Role of packaging for mediterranean food preservation

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1. Definitions, regulations and market

1.1. Why packaging evolved with time?

Packaging has undergone a historical and functional evolution, from prehistoric times to the year 2020, to meet consumer needs and expectations (Figure 1). Packaging has evolved from a simple storage need to a complex marketing tool, and then to a vehicle for technological and sustainable innovation. From its origins to the commercial revolution. In the dawn of humanity, during prehistoric times, the primary function was purely utilitarian: “to contain.” Containers were then directly borrowed from nature, using raw materials such as bladders, hides, or gourds. By Antiquity (3rd century B.C.), the objective became “To pack.” The amphora then emerged as a major innovation, enabling the preservation of liquids and food over longer periods and facilitating the development of maritime trade. The industrial revolution of 1852 marked the arrival of the first department stores (such as Le Bon Marché) and the emergence of commercial brands. The function of packaging shifted toward the need to “appeal and be visible”. It was no longer just about transport, but about catching the consumer’s eye in an emerging competitive environment.

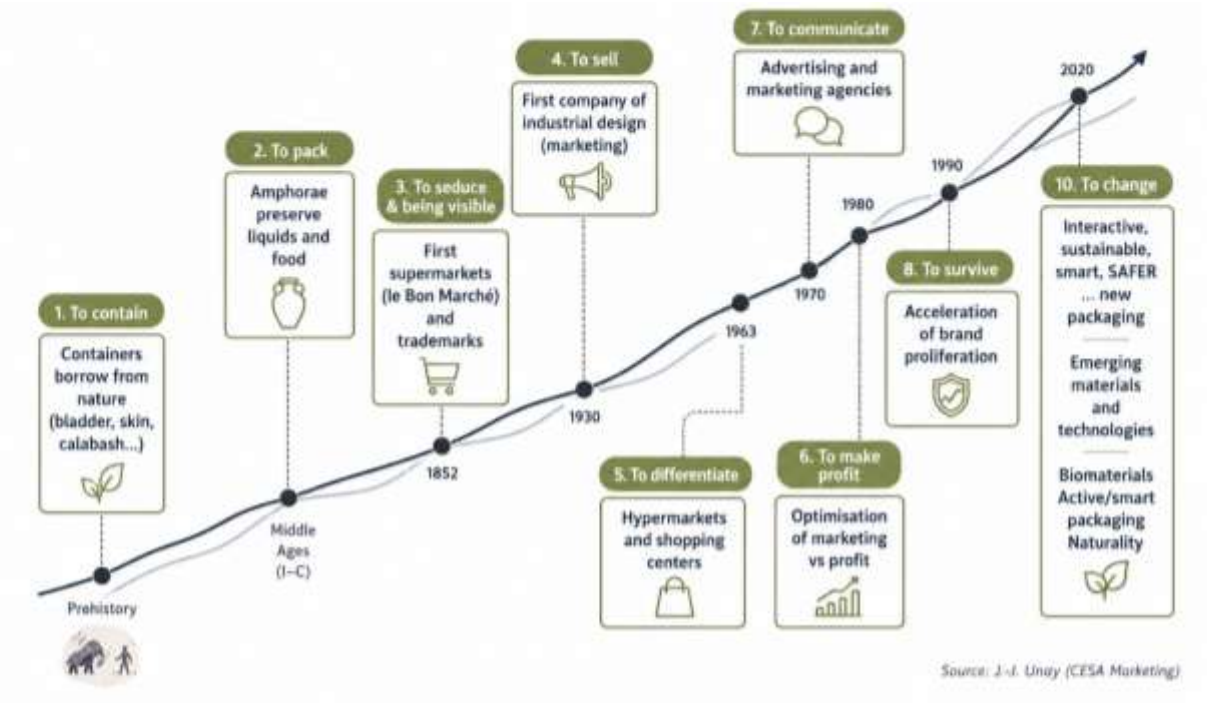

Figure 1 : Evolution of packaging functions

This trend intensified around 1930 with the emergence of the first marketing-oriented industrial design firm, whose explicit goal was to "sell". The era of marketing and differentiation. Beginning in the 1960s and 1970s, the rise of mass consumption radically transformed the industry. In 1963, with the emergence of hypermarkets and shopping malls, packaging had to serve to "differentiate" the product amid an overwhelming array of offerings. Ten years later, in 1970, the role of advertising and marketing agencies became central to "communicating" the brand's values. In the 1980s, the trend reflected a phase of economic rationalization: "Making a profit". Companies then sought to maximize the balance between marketing costs and profitability, and it was at this point that plastics played a major role in fulfilling this function. This period was quickly followed, around 1990, by a need to "survive" in the face of the accelerating proliferation of brands, forcing packaging to become a lever for commercial resilience. The final stage, culminating around 2020, is the move toward smart and sustainable packaging—a phase of "Change" in which consumer demand evolves, becoming more sensitive to health and environmental issues.

Packaging is entering an era of high technology and environmental responsibility. The key words are now interaction, sustainability, and safety ("Interactive, sustainable, smart, SAFER"). This new generation of packaging relies on emerging materials and technologies: biomaterials and the pursuit of naturalness. Active and smart (intelligent) packaging capable of providing information or better preserving the product. In short, this trajectory shows how packaging, initially a simple physical protection, has become a complex technological object that must integrate aesthetic, economic, and ecological dimensions.

This evolution in the functions of packaging has closely followed innovations and developments in materials. In prehistoric times, humans used whatever they found in nature to package food—for example, large bamboo leaves, gourds from the cucurbit family, or animal skins and bladders for liquid foods. Well, the Egyptians, the Greeks, and also early Europeans used clay or reeds to make baskets as early as 7000 B.C. Glass appeared about 3,500 years ago, primarily to store honey and medicines for treating soldiers on the battlefields of Mesopotamia. It wasn't until 600 BC in Gaul that artisanal production of wooden packaging emerged, specifically the barrel, used to market and transport wine and vinegar for the Roman army (Figure 2).

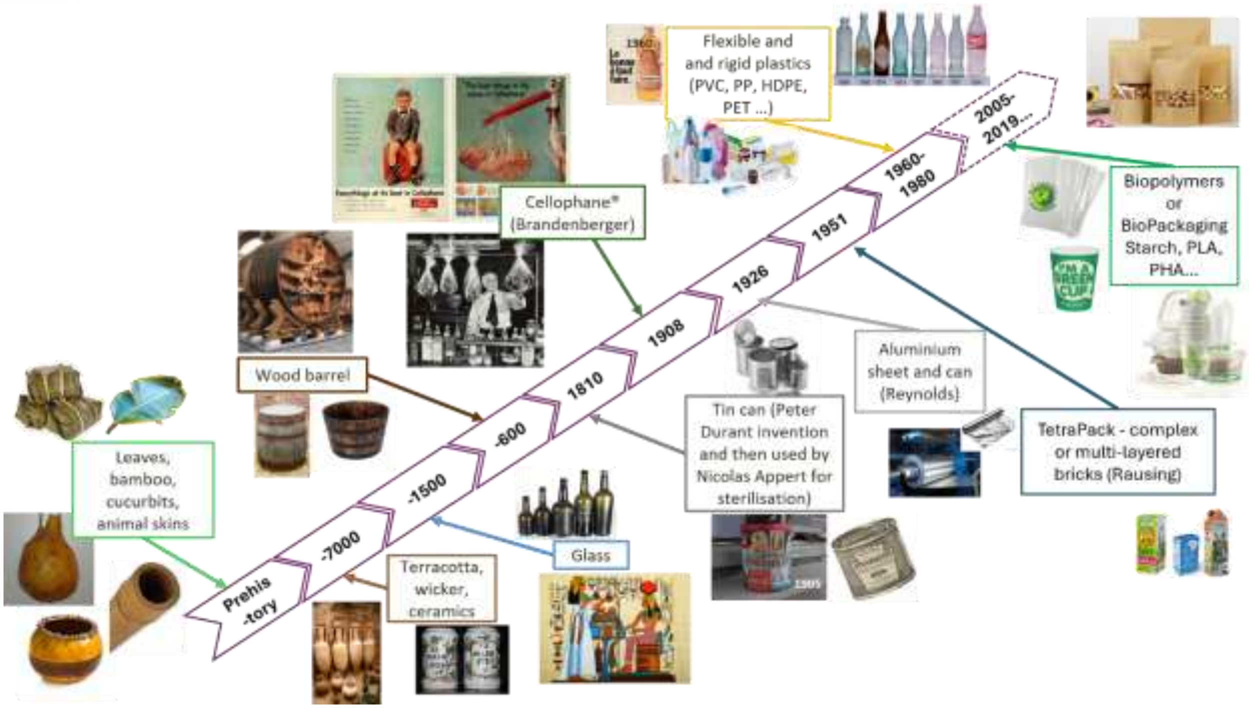

Figure 2 : Timeline of packaging materials.

The packaging industry was really born in 1810 thanks to Peter Durant, who invented the metal can that is a product that perfectly complemented the patent filed by Nicolas Appert that same year. This marked the birth of the can, which was initially intended primarily for Napoleon's armies. The first so-called plastic material was cellophane, made from cellulose and very useful for the trade and preservation of meat. In 1951, TETRAPAK combined paper, cardboard, aluminium foil, and a layer of polyethylene to manufacture its famous carton, ideal for storing and transporting milk and other liquids. In 1960, the very first plastic bottle (made of PVC) appeared, marketed for oils by the Lesieur company. This marked the beginning of the "almost all-plastic" era for the food industry, with an explosion in the number of available polymers that made it possible to meet virtually all the sector's needs. Today, 85% of liquid foods are packaged in PET, the plastic bottle that replaced the glass bottle as early as 1994 for the Coca-Cola Company, for example. Nowadays, consumer preferences are shifting toward bio-based and biodegradable materials to address the challenges posed by the end-of-life of plastics; however, these materials account for no more than 2% of the plastic packaging materials on the market.

The so-called "Mediterranean" diet, prized for its nutritional benefits, requires that its packaging be adapted to ensure the lowest possible health and environmental impacts. Moreover, urbanization, new consumption habit, liked to nomadization, may induce new demands for packaging systems (materials and processes) to be adapted for having the mor convenience and the less negative impacts.

1.2. How packaging is defined?

Depending on what is considered, several definitions could be given.

- According to Cambridge dictionary, packaging is the containers, bags, and plastic that a product is sold in ; the containers or materials used to wrap products which are sold in shops/stores ; the process of wrapping goods or putting them into containers so that they can be sold in shops/stores, the action of packing; conditioning, packaging ; or it is anything, any material used for packaging (paper, cardboard, crates, etc.).
- According to the encyclopaedia of marketing, packaging is the set of elements sold with the product to ensure its presentation, preservation or transport. It is also often referred to as packaging or wrapping, depending on its nature.
- According to the regulation (European directive 1994/62/CE et 2013/2/UE), packaging is « any product made of materials of any kind, intended to contain and protect specific goods, from raw materials to finished products, to enable their handling and transport from the producer to the consumer or user, and to ensure their presentation. All "disposable" articles used for the same purpose shall be considered as packaging. »

Finally, « packaging » can be defined as any material or system used to contain, protect, transport, store, and present goods throughout their lifecycle, particularly in food applications where food safety and quality preservation, as well as consumer and environment innocuities, are critical. Beyond its basic containment function, modern packaging also plays roles in communication, marketing, and sustainability.
A distinction is often made between packing and packaging: packing refers to the physical operation of enclosing products, whereas packaging encompasses design, material selection, functionality, and regulatory compliance.

1.3. What the packaging regulation covers?

Regulation first concerned the food quality preservation and the consumer safety, before being extended to environment and other aspects like logistic, marketing, etc...

Indeed, food packaging regulations have progressively evolved to ensure that materials in contact with food do not endanger human health or alter food composition (figure 3):

- Framework Regulation (EC) No 1935/2004 establishes general safety requirements: materials must not transfer harmful substances to food.
- Regulation (EU) No 10/2011 specifically addresses plastic materials, defining authorized substances, migration limits, and testing conditions.

- Regulation (EC) No 450/2009 covers active and intelligent packaging, which can interact with food (e.g., oxygen scavengers, antimicrobial films).

These regulations introduced key concepts such as: overall and specific migration limits (OML/SML) ; risk assessment of substances and traceability across the supply chain. It evolves from a non-interacting system with food (principle of packaging inertia in front of food characteristics) to an acceptable or desired system able or authorized to exchange components with the food. This last regulatory framework is essential for developing new materials like biopolymer-based films or active or smart packaging materials, which must comply with the same safety standards.

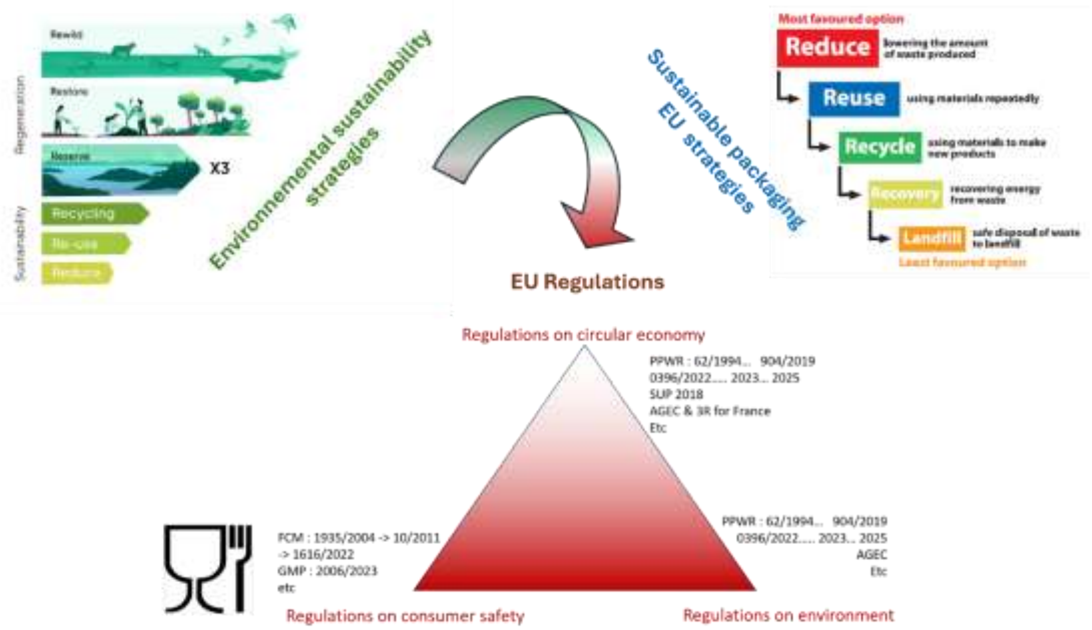

Figure 3 : Packaging strategies for sustainability and safety and related regulations (PPWR Packaging and Packaging Watse Regulation; FCM Food Contact Materials; AGEC Antiwaste Law for Circular Economy, GMP Good Manufacturing Practice; SUP Single Use Plastics; 3R Reduce, Reuse, Recycle)

Environmental concerns have become a major driver of packaging innovation, particularly in Europe in the last decade. It started with the Directive 94/62/EC that focused on reducing packaging waste and improving recycling rates. More recent policies are aligned with the circular economy strategy (2018), promoting reduced resource use and improved recyclability., targeting the « Zero waste » objectives. The new Packaging and Packaging Waste Regulation (PPWR, 2025) aims to 1° reduce unnecessary packaging, 2° ensure all packaging is recyclable or reusable by 2030, and 3° limit single-use plastics. This is summarized in the 3R decree which the principle (Reduce, Reuse, Recycle) is central to these policies, encouraging material efficiency and waste minimization, as illustrated in figure 3.

1.4. What is a packaging designed for a food product?

Food packaging requires a complex functional and organisational approach, taking into account numerous levels and types of materials, functions, constraints, etc. Packaging is presented as a hierarchical system comprising four complementary levels, each playing a specific role in the supply chain. Primary packaging is in direct contact with the product; it constitutes an essential interface ensuring the physical and chemical protection of the food. It could be bottles, trays, pouches, jars, barrels, drums, cans, sachets, pots, blisters, skinned cardboard foils, etc. Materials are wide and diverse, such as paper, cardboard, wood, glass, metal (iron-based or aluminium), plastics, and complexes that combine several materials like for bricks. Secondary packaging groups individual units together and fulfils a crucial informational and marketing function for the consumer. Tertiary packaging optimises distribution by facilitating the transport and handling of sales units, whilst quaternary packaging enables large-scale logistics management, notably through containerisation systems. Figure 4 illustrates the different levels involved in packaging green peas.

Figure 4 : all packaging items to be considered for a food. Example of peas..

Beyond these structural levels, packaging incorporates so-called 'invisible' technical components that play an active role in its performance. Closure systems ensure the products remain sealed and preserved (caps, lids, etc.), whilst coatings and varnishes protect against physico-chemical interactions and environmental factors. Adhesives and inks, meanwhile, ensure the materials hold together and enable the transmission of essential information.

Finally, packaging plays a central role in communication and traceability. Labelling provides regulatory and nutritional information whilst influencing purchasing decisions through design

elements. Furthermore, coding technologies, such as barcodes and QR codes, enable the efficient management of logistics flows and ensure product traceability.
Food packaging goes far beyond its initial protective function to establish itself as an integrated system combining logistical, technical, informational and marketing aspects.

1.5. What could be expected for ideal packaging systems for Mediterranean food and consumers?

To define the ideal packaging for a Mediterranean diet product without considering its industrial history, we must examine the sociology of contemporary food culture. Today, eating "Mediterranean" is not just a nutritional choice; it is a political and identity-defining act that values local sourcing, health, and the preservation of life (figure 5).

Consumer expectation	**Packaging implications**
Health & Purity	Use inert materials (glass, stainless steel) and avoid endocrine-disrupting substances.
Environmental Responsibility	Prioritize compostable or fully recyclable packaging solutions.
Authenticity	Minimalist design, natural textures and raw materials.
Local Identity	Clearly communicate the product's geographical origin and provenance.

Figure 5 : requirement for ideal packaging to fulfil Mediterranean food requirements

Today, the ideal packaging for Mediterranean diet products strikes a balance between radical simplicity and ethical responsibility, moving away from industrial excess to focus on the essentials. Sociologically, this translates first and foremost into a quest for transparency, where the container must take a back seat—through bulk packaging or the use of glass—to guarantee the purity of the product and the absence of chemical transfers. This approach prioritizes consumer health and the visual highlighting of the food's intrinsic quality.

At the same time, packaging becomes a vehicle for storytelling, acting as a bridge between the terroir and the table. It no longer merely lists ingredients but tells a story of geographical origin and artisanal craftsmanship through a minimalist aesthetic. Technically, innovation is moving toward biomimicry and natural active protection, using bio-based materials (such as agricultural residues) to preserve fragile nutrients without impacting the environment.
Finally, the environmental aspect is inseparable from this ideal: packaging must incorporate full end-of-life responsibility, being either compostable or returnable. In short, modern

packaging for this diet is no longer merely a logistical barrier, but a moral commitment. It must be discreet, protective, and regenerative, ensuring that the act of consumption remains consistent with the values of preserving nature and human well-being.

2. How to conceive and to choose a packaging

The design of food packaging relies on a careful balance between technical requirements and societal demands. Its primary function remains to contain, package, and preserve products, ensuring enhanced food safety (SAFER) through the emergence of innovative materials and technologies. At the same time, packaging must play a strategic role in attracting consumers, communicating brand messages, and enabling brands to stand out on supermarket shelves. This marketing dimension, essential for driving sales and maximizing profit, is now accompanied by a need for profound change. Modern packaging must indeed respond to a demand for naturalness by incorporating biomaterials and sustainable solutions. Finally, the shift toward smart and interactive packaging marks a final step where the object becomes a dynamic communication tool, essential for ensuring the survival of brands in a market that is constantly accelerating.

2.1. Criteria to consider for packaging development

The selection of food packaging is based on a multi-dimensional approach combining technical performance, user functionality, marketing effectiveness and compliance with regulatory and environmental requirements. A functional tree structure enables these requirements to be integrated in a coherent manner and optimises the balance between product protection, consumer satisfaction and sustainability. Food packaging is therefore a complex system, at the crossroads of materials engineering, logistics and consumer science.
The figure 6 presents a functional decision tree that organises these criteria into four main categories: technical functions, service functions, marketing functions and constraints. This structure enables the establishment of a rational methodology for the design and selection of packaging systems.

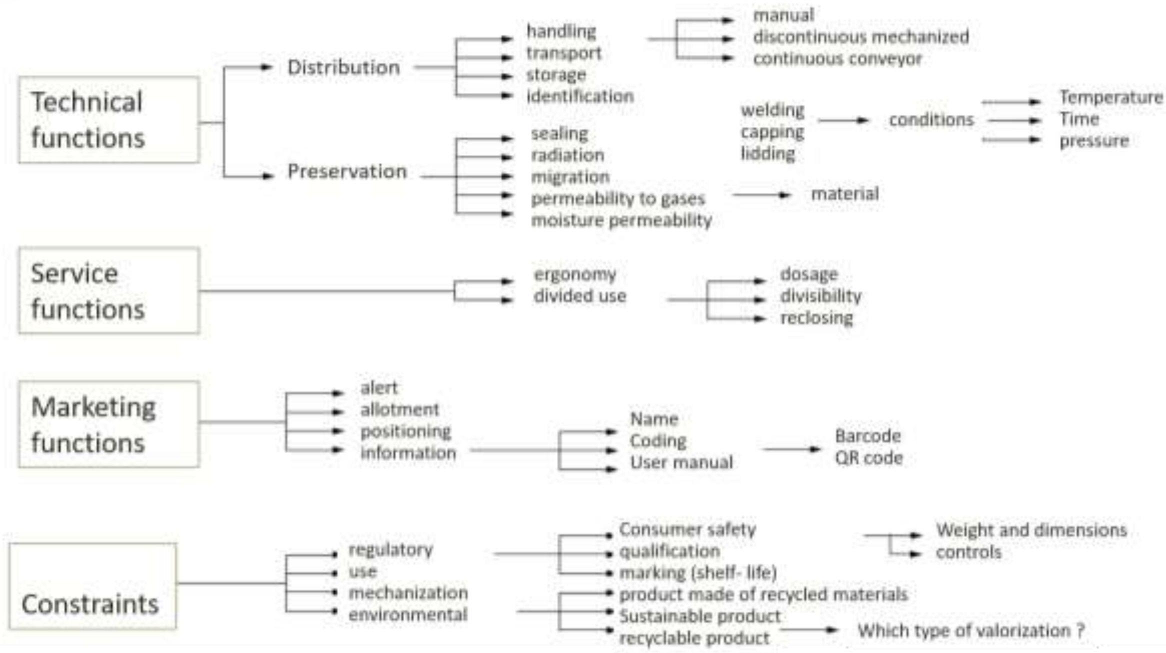

Figure 6: decision tree for packaging conception.

Distribution functions encompass all requirements relating to product logistics, including handling, transport, storage and identification. The choice of packaging must therefore be suited to the handling methods (manual, intermittent mechanised or continuous conveyor), mechanical stresses (impacts, vibrations) and storage conditions (stacking, duration). Product identification, via legible and durable markings, is essential to ensure the efficient management of logistics flows.

Preservation is a key function of food packaging. It relies on several technical criteria: 1) closure systems (sealing, capping, lidding), the effectiveness of which depends on operating conditions (temperature, pressure, time); the barrier properties of the materials against gas, moisture, volatile compounds (flavourings, solvents), radiation (light and UV), and the migration of packaging components. The packaging material must therefore be selected according to the product's sensitivity (to oxidation, moisture, contamination) in order to guarantee its shelf life.

Service features are designed to optimise the user experience and usability. The packaging must therefore make it easy to handle, open and use safely. Users also expect 'divided use'. This involves allowing for precise portioning, divisibility (products that can be divided), and re-sealability to enable storage after opening. These criteria are essential for meeting new consumption habits (on-the-go lifestyles, divided consumption

Packaging is a key channel for communicating with consumers. The identified marketing functions aim to capture attention on the shelf (eye-catching and visually appealing); to reflect the brand image (positioning); and to provide information about the product (name, ingredients, instructions for use, etc.). Coding technologies (barcodes, QR codes) reinforce these functions by facilitating traceability and access to enriched digital information.

The choice of packaging is heavily influenced by consumer safety requirements (absence of contamination), labelling obligations (shelf life, composition), and dimensional and weight constraints linked to logistics standards. Production processes impose specific requirements, such as compatibility with mechanised production lines or suitability for industrial processing. Environmental considerations are now a key factor, with a focus on the use of recycled materials, the recyclability of packaging, integration into a sustainability framework (sustainable packaging), and finally end-of-life recovery (recycling, reuse, energy recovery).

2.2. What will be required be for « ready to eat » or « ready-to-cook » mediterranean foods (Medfoods)?

The rise of ready-to-eat (RTE) and ready-to-cook (RTC) foods has profoundly transformed the requirements for food packaging systems. These products, characterised by high microbiological sensitivity and heightened expectations regarding the sensory quality of Mediterranean-style recipes, combined with convenience, require an integrated approach that combines food safety, technological performance and adaptation to contemporary uses.

First and foremost, food safety is the fundamental requirement. RTE products, which are consumed without further heat treatment, demand a high level of protection against microbiological contamination and oxidation. The packaging must therefore act as an effective barrier against external agents (microorganisms, oxygen, moisture) and guarantee the safety of materials in contact with the food, in particular by limiting migration. This requirement is accompanied by the need for compatibility with specific packaging processes and the out-of-home catering sector.

At the same time, preserving and extending shelf life are major challenges. Packaging materials and structures must control gas exchange and moisture in order to limit oxidation, loss of texture and microbial growth. Protection from light, particularly UV radiation, is also essential for preserving the nutritional and sensory quality of products. Furthermore, packaging must be compatible with storage conditions, whether these involve refrigeration, freezing or heat treatment.

Ready-to-cook (RTC) products introduce additional constraints relating to resistance to preparation processes. Packaging must withstand high temperatures (conventional oven, microwave, boiling) without any deterioration in its mechanical properties or the release of undesirable compounds. Furthermore, it must withstand thermal variations and the physical stresses associated with freeze-thaw cycles.

Functional and ergonomic considerations are also key. The packaging must facilitate consumer use by incorporating simple opening systems, resealable features for consuming the product in stages, and suitable portioning solutions. In many cases, the packaging itself serves as a direct aid to preparation or consumption, thereby helping to reduce the number of steps involved and cut down on preparation time.

The packaging of Mediterranean recipes intended for ready-to-eat (RTE) consumption has specific characteristics closely linked to the nature of the ingredients, the structure of the dishes and the image of naturalness associated with this diet. These products, often comprising fresh vegetables, aromatic herbs, olive oil, cereals and, occasionally, dairy or seafood products, are characterised by a high water content and high water activity, making them particularly susceptible to microbial growth and spoilage, as the recipes developed within the MEDIET4ALL project. Consequently, the packaging must provide effective protection against external contamination whilst controlling gas and water exchange in order to limit oxidation, the rancidity of unsaturated fats and textural deterioration. Another key characteristic lies in the structural complexity of these dishes, which frequently consist of several components (sauces, vegetables, cereal-based ingredients, proteins). This heterogeneity encourages interactions between phases, which can lead to moisture transfer, organoleptic changes or a deterioration in overall quality. To address these challenges, packaging solutions featuring compartments or incorporating specific barriers between components are often favoured, helping to preserve the integrity of each element until consumption. In some cases, these systems also allow the ingredients to be mixed at the point of use, helping to maintain the product's sensory appeal. Furthermore, the high content of unsaturated fatty acids, particularly in olive oil and oilseeds, makes these products particularly susceptible to oxidation and light. The packaging must therefore have high barrier properties against oxygen and incorporate protection against light radiation in order to preserve the nutritional and sensory qualities. The use of modified atmospheres or inert gases is also an effective strategy for limiting these phenomena.

Consumer expectations regarding convenience and user-friendliness also influence the design of this packaging. Packaging formats must allow for easy opening, the option to reseal, and flexible use, whether for individual portions or products intended for sharing, such as mezze-style dishes. Some packaging is designed to allow for direct consumption or gentle reheating, thereby meeting modern consumption patterns.

Finally, symbolic and environmental considerations play a decisive role. As Mediterranean cuisine is associated with healthy and sustainable eating, consumers expect environmentally friendly packaging solutions that incorporate recyclable, bio-based or sustainably sourced materials. At the same time, the visual appearance of the packaging must highlight the authenticity and freshness of the products, often through the use of transparent materials or a simple, natural graphic design. That's why the Mediet4All project focused on trays based on recyclable and recycled plastic materials for ready to cook and /or long shelf-life, or on biobased and biodegradable trays having bioactive properties for ready-to-eat and thus short shelf life meals.

Consequently, the packaging for ready-to-eat Mediterranean dishes is characterised by the need to strike a balance between microbiological and physico-chemical protection, the preservation of sensory qualities, ease of use and consistency with the cultural/traditional and environmental values associated with this type of cuisine and diet.

3. Sustainable packaging and sustainability for MedFoods

Figure 7 displays the priorities for reducing packaging impacts on the environment, presenting a hierarchy of waste management strategies, ranging from the most environmentally favorable options to the least favorable. The top priority is prevention and reduction, which involve avoiding the use of unnecessary plastic and limiting single-use products. The second level is reuse, which involves designing and producing durable, reusable items to extend their lifespan. Mechanical recycling is the next step, aimed at recycling materials (such as PET) while requiring efficient sorting and collection systems. Chemical recycling or plastic regeneration primarily involves low-value materials, with solutions that are sometimes decentralized. Incineration allows for energy recovery through the combustion of waste, but it should only be considered as a last resort. Landfilling is strongly discouraged, as it results in a permanent loss of raw materials. The figure highlights that more than half of the plastic produced each year ends up in the environment or in landfills. The most critical issue is leakage into the environment, including the dispersal of waste into ecosystems and the oceans. Overall, this model promotes a circular economy, prioritizing reduction at the source and material recovery to limit environmental impacts.

Replacing petroleum-based plastics with plastics derived from renewable natural resources and/or that are biodegradable is one of the solutions most desired by consumers. These are often named “bioplastics”, but this term need explanations.

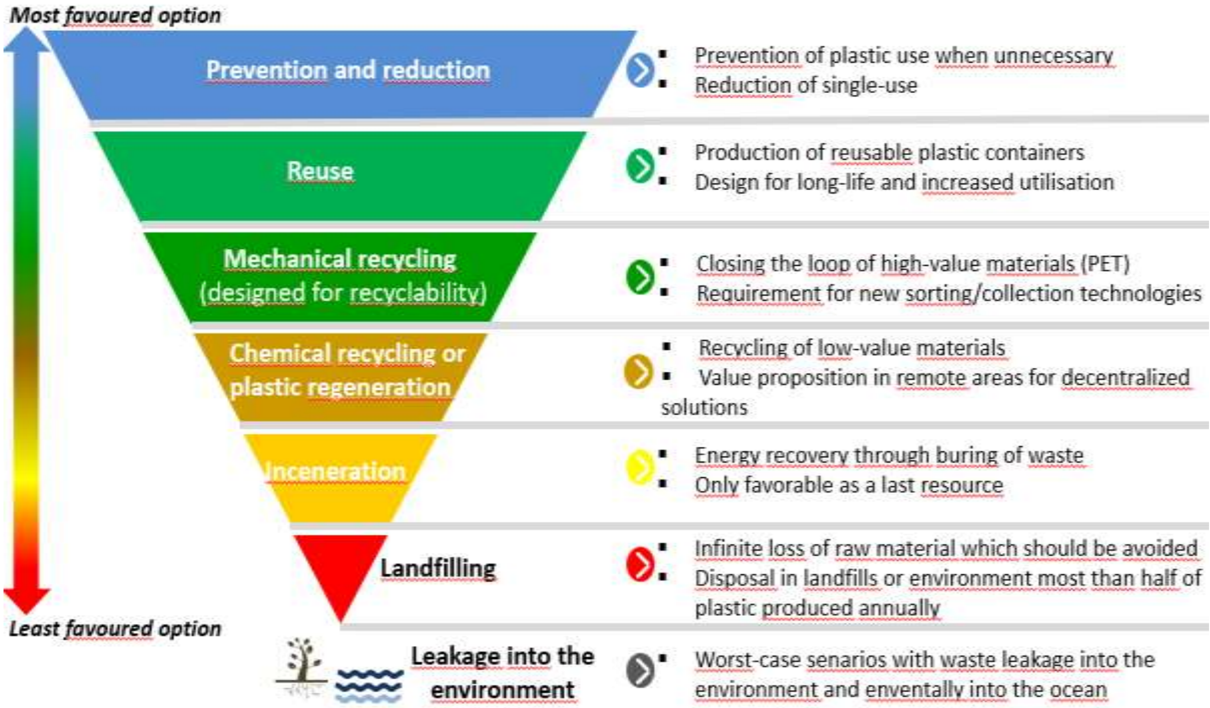

Figure 7: Packaging sustainability priorities

3.1. Bioplastics : what to consider?

Bioplastics (biopolymers used in bio-based and/or biodegradable packaging) are classified according to two fundamental criteria: the origin of the raw materials and their biodegradability (Figure 8).

Figure 8 : "Bioplastics", could be biodegradable, biosourced, or non-biodegradable or non-biosourced.

Conventional polymers, which are petroleum-based and non-biodegradable, account for more than 95% of the plastics used in the agri-food sector. This category includes widely used plastics such as polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), as well as certain polyamides (PA) and thermosetting plastics such as polycarbonate. These materials, which are ubiquitous in industrial and household applications, are characterized by their durability but pose major environmental challenges due to their persistence and non-biodegradability on a human timescale.

Above these are biopolymers known as "bio-based" but which are not biodegradable. These include, for example, versions of conventional polymers derived from renewable resources, such as bio-based PE, PP, or PET, as well as certain bio-based polyamides. Although they are derived from renewable sources, their end-of-life behavior remains similar to that of conventional plastics.

Biodegradability is becoming the dominant criterion for end-of-life management. There are biodegradable polymers derived from fossil resources, such as polybutylene adipate terephthalate (PBAT), polybutylene succinate (PBS), caprolactones (PCL), and ethylene vinyl alcohol (EVOH)—the latter being widely used in composite materials due to its excellent oxygen barrier properties. These materials can degrade under certain conditions, although they are not derived from renewable resources.

Finally, the ideal solution would be biopolymers that are both biodegradable and bio-based, such as PLA (polylactic acid), polyhydroxyalkanoates (PHA, PHB, PHBV), starch-based blends,

or cellulose (cellophane, cellulose acetate). This category appears to be the most environmentally sound, combining renewable origins with the ability to degrade, but accounts for only 2% of applications, primarily those made from PLA or starch-based materials.
It is thus very important when the term “bioplastic” is used to specify, if it is both biosourced AND biodegradable, which is what expect the consumer.

3.2. Viable strategies for sustainable packaging for mediterranean foods

Traditional polymers such as polyethylene ($800–1,200/metric ton), PET ($850–1,000/metric ton), and polypropylene ($1,000–1,300/metric ton) appear to be relatively affordable options. In contrast, certain engineering polymers such as EVOH have significantly higher costs ($8,000–11,000/metric ton), illustrating the diversity of performance characteristics and applications. In this context, biopolymers such as PLA ($1,600–3,100/t), PHBV ($3,000–8,000/t), and starch-based Mater-Bi ($2,500–3,500/t) fall within an intermediate price range and are therefore the ones found on the market, as they are competitive. Growing interest in raw materials derived from biomass and agricultural byproducts. For example, the cost of wheat ($250–650/t) and wheat starch ($600–850/t) appears particularly competitive, making them attractive resources for bioplastic production. Similarly, cellulose ($1,000–1,200/t), which has been clearly highlighted, stands out as a promising alternative. Resources derived from waste, such as casein or chitin, however, have higher costs, reflecting the challenges associated with their extraction and processing. Biopolymer processing methods are generally compatible with conventional technologies (particularly extrusion), thereby facilitating their industrial integration.
Overall, this highlights a gradual transition toward more sustainable materials, where the trade-off between cost, performance, and environmental impact is becoming a key factor. Taking these factors into account, only PLA, starch-based bioplastics, and a few PHAs are economically viable and technologically compatible with existing industrial processes.

However, their barrier and mechanical properties, in particular, often fall short of the requirements for sensitive food products in food applications. One solution is to overcome these drawbacks by applying thin barrier and/or bioactive layers to the surface of bio-based and/or biodegradable materials already available on the market. This is the strategy employed in the MEDIET4ALL project, which has two objectives: 1) to use environmentally friendly industrial packaging, and 2) to enhance its properties (barrier and bioactive). In particular, Mediterranean recipes must be protected from oxidation; to this end, PLA trays have been coated with fish gelatin-based solutions (which provide oxygen impermeability) that incorporate natural compounds (extracts from plants, algae, and crustaceans) with antioxidant properties. The UMR PAM and the researcher group led by Prof. F. Debeaufort, Dr. Benbettaieb, and C. Poulain have thus developed packaging tailored to this strategy. This work has been the subject of several publications[1] on 1) the optimization of coating formulations (composition, selection of natural bioactive molecules, and single- or multi-layer coating structures), 2) spray-coating and casting processes, and 3) solvent-free coating stabilization processes for cross-linking with low energy consumption (cold plasma technology).

The coating and new packaging systems developed in this way are tested in collaboration with partners of the University of Palermo and the University of Valencia on various food products, including omelettes, fresh fish fillets, table olives, oils, and other fatty products that have been selected based on their characteristics (liquid, solid, fatty, high in water content, etc.), storage conditions (at room temperature or refrigerated), and the shelf life of the foods (ranging from a few days to several months).

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