This category includes the use of terms such as “green”, “natural”, “sustainable”, “environmentally friendly” or “climate neutral”, without providing clear explanations or verifiable data to justify these claims (Tzoula, 2026). According to Directive (EU) 2024/825, such claims are considered “generic” when they are not associated with an officially recognised sustainability label or are not accompanied by specific explanatory details.

Second, the literature indicates the existence of certification and assurance schemes that can mislead consumers. Examples documented in the United Kingdom show that certain agricultural certification schemes can suggest a high level of environmental protection, although the actual certification requirements do not confirm these standards. A relevant case is the Red Tractor scheme, which includes approximately 45,000 British farms and which was assessed by the Advertising Standards Authority as potentially misleading, because it created the impression of the existence of ecological standards that were not supported by the results of the inspections carried out (River action, 2024).

Thirdly, misleading claims regarding the origin of products and production methods are identified. In the United States, several disputes have concerned marketing campaigns that

promote the image of small, traditional or pastoral farms, while in reality hiding industrial-scale production processes. A relevant example is the Tillamook case, in the state of Oregon, where it was claimed that promotional materials presented an idealized image of dairy farms, while production was carried out in industrial units of the CAFO (concentrated animal feeding operations) type, associated with significant environmental impacts (Pardo, 2019).

In recent literature, concerns about identifying and preventing greenwashing practices in the agri-food sector have led to the development of increasingly sophisticated tools and methodological frameworks. Recent studies highlight that detecting misleading claims is no longer limited to analyzing the textual content of labels, but involves the use of digital technologies, analytical methods and interdisciplinary approaches.

For example, research by Nicolau and Petcu (2026) proposes an integrated model based on the use of blockchain, Internet of Things (IoT) and artificial intelligence technologies, designed to verify the veracity of ecological claims in the agri-food sector. The authors develop a mathematical index for verifying sustainability claims (“Green Claim Veracity Index”), which allows assessing the coherence between the information communicated to consumers and the actual data on product traceability (Nicolau and Petcu, 2026). This approach highlights the potential of digital technologies in increasing the transparency of agri-food chains and in reducing the risk of misleading communication.

At a conceptual and normative level, the study by Sgroi et al. (2025) analyses the European policy framework and the Italian context, demonstrating that clear regulations on the labelling and communication of environmental claims can significantly contribute to reducing greenwashing practices (Sciortino et al., 2025). The authors underline the importance of harmonising the legislative framework with effective monitoring and sanctioning mechanisms, as well as the need to involve public institutions in the verification of sustainability claims.

A relevant contribution to the systematization of methods for identifying greenwashing is provided by Nugraha et al. (2024), who carry out a systematic analysis of over 700 articles indexed in international databases. The results of the study highlight the decisive role of information transparency, label clarity and independent verification in preventing misleading communication (Nugraha et al, 2024). The authors also propose a series of practical measures, such as standardizing information on environmental impact and strengthening certification systems.

From the perspective of the evolution of the field, the bibliometric analysis carried out by Montero-Navarro et al. (2021) shows that research on greenwashing has developed significantly in recent decades, highlighting three main areas of interest: corporate social responsibility, marketing strategies and sustainability auditing (Montero-Navarro A., et al. 2021). The study emphasizes the need to integrate verification and auditing mechanisms into sustainability communication processes, to prevent distortion of the information presented to consumers.

In recent years, the literature increasingly highlights the use of innovative technological tools to detect greenwashing in packaging and visual communication. Fuentes et al. (2021) propose the use of eye-tracking and biometric technologies to analyze consumer reactions to visual elements of packaging, demonstrating that certain symbols, colors or expressions can influence the perception of the greenness of products. Similarly, Gonzalez Viejo et al. (2022) explore the use of smart technologies and sensors to authenticate packaging and verify

sustainability claims, providing a methodological basis for the objective evaluation of green communication.

Overall, the literature highlights that effectively identifying greenwashing practices requires an integrated approach, combining technological tools, independent verification mechanisms and clear communication standards. These developments demonstrate that detecting greenwashing is not only a regulatory challenge, but also an emerging area of methodological innovation, with direct implications for the credibility of the agri-food market and consumer trust.

3. Practical frameworks and consumer-oriented tools for detecting greenwashing in the agri-food sector

3.1. Key warning signs and visual indicators of greenwashing

European consumers' perceptions of green claims reflect a high level of interest in environmental protection, but also an increase in uncertainty about the credibility of green labels. Recent studies highlight that, although consumers show significant concerns about climate change and adopt sustainability-oriented behaviors, they have difficulties in identifying authentic claims and show a low level of trust in existing verification mechanisms. The main results on consumer perceptions are summarized in Table 1.

Table 1. European consumers' perception of environmental claims

Indicator	Survey result	Interpretation
Consumers feeling anxious about climate change	54%	▪ Reflects high sensitivity to environmental issues and openness to sustainable products
Consumers striving for an environmentally friendly lifestyle	79%	▪ Indicates a clear trend towards responsible consumption
Consumers buying products with eco-labels	48%	▪ Confirms the major role of labels in the purchasing decision
Consumers who believe there are too many green labels	56%	▪ Highlights the risk of confusion generated by the proliferation of labels
Consumers who believe polluting companies should not use green claims	75%	▪ Reflects high expectations for corporate responsibility
Consumers with little or no information about the criteria for ecological claims	66%	▪ Indicates the existence of a major information deficit
Consumers who believe that green claims are verified by authorities	35%	▪ Suggests a low level of trust in control mechanisms

Source: adapted by authors based on (BEUC, 2020).

At the same time, the high diversity of certification schemes contributes to the fragmentation of the labelling system and to increased confusion among consumers. Studies show that around half of the existing green labels do not offer clear mechanisms for independent verification or certification, which reduces the credibility of product sustainability messages (BEUC, 2020). Furthermore, over 230 sustainability labels are used in the European Union, which creates a complex and difficult-to-interpret information

environment for consumers, favoring the emergence of misperceptions and misleading communication practices (European Commission, 2020; OECD, 2011). Overall, these data highlight that the lack of standardization and uniform verification mechanisms contributes to maintaining a high level of uncertainty among consumers and facilitates the proliferation of greenwashing practices.

Overall, the data presented highlights a combination of increased consumer interest in sustainability and high levels of confusion generated by the proliferation of eco-labels.

Thus, greenwashing often occurs when sustainability is communicated at a declarative level rather than demonstrated by verifiable data. In practice, sustainability becomes apparent when the information provided to consumers is incomplete, difficult to verify or selectively presented, which limits their ability to distinguish between real environmental performance and marketing strategies. This problem is amplified by the lack of standardized reporting mechanisms, the insufficiency of independent auditing and the proliferation of sustainability labels.

From the perspective of the agri-food chain, apparent sustainability can be identified at several stages of economic activity, including production practices, climate impact assessment, formal compliance with regulations and communication to consumers.

The main manifestations of apparent sustainability and the mechanisms associated with greenwashing practices are summarized in Table 2.

Table 2. Typologies of apparent sustainability and mechanisms associated with greenwashing practices

Domain	Typology of apparent sustainability	Mechanisms that facilitate greenwashing practices	Implications for the credibility of environmental performance
Production practices	Situations where actual production practices are partially hidden or selectively communicated	➤ Promoting the “green” nature of products while ignoring the impact on soil and water resources; ➤ Use of resource-intensive inputs without transparency regarding quantities used, provenance or environmental footprint; ➤ Lack of documented evidence demonstrating measurable reductions in environmental impact.	➤ Creates an incomplete representation of environmental performance and can mislead stakeholders about the true level of sustainability; ➤ Limits traceability and reduces the possibility of verifying real improvements in environmental performance; ➤ Leads to poorly substantiated sustainability claims and reduces the level of trust in environmental reporting.
Climate impact	Situations where climate performance is declared without a full and integrated assessment	➤ Mentioning emissions without calculating, monitoring and reporting them according to standardised methodologies; ➤ Excluding relevant stages such as production, processing, storage and distribution from environmental data reporting; ➤ Avoiding long-term accountability and lack of climate impact reduction strategies.	➤ Causes underestimation of real environmental pressures and affects the climate responsibility of organizations; ➤ Produces fragmented life cycle information and prevents complete assessment of environmental impacts; ➤ Favours short-term communication strategies at the expense of real structural transformations.

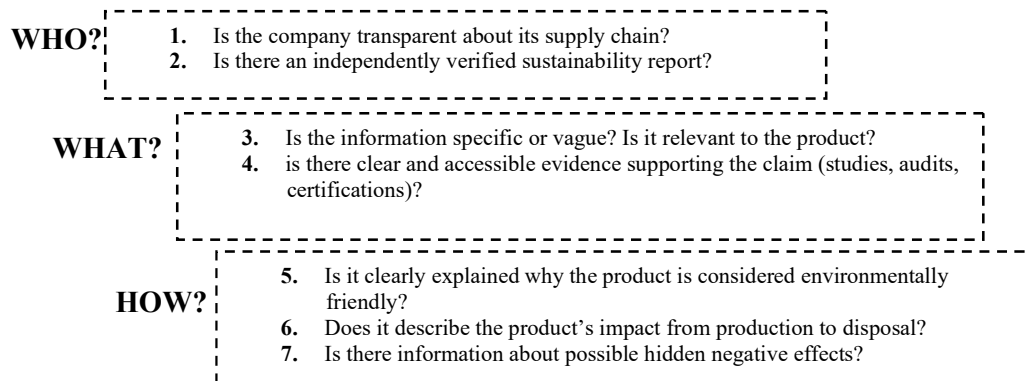
Regulation and control	Situations where compliance is formal and does not reflect real performance	➤ Minimal compliance with legal requirements without implementation of measures aimed at environmental performance; ➤ Lack of independent audit and insufficient traceability mechanisms; ➤ Absence of independent verification mechanisms or third-party certification.	➤ Creates apparent compliance without significant environmental results; ➤ Reduces the credibility of environmental claims and facilitates the perpetuation of deceptive practices; ➤ Weakens institutional control and allows for the maintenance of claims that are difficult to verify.
Consumer	Situations where consumers are exposed to incomplete or ambiguous information on sustainability	➤ Use of “green” labels without clear explanations of the methodology or criteria used; ➤ Use of emotionally charged messages without presentation of verifiable data; ➤ Difficulty distinguishing between marketing communication and scientifically supported claims.	➤ Increases consumer confusion and reduces their ability to identify credible claims; ➤ Encourages decision-making based on perceptions rather than objective information; ➤ Reduces consumer trust and increases their vulnerability to misleading information.

Source: elaborated by authors.

Table 2 highlights that greenwashing can occur simultaneously at the level of production, climate reporting, institutional compliance and consumer communication. Therefore, the ability of consumers to recognize ambiguous, insufficiently substantiated or unverifiable environmental claims becomes an important element in limiting the effects of these practices and supporting informed consumer behavior.

3.2. Methodological framework for verifying and validating sustainability claims

In the context of the increasing complexity of sustainability messages used in commercial communication, it becomes essential *to develop systematic evaluation frameworks that allow the identification of credible claims and their differentiation from greenwashing practices*. The specialized literature emphasizes that the effective evaluation of ecological claims must be based on a set of key questions (see Figure 1) that target the transparency of the actors involved, the nature of the information presented, the methods used to support the claims and the real extent of the environmental benefits (Delmas and Burbano, 2011; Lyon and Montgomery, 2015; OECD, 2011).



HOW MUCH? 8. How significant is the actual environmental benefit?

Figure 1. Practical framework for identifying potential greenwashing through sustainability claim evaluation

Source: Adapted by the authors based on Delmas & Burbano (2011); Lyon and Montgomery (2015); OECD (2011); European Commission (2020, 2023).

Overall, the use of an assessment framework based on the dimensions of “who, what, how and how much” contributes to the development of a critical and systematic approach to the analysis of environmental claims, facilitating the identification of potentially misleading practices and strengthening the capacity of consumers and other relevant actors to make informed decisions. This approach represents an important step in reducing vulnerability to greenwashing and in promoting transparent and responsible communication on environmental performance.

After evaluating the content and communication of ecological claims, *verifying the credibility of the issuing company is a fundamental step in analyzing their authenticity.*

In this sense, credible companies are characterized by the availability of clear and accessible information on sustainability policies, supply chains, emissions levels and production processes used.

The publication of independently verified sustainability reports, as well as the use of internationally recognized certifications - for example, EU Ecolabel, FSC, Fairtrade or Carbon Trust - contribute to strengthening trust in the veracity of the claims communicated. At the same time, the analysis of the company's reputation is an important element in identifying the risks associated with greenwashing practices.

The existence of previous sanctions for misleading advertising, involvement in environmental impact controversies or the formulation of ambitious commitments without clear implementation plans can be warning signs of a lack of consistency in sustainability policies.

At the same time, the degree of specialization of the company in the field in which it makes environmental claims should also be assessed in relation to its main activity, since discrepancies between the business model and marketing messages may indicate the use of isolated initiatives with a predominantly reputational purpose.

Overall, the assessment of transparency, independent verification, organizational reputation and coherence of business activities provides an integrated framework for analyzing company credibility and identifying potential greenwashing practices.

These elements contribute to the development of a systematic approach to verifying sustainability claims and support informed decision-making by consumers and other actors involved in the value chain.

In addition to analyzing the company's credibility, *identifying visual signals and techniques frequently used in greenwashing* is an essential step in assessing the authenticity of green claims.

Thus, greenwashing techniques are often based on omitting essential information, selectively communicating favorable aspects, and lacking verifiable data or independent certifications (European Commission, 2024). In many cases, companies use minor features as

evidence of overall sustainability, creating a false impression of the actual environmental impact.

In parallel, certain visual elements can mislead consumers, such as the use of colors associated with nature, bucolic images, or proprietary symbols that mimic official certifications. Rustic, opaque packaging or labels with vague terms such as “eco”, “organic” or “natural” without clear and verifiable justifications contribute to reinforcing the perception of sustainability, even in the absence of real evidence (International Organization for Standardization, 2018).

To illustrate how visual cues and vague language can contribute to misperceptions regarding sustainability, the literature provides numerous relevant examples of internationally documented greenwashing practices.

A relevant example from the agri-food sector is associated with the company Danone, which has been involved in several controversies related to claims considered misleading regarding the characteristics of its products. The company has been involved in litigation over sustainability claims, including the use of terms such as “carbon neutral” or statements about the recyclability of packaging. Some legal actions have argued that such wording can be ambiguously interpreted by consumers and create the impression of a lower environmental impact than is actually the case, highlighting the importance of using clear, verifiable claims supported by transparent methodologies (Watson, 2024).

A common form of greenwashing in the agri-food sector is greenlighting, which consists of selectively highlighting positive aspects, while significant negative impacts are omitted or minimized in communication to consumers.

In the agri-food sector, this practice is often manifested by the use of suggestive images, such as traditional farms, green pastures or free-range animals, which create the perception of sustainable production. However, in the absence of complete information on the supply chain, greenhouse gas emissions or packaging materials, such visual representations can mislead consumers. Highlighting isolated initiatives or minor features, without a clear strategy to reduce environmental impact, can reinforce an artificially positive image, contributing to erroneous perceptions of the sustainability of agri-food products.

In addition to selective communication of information, greenwashing is frequently manifested by *the use of general and ambitious claims that are not supported by clear evidence or measurable indicators*.

Table 3. Typical forms of vague or exaggerated environmental claims in the agri-food sector

Statement Category	Typical Examples of Expression	Main limitation	Verification sources and assessment methods
Absolute claims regarding impact	"Zero emissions", "Zero environmental impact", "100% planet friendly"	Unrealistic claims, as any product generates environmental impact	Verifying the company's sustainability reports, analyzing emission calculation methodologies (e.g. GHG Protocol), consulting independent certifications
Future commitments without a clear plan	"We will become climate neutral by 2030"	Lack of concrete steps and progress indicators	Consulting published climate strategies,

			checking for interim targets, annually reported progress
Biodegradability claims	"100% biodegradable", "Eco-friendly packaging"	Biodegradation depends on specific conditions (e.g. industrial compost)	Check applicable standards (e.g. EN 13432), analyze degradation conditions indicated on packaging, consult official certifications
Claims of exceptional performance	"Reduces pollution by 80%", "Purifies natural air"	Lack of independent testing or clear methodologies	Verifying tests conducted by independent bodies, analyzing available technical data
Use of generic terms	"Natural", "Eco", "Sustainable"	Vaguely defined terms used without measurable criteria	Check for recognized certifications, analyze definitions used, consult official labels or public databases

Source: developed by the authors based on legislative database of European Commission, OECD, ISO.

For the assessment of ecological claims to be rigorous, it is not enough to identify vague formulations or suggestive visual elements, but it is also necessary to locate concrete sources of information that allow their verification.

In the agri-food sector, the credibility of environmental claims can be analyzed by reporting to several categories of sources, each offering a distinct level of detail and validation.

A first level of verification is represented by the **product packaging**, which is often the most accessible initial source of information for consumers. The packaging can provide important clues regarding the presence of recognized official labels, such as the EU Ecolabel, FSC or Fairtrade, but also information regarding the composition of the materials used, the applicable standards or the existence of QR codes and links to additional details (Perciu, R., et al., 2025). In this sense, the packaging should not be seen only as a marketing tool, but also as a preliminary information support for the evaluation of sustainability claims. However, the verification should not stop at the information on the label.

A second important level is provided by the **official websites of manufacturers** and the sustainability reports published by them. These sources allow for a more in-depth analysis of environmental commitments, by consulting the sections dedicated to sustainability, environmental responsibility or ESG reporting. Here too, the methodologies used to justify the claims can be identified, including references to Life Cycle Assessment (LCA) analyses, as well as measurable indicators relating to emission reduction, resource efficiency or waste management. Therefore, the company website can provide a higher level of transparency, provided that the information presented is clear, up-to-date and verifiable.

Furthermore, in order to avoid exclusive dependence on the information provided by the company itself, it becomes necessary to consult **external and independent sources**. In this context, the databases of certification bodies play an essential role in validating the authenticity of the certifications invoked. They allow for confirmation of the real existence of

the certification, identification of the exact scope and verification of its validity period. Such verification is particularly important in situations where symbols, logos or statements appear on the packaging that may suggest the existence of certification, without this being clearly demonstrated.

Finally, for a more in-depth assessment, especially in the case of complex or controversial claims, it is useful to refer to ***scientific publications and the relevant regulatory framework***. Scientific studies can provide information on the actual environmental impact, calculation methodologies and comparisons between different types of products or materials, while regulations allow for the assessment of the compliance of claims with applicable standards and legal requirements. The combined analysis of scientific evidence and regulatory sources helps to distinguish between objectively supported claims and those that are mainly based on general formulations or communication strategies.

Continuing the analysis of sources of verification of ecological claims, ***it becomes necessary to assess the degree of transparency throughout the product's life cycle***, as sustainability cannot be assessed exclusively based on a single stage in the production chain.

In this sense, ***Life Cycle Assessment (LCA)*** is an essential tool for identifying stages with significant impact and for assessing the credibility of environmental claims (Perciun, R., et al., 2025).

The first relevant stage is ***the production of raw materials***, where information on the origin of ingredients and their traceability becomes essential. The assessment of this stage involves analysing the country of origin, the type of farm and the way in which natural resources are managed. In particular, the impact of agriculture on the environment can be influenced by water consumption, the use of pesticides and fertilisers, as well as soil degradation. At the same time, working conditions on farms and compliance with social standards are relevant indicators of sustainability, and emissions generated during the extraction, cultivation or primary processing stage must be systematically analysed.

Further down the production chain, ***industrial processes*** represent a critical stage, characterised by significant energy and resource consumption. At this stage, the sustainability assessment must include an analysis of the energy source used, in particular the differentiation between renewable sources and fossil fuels. It is also important to examine the amount and type of waste generated, the total water consumption and the effectiveness of measures to reduce it. The use of chemicals in processing, refining or preservation can introduce additional risks to the environment and health, which is why transparency regarding these practices is essential.

Another relevant element in assessing the environmental impact is ***the transport of products***, which contributes significantly to greenhouse gas emissions. At this stage, the distance traveled to the consumer must be analyzed, including the origin of the raw materials and the distribution of the final product. The mode of transport used directly influences the level of emissions, with air transport being considered the most polluting, while maritime and rail transport are generally more energy efficient. The evaluation of emissions associated with the logistics phase can be carried out by consulting CO₂ emission estimates or calculations integrated into the life cycle analysis.

In the product use phase, sustainability is influenced by the additional ***resources required***, such as water or energy consumption, but also by the actual duration of use of the product. A product that requires significant resources during use or that has a short lifespan may generate a higher cumulative impact than one that appears less sustainable at the

production level. In this sense, the analysis of the actual lifespan and the point at which the product becomes waste contributes to a more realistic assessment of the environmental impact.

The last stage of the life cycle is represented by *the management of the product at the end of use*, where the actual capacity for recycling, reuse or composting becomes decisive. It is important to analyze the actual rate of collection and sorting of materials, as well as the existence of the necessary infrastructure for recycling. Similarly, claims regarding biodegradability or compostability must be evaluated in relation to the actual conditions in which these processes take place, since many materials considered biodegradable require specific industrial conditions. The alternative scenario, namely how the product is managed when not recycled, must also be analyzed.

When consumers or evaluators suspect a case of greenwashing, the initial reaction should not be passive, but oriented towards verification and documentation. Consumer involvement in reporting such situations plays an important role in strengthening market protection mechanisms. At European level, numerous complaints about misleading environmental claims are reported annually, highlighting the growing awareness of greenwashing practices. According to the results of a Eurobarometer survey conducted by the European Commission, around 42% of European consumers said they had encountered environmental claims or labels that they considered misleading or difficult to verify in recent years (Perciun et al., 2025). This percentage underlines the need to strengthen verification tools and reporting mechanisms.

4. International regulatory and enforcement approaches to greenwashing in the agri-food sector

Building on the identification, verification and reporting mechanisms discussed in the previous sections, it becomes necessary to examine how international regulatory frameworks and enforcement mechanisms address greenwashing practices in the agri-food sector. Given the diversity and increasing sophistication of greenwashing strategies identified in recent years, legislative intervention at the European level has become essential to protect consumers and ensure transparency in the market.

In this context, the European Union has introduced a set of specific regulatory instruments addressing environmental claims, particularly through Directive (EU) 2024/825 on empowering consumers for the green transition and the proposed Green Claims Directive. These instruments aim to limit the use of misleading environmental statements and strengthen the credibility and comparability of sustainability-related information provided to consumers (European Commission, 2024a; European Commission, 2023a).

The Directive introduces several important provisions regarding the way in which economic operators can use environmental claims (European Commission, 2024b).

1. First, the Directive restricts the use of general environmental claims unless they are supported by verifiable evidence demonstrating recognised excellent environmental performance relevant to the specific claim. Generic expressions such as "green", "non-toxic", "eco-friendly" or "sustainable" are permitted only when accompanied by clear, specific and substantiated explanations provided within the same communication medium.

2. Second, strict requirements are introduced regarding the use of sustainability labels (European Commission, 2023b). Under the new regulatory framework, sustainability labels are considered valid only when issued by public authorities or independent certification

bodies operating under recognised certification schemes. The introduction of private sustainability labels that are not based on transparent and verifiable certification systems is restricted, with the objective of preventing the proliferation of misleading or unverifiable eco-labels.

3. Third, the Directive establishes clear rules for environmental claims related to future commitments. Statements referring to future environmental performance must be supported by a detailed implementation plan including measurable, time-bound and publicly accessible objectives. Moreover, progress towards achieving these objectives must be regularly verified by independent third-party auditors to ensure accountability and transparency (European Commission, 2023a).

Beyond regulatory requirements, enforcement mechanisms play a crucial role in ensuring compliance with environmental claim regulations. Under the European framework, national consumer protection authorities are responsible for investigating misleading claims and applying corrective measures. These measures may include financial penalties, mandatory correction of misleading information, withdrawal of non-compliant products from the market, or public disclosure of violations. The strengthening of enforcement mechanisms reflects the growing recognition that regulatory provisions must be accompanied by effective monitoring and sanctioning systems to achieve tangible results.

Overall, the evolution of the European regulatory framework reflects an increasing institutional commitment to limit greenwashing practices and strengthen consumer trust in sustainability-related information. Recent legislative developments emphasize the importance of clarity, verifiability and accountability in environmental communication, particularly in relation to sustainability labels and future environmental commitments (see Table 4).

Table 4. Recent legislative developments addressing greenwashing and environmental claims in the European Union

Legislative instrument	Year	Key provisions relevant to greenwashing	Relevance for the agri-food sector
Directive (EU) 2024/825 – Empowering Consumers for the Green Transition	2024	Prohibits misleading environmental claims; restricts generic terms such as "eco" or "green" without substantiation; strengthens consumer protection against deceptive sustainability communication	Ensures that environmental claims related to food origin, sustainability and packaging are clear, verifiable and evidence-based
Green Claims Directive (Proposal COM/2023/166)	2023	Requires companies to substantiate environmental claims using recognized scientific methodologies (e.g., Life Cycle Assessment); mandates third-party verification of claims	Particularly relevant for claims related to organic production, carbon footprint and sustainable packaging in agri-food chains
EU Ecolabel Regulation (Regulation (EC) No 66/2010, ongoing revisions)	2010 (updated periodically)	Establishes criteria for awarding official eco-labels based on environmental performance across the lifecycle	Highly relevant for organic food products and prevention of misleading "bio" or "organic" statements

Unfair Commercial Practices Directive (Directive 2005/29/EC, amended by Directive (EU) 2024/825)	2005 / 2024	Strengthens rules against misleading advertising and introduces explicit provisions targeting greenwashing practices	Applies to marketing communication in food retail and branding of sustainability-related attributes
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Source: Compiled by the author based on legislative database of European Commission.

As illustrated in Table 4, the European regulatory landscape addressing greenwashing has evolved significantly in recent years, moving from general consumer protection provisions to more specific requirements targeting environmental claims. This transition reflects the increasing recognition that sustainability-related information must be scientifically substantiated and independently verified. In the agri-food sector, where consumer trust is strongly influenced by perceptions of product origin, production methods and environmental impact, the implementation of these regulatory measures plays a crucial role in ensuring market transparency and preventing misleading communication practices.

In addition to the legislative developments discussed above, recent analytical reports highlight the geographical spread of greenwashing risks globally. Data presented in the fourth annual Greenwashing Report by RepRisk (2025) indicate that several countries characterized by a high level of exposure to biodiversity-related risks are also associated with a high incidence of greenwashing practices (see figure 2). This pattern is particularly relevant for the agri-food sector, where environmental claims are closely linked to the use of natural resources and the impact on biodiversity.

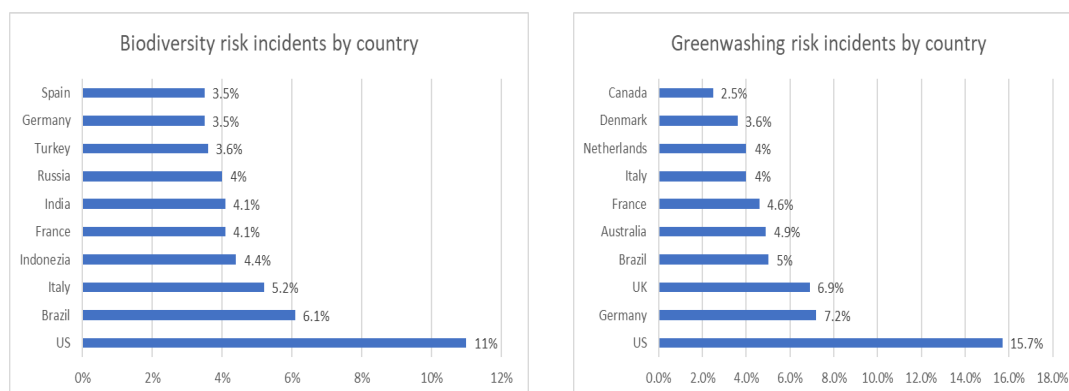


Figure 2. Top ten countries for biodiversity and greenwashing risk incidents, 2025

Source: Made by authors in base of RepRisk, 2025.

As shown in Figure 2, the United States has the highest share of incidents associated with greenwashing risk, followed by Germany and the United Kingdom, while other developed economies such as Australia, France and Italy frequently appear in the rankings for exposure to such practices. The overlap between countries with high biodiversity risk and those associated with greenwashing incidents suggests that sectors dependent on natural resources, including agriculture and food production, are particularly vulnerable to the use of potentially misleading environmental claims.

In addition to the geographical distribution of greenwashing risks, recent literature also highlights a significant sectoral concentration of these practices. The analysis carried out by RepRisk (2025) indicates that certain economic sectors are consistently associated with a high number of companies involved in greenwashing incidents, reflecting the specific vulnerability of industries with a direct impact on the environment and natural resources.

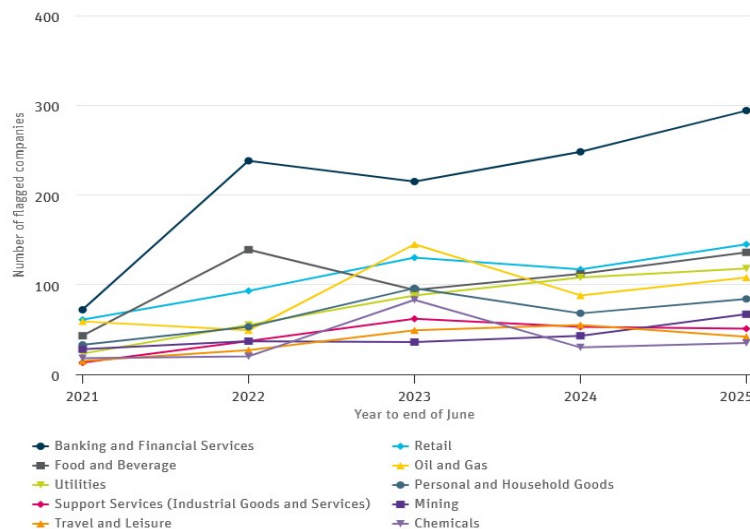


Figure 3. Sectors with the highest number of companies linked to greenwashing risk

Source: RepRisk, 2025

As can be observed in Figure 3, the Food and Beverage sector remains consistently among the sectors with a high number of companies associated with greenwashing risks in the period 2021–2025. This constant presence reflects the specific vulnerability of the agri-food sector, characterized by direct dependence on natural resources, biodiversity and agricultural practices with an impact on the environment.

At the same time, the increase in consumer interest in products perceived as sustainable, ecological or from responsible sources determines the intensification of the use of environmental claims in commercial communication. In this context, the risk of using exaggerated or insufficiently substantiated claims is becoming higher, affecting the level of consumer trust and the transparency of the agri-food market.

The persistence of the agri-food sector among the sectors exposed to greenwashing risks highlights the need to strengthen more effective practices to prevent and combat these phenomena, including through clear mechanisms for regulation, verification and enforcement of sanctions. In this sense, the analysis of international experiences regarding addressing the greenwashing phenomenon becomes essential for identifying effective intervention models and adapting them to the particularities of the agri-food sector.

Within the European Union, one of the priority directions in combating the phenomenon of greenwashing is aimed at carbon neutrality claims, especially those based on carbon offsetting mechanisms. In recent years, national consumer protection authorities have intensified checks on the way such claims are used in commercial communication,

highlighting the risks associated with the use of terms that are difficult for consumers to verify.

A relevant example is the case of *Arla Foods*, one of the largest dairy producers in Europe, active mainly in **Denmark** and **Sweden**. Regulators have asked the company to stop using the phrase “net-zero climate footprint” in advertising materials, arguing that the claim may mislead consumers. According to the authorities’ assessments, the climate impact associated with milk production cannot be completely neutralized solely through compensatory measures, such as planting trees or purchasing carbon credits. Furthermore, it was highlighted that compensation mechanisms are often difficult for consumers to understand and verify, which reduces information transparency (Larsson, 2025).

Another relevant case is that of the supermarket chain *Albert Heijn*, the largest food retailer in the **Netherlands**. The company was sanctioned for using the term “carbon neutral” on the labels of some products, including fruit and vegetables, without providing a rigorous justification based on a full supply chain analysis (Houthoff, 2023). The Dutch authorities concluded that simply offsetting emissions cannot substitute for effectively reducing environmental impact, and the use of such claims without a clear scientific substantiation can create erroneous perceptions about the sustainability of the products.

France is considered one of the pioneer countries in developing a legislative framework dedicated to combating the phenomenon of greenwashing, by adopting the “Climat et Résilience” Law (Loi Climat et Résilience). This law introduces clear restrictions on the use of generic terms in commercial communication, with the main objective of reducing the use of vague and difficult-to-verify claims by consumers (French Parliament, 2021).

Within this legislative framework, the French authorities have limited the use of general expressions such as “biodegradable”, “environmentally friendly” or other similar formulations, when they are not accompanied by concrete and verifiable information. Such terms have been considered potentially misleading, as they can create the perception of superior environmental performance without providing clear evidence of the product’s real impact on the environment.

The implementation of these measures has had a direct impact on companies in the agri-food sector, especially those using packaging labeled as ecological or sustainable. Under the new requirements, economic operators were required to replace general claims with specific and measurable information, such as data on the composition of the materials used for packaging, the level of emissions associated with production or the actual degree of recyclability.

In many cases, this information is provided to consumers via QR codes, which allow quick access to additional details on the environmental impact of the product. From the perspective of the agri-food sector, the experience of France highlights the importance of moving from symbolic communication to communication based on verifiable data.

The restriction of generic terms has led companies to adopt a more transparent and rigorous approach to presenting environmental performance, helping to reduce the risk of misleading consumers.

In the **UK**, the fight against greenwashing is supported by the Competition and Markets Authority (CMA), which has developed the “Green Claims Code”, a set of detailed rules for the assessment of environmental claims used in commercial communication. This framework provides clear guidance for companies in the retail and agri-food sectors, establishing that any

claim regarding environmental impact must be clear, specific and supported by verifiable evidence.

A relevant example in the agri-food sector is the case of plant-based drinks sold under the Alpro brand, belonging to the *Danone group*. Advertisements suggesting that almond milk is “good for the planet” were analysed by the authorities, and the use of this general claim was considered problematic from an information transparency perspective. Although plant-based products are often perceived as having a lower carbon footprint compared to conventional dairy products, the authorities highlighted the fact that almond production involves high water consumption, especially in regions characterized by a risk of drought. In this context, the general claim about environmental benefits was considered insufficiently substantiated and potentially misleading for consumers.

This case highlights that, in assessing environmental claims, the UK authorities pay close attention to the entire production cycle, not just selective indicators such as carbon emissions. In the agri-food sector, where environmental impacts are determined by multiple factors - including water consumption, land use and biodiversity - simplified sustainability claims can lead to misinterpretations of the actual performance of products.

In **Germany**, the fight against greenwashing in the agri-food sector has focused particularly on the credibility of sustainability certifications used in global supply chains. A relevant example is the case of the supermarket chain *EDEKA*, one of the largest food retailers in Europe, involved in a dispute over the use of sustainability claims for palm oil. In the context analysed, products sold under its own brand “Gut & Günstig” contained palm oil promoted as “sustainable” using the Round Table on Sustainable Palm Oil (RSPO) certification label (Kalmer, 2026). This label is frequently used to signal compliance with certain standards regarding environmental protection and respect for social rights within supply chains.

The legal action was initiated by the non-governmental organization foodwatch, with the support of the European Center for Constitutional and Human Rights (ECCHR), which challenged the way in which the RSPO certification was used in commercial communication. The plaintiffs argued that the mere use of the RSPO label does not provide consumers with sufficient information about the standards applied and can create the perception of complete sustainability, while in some cases the supply chains have been associated with human rights violations and negative environmental impacts, including in regions such as Guatemala.

In February 2026, the Hamburg Regional Court ruled that the use of the RSPO label without further explanation of the specific certification criteria may constitute a misleading practice, in violation of the provisions of German law on unfair competition (*Gesetz gegen den unlauteren Wettbewerb – UWG*). Following this decision, EDEKA was required to avoid using the RSPO label in the absence of clear and accessible information explaining the specific standards associated with the certification (Kalmer, 2026).

The analysis of international experiences highlights that the phenomenon of greenwashing in the agri-food sector is addressed through a combination of legislative measures, institutional control mechanisms and concrete legal interventions. Thus, the examples analyzed demonstrate that authorities in different jurisdictions emphasize limiting the use of generic terms, rigorously verifying claims regarding climate neutrality and strengthening the credibility of certification systems used in communicating sustainability.

At the same time, these cases highlight that the mere existence of labels or certifications is not enough to guarantee information transparency, as it is necessary to provide clear,

verifiable and accessible data to consumers. In the agri-food sector, where supply chains are complex and the impact on the environment is multidimensional, the use of general or insufficiently substantiated claims can generate erroneous perceptions and affect consumer confidence in sustainable products.

Therefore, the experience of the analyzed states suggests that the effectiveness of combating greenwashing depends on the integration of complementary tools, such as clear regulations, effective verification mechanisms, consistently applied sanctions and increased transparency in environmental communication.

These approaches provide valuable benchmarks for the development of coherent policies adapted to the specificities of the agri-food sector, contributing to strengthening the credibility of sustainability claims and supporting the transition to food systems with low environmental impact.

5. Conclusions and recommendations

The analysis carried out in this study highlights the fact that the phenomenon of greenwashing has become increasingly widespread and complex in the agri-food sector, amid the growing interest of consumers in products perceived as sustainable and environmentally responsible. The review of the specialized literature demonstrated that misleading environmental claims frequently appear in the context of the use of generic terms, insufficiently explained certifications and the lack of transparency regarding the real impact of products on the environment.

The results of the analyses show that the agri-food sector is highly vulnerable to greenwashing practices, due to its direct dependence on natural resources, biodiversity and agricultural processes with significant impact on the environment. At the same time, the pressure to respond to market demands regarding sustainability determines economic operators to use environmental claims more frequently, which increases the risk of exaggerated or insufficiently scientifically substantiated messages.

The international experiences analysed in the study highlight the fact that preventing and effectively combating greenwashing requires a combination of legislative measures, verification mechanisms and institutional interventions. Examples from the European Union, France, the United Kingdom and Germany demonstrate that regulating the use of generic terms, verifying climate neutrality claims and strengthening the credibility of certification systems contribute significantly to increasing transparency in sustainability communication.

At the same time, the analysis of data on the geographical and sectoral distribution of greenwashing risks confirms that the food and beverage sector remains consistently among the areas with a high level of exposure to such practices. This reality underlines the need to develop effective monitoring and control tools capable of ensuring the credibility of information on the sustainability of agri-food products.

Based on the lessons learned from international experience and the analysis of the existing regulatory framework, a series of recommendations are outlined aimed at strengthening the mechanisms for preventing and combating greenwashing practices in the agri-food sector:

Strengthening the legislative framework on environmental claims. It is necessary to develop and implement clear regulations on the use of environmental terms in commercial communication, including the explicit definition of generic terms such as “eco”, “sustainable”

or “environmentally friendly”. These regulations should establish the obligation to provide verifiable and easily accessible evidence to consumers.

Creating effective mechanisms for verifying sustainability certifications. The competent authorities should develop tools for assessing the credibility of certifications used in the agri-food sector, including by monitoring the standards applied and verifying the way in which they are communicated to consumers.

Promoting transparency through the use of digital tools. Implementing QR codes and digital platforms that allow quick access to detailed information on the origin of products, environmental impact and sustainability assessment methodology can contribute to increasing consumer awareness.

Strengthening the role of control institutions and consistent application of sanctions. Applying clear and proportionate sanctions for the use of misleading environmental claims is an essential factor in discouraging greenwashing practices and maintaining a fair competitive environment.

Increasing consumer education and awareness. Developing educational programs and information campaigns on the interpretation of environmental labels and identifying misleading claims can contribute to forming more informed and responsible consumers. 6. Adapting international good practices to the national context

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