ORIGINAL RESEARCH & REGULATORY ANALYSIS

The Green Package Has Three Tests

Why Europe's October 2026 Bio-Based Plastics Consultation Must Be Read Alongside Migration Chemistry, Food Protection and Real-World Circularity

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ABSTRACT

On 21 October 2026, the European Commission opened a consultation on bio-based feedstock in plastic packaging, two months after the Packaging and Packaging Waste Regulation began to apply. The timing exposes a difficult question: can a package be promoted as a circular-economy solution without demonstrating that it is safe in contact with food, protects the food throughout its useful life, and reaches an appropriate end-of-life system? EFSA's July 2026 horizon-scanning report separately identified the increased use of bio-based and biodegradable food-contact materials as an emerging-risk signal. Recent analytical studies have identified oligomers, additives and other potential migrants in selected bio-based materials, but their findings do not justify condemning the entire category. This article separates current legal obligations from prospective bio-based-content policy, examines EU, Spanish, British and US rules, and proposes a testable, three-gate evidence framework joining migration assessment, food-loss prevention and verified circularity. The central argument is that renewable carbon is an origin claim and not a substitute for product-specific evidence.

KEYWORDS: *bio-based plastics; food-contact materials; migration; NIAS; packaging waste; shelf life; circularity; regulatory compliance*

KNOWLEDGE CENTER CATEGORY: Food Safety & Regulatory Affairs / Processing Technologies

SEO SLUG: bio-based-food-packaging-safety-migration-circularity-2026

META DESCRIPTION: Europe's 2026 bio-based packaging debate reveals why chemical migration, food protection and circularity need separate, verifiable evidence before adoption.

INTERNAL TAGS: Bio-based packaging; Food-contact safety; NIAS; PPWR; Shelf-life validation; Circularity; Regulatory Affairs; Emerging Research

01 | A consultation, a warning and a false equivalence

The European Commission's 21 October 2026 public consultation on bio-based feedstock in plastic packaging is more than a market survey. It asks whether the Union should encourage greater use of biomass-derived inputs, possibly through targets or sustainability requirements, while the Packaging and Packaging Waste Regulation (PPWR) is already reshaping packaging markets. The consultation closes on 13 January 2027. It does not itself create a bio-based-content mandate, grant an exemption from recycled-content requirements or certify any material as suitable for food contact. Article 8 of Regulation (EU) 2025/40 requires a Commission review by 12 February 2028; any resulting additional obligations would depend on subsequent legislative action. [1,2]

A second signal arrived earlier. In its annual emerging-risk report published in July 2026, the European Food Safety Authority (EFSA) identified increased use of bio-based and biodegradable materials in food-contact applications among four emerging risks identified through its structured horizon-scanning process. This is a signal for research and preparedness, not an EFSA determination that all bio-based packaging is unsafe. The distinction is essential: neither a sustainability aspiration nor an early-warning signal is a substitute for a product-specific safety assessment. [3,4]

The apparent policy tension is productive. One European policy track asks how to replace fossil feedstock and reduce packaging waste; another asks whether a growing and chemically heterogeneous material class could create exposure pathways not adequately captured by familiar testing routines. Food manufacturers must answer both questions while protecting the contents from oxidation, moisture, contamination and physical damage. The commercial unit is not an empty film or tray: it is a safely delivered food product.

02 | Four terms that must not be treated as synonyms

Bio-based describes the origin of some or all carbon or other feedstock, not the behaviour of the finished material in waste treatment. Bio-based polyethylene can be chemically comparable to fossil-derived polyethylene and need not be biodegradable. Biodegradable describes a process of microbial transformation under specified conditions and timescales; it says nothing by itself about renewable feedstock. Compostable requires conformity with defined conditions and standards and is not equivalent to degradation in seawater, roadside litter or a household compost heap. Recyclable refers to the capacity of a material and package to be collected, sorted and processed into secondary material within an actual or legally defined system. [2,10]

Polylactic acid (PLA), polyhydroxyalkanoates (PHAs), regenerated cellulose, starch blends and biomass-derived polyolefins differ in monomers, additives, processability, barrier properties and end-of-life options. Commercial articles may also contain fossil-derived modifiers, adhesives, inks, coatings and multilayer combinations. Therefore, a label such as 'plant-based' does not disclose the full formulation or determine whether the article falls under EU plastic food-contact legislation. The precise construction must be assessed. [7,11]

These distinctions matter legally and experimentally. A manufacturer may have evidence for renewable feedstock percentage without evidence for migration; evidence for industrial compostability without evidence for local collection; or a favourable polymer-level life-cycle assessment without a validated shelf life for the packed food. Combining these independent assertions into the single adjective 'sustainable' creates a claim larger than the evidence.

03 | The first test: chemical safety is independent of feedstock origin

Article 3 of Regulation (EC) No 1935/2004 requires food-contact materials to be manufactured under good manufacturing practice so that, in normal or foreseeable use, they do not transfer constituents to food at levels that endanger human health, unacceptably change composition or deteriorate organoleptic characteristics. Regulation (EC) No 2023/2006 provides the manufacturing quality-system framework. For plastic materials and articles within its scope, Regulation (EU) No 10/2011 adds compositional requirements, authorised substances, migration limits, testing rules and documentation. The 2025 amendment, Regulation (EU) 2025/351, further revised provisions on manufacture and quality control. None of these instruments treats 'bio-based' as a blanket exemption. [5–8]

Migration is a chemical and physical event: a substance moves from packaging into food or a suitable simulant. Its extent depends on the chemical's mobility and concentration, the polymer and its morphology, temperature,

contact duration, surface-area-to-food ratio, food composition and processing history. Fatty foods, acidic beverages, dry powders and hot-filled products may require materially different testing strategies. Compliance established for cold contact with dry food does not automatically cover a hot-filled oil-rich sauce. [7,11]

An overall migration result is a useful quality measure, but it is not a universal toxicological certificate. Specific migration limits apply to defined substances; non-intentionally added substances (NIAS) and other relevant compounds may require risk assessment beyond a single overall figure. A declaration of compliance must be supported by adequate documentation, and its scope must match the intended food, time and temperature. [7,16]

04 | NIAS: the blind spot created by 'natural' material narratives

NIAS may include oligomers, reaction by-products, residual monomers, impurities in biomass feedstock, degradation products, contaminants introduced during converting, or substances formed by interactions among layers. Their existence is not unique to bioplastics. What can change is the pattern of substances, their variability and the available toxicological data. A supplier declaration listing intentionally added monomers and additives is not necessarily a complete inventory of plausible migrants. [11,12]

A 2025 review by Lestido-Cardama and colleagues, involving researchers at the University of Santiago de Compostela and Spain's National Food Centre, examined the chemical complexity and analytical approaches relevant to bio-based and biodegradable food-contact polymers. A 2026 study by Vázquez-Loureiro and colleagues analysed 17 samples across several bio-based polymer families using non-targeted LC–high-resolution mass spectrometry and in-vitro bioassays. The authors reported various oligomer families and biological responses in some extracts. These are important hazard-identification findings; an in-vitro response in an extract is not, by itself, evidence of an adverse health effect at real dietary exposure levels. [11,12]

A 2024 exploratory study by Simonetti and colleagues detected migration of selected organophosphate esters and PFAS from some sustainable food-contact materials under specified simulant conditions. This does not establish that every plant-based package contains those chemicals, nor that the tested sample set represents the European market. It demonstrates why assumptions about chemical purity should be tested rather than inferred from renewable origin. [13]

05 | A tiered analytical programme is better than indiscriminate screening

A defensible analytical plan begins with the bill of materials, process history and foreseeable use. First identify known authorised constituents and restricted substances; then investigate likely NIAS using appropriate targeted methods and non-targeted screening. Gas chromatography–mass spectrometry may help characterise volatile and semi-volatile migrants; liquid chromatography coupled to high-resolution mass spectrometry can capture other molecular families, including certain oligomers. Orthogonal methods and confirmatory standards are needed where identification confidence is limited. [11,12,15]

The next stage is exposure relevance. A chemical found in an aggressive solvent extract may not migrate at comparable levels into a real food during normal use. Conversely, a negative result in one simulant may be insufficient for a high-fat or heated product. Reporting should state sample preparation, blanks, limits of detection and quantification, identification confidence, migration conditions, uncertainty and the basis for toxicological interpretation. The hazard-identification stage must not be silently converted into a claim of quantified human risk. [7,11]

Bioassays can help prioritise complex mixtures and identify biological activities that targeted chemistry may miss. However, bioassay interpretation requires controls for cytotoxicity, matrix interference, exposure plausibility and assay specificity. They supplement, rather than replace, regulatory compositional and migration assessment. [12]

06 | The second test: packaging must preserve the food it claims to protect

The sustainability of food packaging cannot be assessed without the food it carries. A material with an attractive renewable-carbon profile can still perform poorly if oxygen ingress accelerates lipid oxidation, moisture transfer destroys powder flowability, a seal fails in chilled distribution, or a compromised barrier increases microbiological spoilage. Conversely, a conventional film may be environmentally preferable in a specific use if its low mass and

barrier performance prevent substantial food losses. The direction of the result is empirical, not ideological. [18,19]

Performance assessment should include oxygen and water-vapour transmission under realistic humidity and temperature, seal integrity, puncture resistance, light transmission where relevant, interaction with oils or acidic foods, and accelerated or real-time shelf-life data. For microbiologically sensitive ready-to-eat foods, preservation claims require appropriately designed microbiological validation and, where warranted, challenge studies. Chemical migration and food-protection performance should be measured on the same packaging configuration, not on unrelated laboratory specimens.

This is especially relevant to cocoa and fat-containing ingredients, botanical powders, protein preparations, sauces and prepared meals. A cocoa powder bag must control moisture, foreign-body ingress and aroma loss; a high-fat confectionery wrapper may need a different oxygen and grease barrier; a chilled meat tray introduces microbial and seal-integrity constraints. The correct packaging choice may differ across these applications even if the same polymer is available.

07 | A worked decision example: the food-loss counterfactual

Consider a hypothetical comparison of two packages designed to deliver 10,000 edible portions of a chilled food. Package A has lower embodied packaging emissions but leads to a modelled 3% loss of edible portions; package B has a larger packaging footprint but limits the loss to 1%. The difference is 200 portions. Whether package B is environmentally preferable depends on the food's production burden, packaging masses, distribution, end-of-life assumptions and the robustness of the loss estimates. No general answer follows from the polymer label alone.

The functional unit should therefore be something like '10,000 safe, acceptable portions consumed within the declared shelf life under a specified distribution system', rather than simply 'one kilogram of packaging'. This is a proposed analytical discipline, not a legal definition. Published optimisation and life-cycle studies already show that packaging, waste treatment, greenhouse-gas emissions and circularity can generate competing outcomes. Accordingly, the article does not claim that coupled packaging–food life-cycle assessment is a new invention. [18,19,27]

08 | The third test: end-of-life performance is infrastructure-dependent

A package may be technically recyclable and yet fail to be collected or sorted in the destination market. A material certified for industrial composting may be sent to residual waste where the appropriate facility or collection route is unavailable. A biodegradable polymer may fragment or persist under conditions different from those of the test standard. Real circularity therefore requires a defined destination, evidence on collection and sorting, and an end-of-life route consistent with the actual article, including inks, adhesives and closures. [2,10]

The PPWR's Article 6 sets a staged recyclability framework. Design-for-recycling requirements and recycled-at-scale criteria have different implementation horizons and depend on delegated and implementing acts. Article 9 identifies particular packaging formats for compostability requirements from February 2028, rather than providing a general right to market any compostable material as a substitute for recycling. A product-level end-of-life claim must be checked against the applicable format and national waste-management conditions. [2]

A 2026 systematic review of food-packaging life-cycle assessments found substantial methodological variation, including functional units and impact categories. That heterogeneity is a warning against comparing isolated carbon-footprint numbers without harmonising assumptions. The relevant question is not 'is bio-based better?' but 'under which source, food, distribution, recovery and impact assumptions does this package improve the total system?' [19]

09 | What Article 8 PPWR actually allows and what it does not

Article 8 of Regulation (EU) 2025/40 obliges the Commission to review the technological development and environmental performance of bio-based plastic packaging by 12 February 2028. It permits the Commission, where appropriate, to propose sustainability requirements, targets for bio-based feedstock, and a narrowly conditioned possibility of using bio-based feedstock instead of post-consumer recycled content to meet certain

Article 7 targets when suitable food-contact recycling technologies meeting Regulation (EU) 2022/1616 are unavailable. This is a possible future legislative pathway, not a current automatic substitution entitlement. [1,2,9]

That condition is crucial. Food-contact recycled plastic requires controls over input waste, decontamination, technology suitability and authorised processes where applicable. Regulation (EU) 2022/1616 reflects the problem of incidental contamination in waste streams. An absence of locally available recycled resin, a high purchase price or a supplier's preference for virgin bio-based polymer is not equivalent to the legal condition contemplated by Article 8. [9]

The October consultation asks for evidence on feedstock availability, environmental impacts, sourcing, market measures and recycling compatibility. A high-quality response should address material performance and chemical safety as well as carbon and feedstock economics. Industry participation is an opportunity to influence future policy; it should not be advertised as confirmation that a proposed material already qualifies for a new EU incentive. [1]

10 | The rules already applicable in 2026

The PPWR began to apply generally on 12 August 2026, subject to its article-specific transitional provisions. Among the immediately material requirements, Article 5(5) sets concentration thresholds for PFAS in food-contact packaging: 25 parts per billion for an individual PFAS in targeted analysis, 250 parts per billion for the sum in targeted analysis (with specified treatment of precursors), and 50 parts per million for PFAS including polymeric PFAS. The provisions define analytical scope and technical-documentation requirements; they should not be confused with limits on PFAS concentrations in the food itself. [2,25]

These thresholds matter for both fossil-derived and bio-based articles. An unverified plant-fibre barrier coating does not escape the PFAS provisions because the fibre is renewable. The same logic applies to other chemical restrictions under food-contact law: the package's source material does not determine whether migration or compositional limits are met.

Regulation (EU) 2025/351, already in force, also introduced changes to plastic food-contact material quality control, with transitional provisions that require attention to manufacture and placing-on-the-market dates. Companies should examine the consolidated and amending texts for their precise products rather than assuming that the PPWR replaces the plastics food-contact regime. [8]

11 | Spain: directly applicable EU rules and national control practice

In Spain, the PPWR and the EU framework on food-contact materials operate as directly applicable Union regulations, while market surveillance and official controls involve the competent Spanish authorities and, in practice, the relevant autonomous-community enforcement structures. A manufacturer should distinguish packaging-waste obligations from the chemical safety obligations of a food-contact article and from general food-safety responsibilities. A document labelled 'eco-certified' does not replace a food-contact declaration of compliance where one is required. [2,5–8]

Spain is also a contributor to the scientific evidence base. The 2025 review on chemical safety of bio-based and biodegradable polymers includes researchers from the University of Santiago de Compostela and the National Food Centre associated with AESAN; the agency's scientific-publications portal lists related research. This makes the issue more than an imported regulatory debate: relevant analytical expertise exists within Spain's food-safety research ecosystem. [11,24]

A Spanish importer buying packaging from outside the EU should request a product-specific compliance file, not merely a manufacturer's marketing brochure. Where a component falls outside fully harmonised EU-specific measures, applicable national provisions and general Article 3 obligations still need to be considered. [5,16]

12 | Great Britain, Northern Ireland and the United States: no universal 'bioplastic approval'

Great Britain retains a separate authorisation framework for plastic food-contact materials. From April 2025, relevant Great Britain authorisations are reflected in official registers following ministerial decisions; the FSA/FSS

register includes authorised monomers, additives, polymer-production aids and macromolecules obtained from microbial fermentation. Northern Ireland must be considered separately under the relevant EU-linked rules. The UK authorities' scrutiny of bamboo-filled plastic tableware illustrates why a plant-derived component cannot simply be assumed authorised or safe in a plastic composite. [22,23]

In the United States, the Food and Drug Administration assesses the legal status of substances reasonably expected to migrate from food-contact articles through applicable food-additive regulations, effective food-contact notifications, prior sanctions, threshold-of-regulation exemptions or other recognised pathways, as appropriate. Food-contact notifications are specific to the manufacturer or supplier and authorised conditions of use. A polymer's renewable origin does not create a general exemption, and an EU declaration of compliance is not itself a US authorisation. [20,21]

The regulatory comparison yields a practical rule: an internationally sold package needs a jurisdiction-by-jurisdiction substance and intended-use assessment. Environmental claims and recycling rules add a separate layer. A single global certificate saying 'food grade, biodegradable, FDA/EU approved' without a defined scope should be treated as a prompt for further evidence, not as a sufficient conclusion.

13 | Three different dossiers - not one certificate

A credible packaging qualification file should contain three linked dossiers. The chemical-safety dossier documents material identity, authorised substances, restrictions, NIAS assessment, migration under intended conditions, GMP, traceability and any required declaration of compliance. The food-protection dossier documents barrier and mechanical properties, process compatibility, microbial or oxidative shelf-life evidence, transport conditions and foreseeable misuse. The circularity dossier documents bio-based feedstock claims, source sustainability, mass-balance or chain-of-custody methodology where used, life-cycle assumptions, local collection and sorting, recyclability or compostability and disposal guidance. [2,5–10,16]

These dossiers should be linked by a common packaging construction identifier, supplier version, intended food category, manufacturing site and change-control record. The architecture prevents a subtle but common error: using the same generic polymer name to justify claims about a different formulation, adhesive, coating, thickness or end-of-life destination.

Confidentiality can be preserved. A food manufacturer does not always need a supplier's complete proprietary recipe, but it needs enough substantiated information to establish that the final article is lawful and safe for its intended use. Third-party assessment, controlled disclosure and appropriately scoped declarations can support this without requiring public release of trade secrets.

14 | A supplier questionnaire that asks the right questions

Before accepting a bio-based packaging alternative, a purchaser should establish the polymer and multilayer construction, percentage and method of bio-based content determination, intended food-contact conditions, applicable authorisations, relevant NIAS investigations, migration methods and limits, presence of coatings or barrier treatments, and change-notification obligations. If recycled material is used, the applicable recycling route and decontamination controls must be documented. [7–9]

The same questionnaire should ask for oxygen and water-vapour barrier results under specified test conditions; evidence for heat sealing, filling, transport and shelf life; and the actual end-of-life pathway in the destination market. A statement that an item 'meets EN 13432' may be relevant to industrial compostability, but does not prove migration safety, home compostability or acceptance by a municipal bio-waste system.

The supplier's answer should permit a clear decision: approved for defined conditions; conditionally approved pending specified tests; or not approved. Vague 'green' assurances should not be converted into release specifications.

15 | Research & Innovation Opportunity

UNRESOLVED PROBLEM. Chemical-migration assessment, packaged-food shelf-life validation and packaging life-cycle assessment are often commissioned by different teams, using different samples, assumptions and

version controls. Consequently, an environmentally promising substitution can be approved without measuring whether it changes exposure to migrants or food-loss rates under the same real-use conditions.

WHY IT MATTERS. For many foods, small changes in spoilage, oxidation, breakage or product rejection may alter the net environmental effect of a packaging substitution. Conversely, a superior barrier is not acceptable if chemical-safety requirements are not met. A decision system must prevent trade-offs that improperly compensate for legal non-compliance.

WHAT IS ALREADY KNOWN. EU food-contact and packaging legislation supplies distinct compliance frameworks; migration science and NIAS screening are established disciplines; and published multi-objective optimisation models already couple packaging and waste-management choices. The 2025 and 2026 analytical studies identify relevant candidate migrants and biological responses in selected materials. [2,7,11–13,18]

WHAT REMAINS UNKNOWN. There is no universally validated cross-product protocol showing how a combined, product-specific sequence of chemical safety, food-protection performance and realistic end-of-life evidence improves decisions across heterogeneous bio-based packages. The evidence does not establish that a new proprietary technology or patentable method has been invented.

PROPOSED HYPOTHESIS. A sequential three-gate evidence protocol—chemical safety first, food protection second, real-world circularity third—will reduce both false approvals and unnecessary rejection of suitable materials compared with procurement decisions based on bio-based percentage or a single environmental score. This is an expert proposal for validation, not an established standard or a claim of novelty.

DEVELOPMENT PATHWAY. Select matched packaging pairs for at least four food systems: a lipid-rich cocoa or confectionery product, a hygroscopic powder, an acidic sauce and a chilled ready-to-eat product. Use a common functional unit and record the exact packaging construction. Gate 1 evaluates legal composition, targeted and non-targeted migration and relevant toxicological evidence. Gate 2 measures barrier properties, physical integrity and product-specific shelf life. Gate 3 uses a transparent life-cycle model with measured food losses, realistic collection routes, end-of-life processing and sensitivity analysis.

KEY VALIDATION STEPS. Preregister decision thresholds and uncertainty ranges; blind assessors to marketing labels; test several supplier lots and process conditions; replicate analytical results across laboratories; use validated microbiological studies when relevant; audit collection and sorting data; and compare predicted versus observed food-loss and waste outcomes. Quantify disagreement between the three-gate decision and conventional supplier selection. Report where the protocol fails or adds cost without benefit.

REGULATORY CONSTRAINTS. The protocol cannot replace Regulation (EC) No 1935/2004, Regulation (EU) No 10/2011, the PPWR, national enforcement or US/UK substance authorisations. A favourable carbon result cannot offset an unlawful migration result. Bioassays are supplementary hazard-identification tools and must not be used as standalone proof of human risk or safety.

POTENTIAL INDUSTRIAL RELEVANCE. If validated, the protocol could support packaging substitution projects, contract manufacturing, ingredient and prepared-food supplier qualification, export documentation and evidence-based submissions to the Article 8 consultation. It could also support digital change-impact tracking without disclosing proprietary formulation details.

16 | Digital traceability: the package has a formulation history

A practical digital record would link material formulation version, polymer source, additives, coating supplier, extrusion or coating conditions, converter lot, packed-food batch, migration-test method, shelf-life protocol and waste-management assumptions. A change in a coating, processing aid or recycled-feedstock stream should trigger a documented review of affected evidence rather than a blanket recertification or an unexamined carryover of previous conclusions.

Machine-learning tools may help prioritise tests and detect anomalous changes in spectra, barrier measurements or supplier records, but their performance must be validated against real samples and independently assessed decisions. A model trained on familiar fossil-derived polymers may perform poorly on new blends; a predicted low-risk NIAS profile is not equivalent to measured migration. The most defensible role for AI is traceable triage and change-impact analysis, not automated regulatory authorisation.

17 | Industrial implications for ingredient and food manufacturers

The immediate commercial implication is that packaging procurement should move from unit-price and material-label comparisons to verified fitness for use. For dry ingredients, prioritise moisture and aroma protection and sealing; for high-fat matrices, test relevant lipophilic migrants and oxygen exposure; for beverages, evaluate acidity, contact time and filling temperature; for chilled prepared foods, include microbial shelf-life and seal integrity. Every scenario still requires applicable chemical-safety documentation.

For INTABIOTECH-relevant businesses, the useful opportunity is not to attach a product brand to a packaging trend. It is to develop rigorous supplier-qualification protocols for cocoa powders and alternatives, functional ingredients, preservation systems and processed foods; to design evidence packages that connect food quality to packaging decisions; and to help customers distinguish credible technical claims from marketing language. This does not imply that any existing INTABIOTECH product has been validated for bioplastic decontamination or migration control.

The opportunity for a Knowledge Center is similarly specific: publish reproducible analytical questions, jurisdiction-specific legal maps, validated comparison methods and transparent uncertainty. That is more valuable than describing every new biomass-derived polymer as a breakthrough.

18 | Evidence status and boundaries

ESTABLISHED EVIDENCE. EU food-contact materials remain subject to chemical-safety obligations regardless of renewable origin; the PPWR is in application subject to staged provisions; the Commission opened the Article 8 consultation on 21 October 2026; and the Article 8 review is due by February 2028. Peer-reviewed literature documents chemical migrants in selected bio-based materials. [1,2,5–13]

EMERGING EVIDENCE. EFSA's structured horizon scanning identified the increased use of bio-based and biodegradable food-contact materials as an emerging-risk signal. Newer non-targeted analytical and in-vitro studies improve hazard identification but do not yet establish representative population-level risks across the whole market. [3,4,12]

EXPERT INTERPRETATION. Sustainability, chemical safety and food protection are separate dimensions that must be joined at the level of the actual packaging–food system. A single 'eco' or 'food-grade' certificate rarely answers all three.

HYPOTHESIS. A sequential three-gate protocol may improve packaging-substitution decisions and change control. Its benefit over existing practice is unproven and requires prospective comparison.

RESEARCH AGENDA. Priority questions include representative NIAS occurrence, matrix-specific migration, package-induced food-loss changes, uncertainty in recycling and composting claims, and multi-market documentation for the same construction.

19 | Conclusions: renewable origin is a beginning, not a verdict

The 2026 European policy moment is unusually clear. The Commission is examining how bio-based feedstock might contribute to packaging markets; EFSA has highlighted an emerging-risk signal related to the increased use of bio-based and biodegradable food-contact materials; and existing law already requires that food-contact packaging be safe under its intended conditions of use. These are complementary responsibilities, not competing ideologies. [1–5]

A package deserves a credible sustainability claim only when its material chemistry is sufficiently characterised, its performance protects the food, and its end-of-life assumptions correspond to the destination market. The proposed three-gate sequence makes those conditions explicit. It is an agenda for testing and better decisions and not a new legal exemption, a universal ranking of polymers or a claim of proven innovation.

The governing principle is simple: verify the chemistry, protect the food, and prove the circularity. Renewable carbon cannot perform any of those tasks by declaration alone.

Related Knowledge Areas

Food Safety | Regulatory Affairs | Processing Technologies | Sustainability | Functional Ingredients | AI & Food | Emerging Research

Editorial Scope & Evidence Note

Prepared from sources available through 23 October 2026. Regulatory status is described as of that date. This independent technical and legal analysis is not an opinion of the European Commission, EFSA, AESAN, the FSA or FDA, nor a product-specific legal authorisation. The proposed three-gate research protocol is a hypothesis for prospective validation, not an established industry standard. Patent and literature checks cited here are illustrative rather than an exhaustive freedom-to-operate or novelty search.

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