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Department of Food Science

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Tasdawit n Bgayet
Université de Béjaïa

Course Handout

Intended for

L2 and L3 in Packaging and Quality

Packaging in the Food Industry

Functions, Legislation, and Standardization

Produce by

Dr DJELILI-MAMOU Farida

Assistant Professor, Class B

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Preface

Packaging plays a fundamental role in modern society, extending far beyond its traditional function of containing products. In the food industry, packaging serves as an essential tool for preserving product quality and safety, providing consumers with reliable information, facilitating transportation and distribution, supporting marketing strategies, and ensuring compliance with legal and regulatory requirements. As consumer expectations continue to evolve and sustainability becomes an increasingly important concern, the study of packaging has become a multidisciplinary field that integrates food science, materials engineering, marketing, quality management, and legislation.

This course handbook has been prepared to provide students with a comprehensive introduction to the fundamental principles of food packaging. It is intended primarily for undergraduate and graduate students in food science, food technology, agricultural sciences, and related disciplines. It may also serve as a useful reference for professionals involved in food production, packaging, quality assurance, and regulatory affairs.

The content of this handbook is organized into two main chapters. The first chapter presents the essential functions of packaging, emphasizing its role in preserving and protecting food quality, communicating information to consumers, supporting marketing activities, and guiding the selection of appropriate packaging materials according to product characteristics and distribution requirements. Practical examples and review questions are included to reinforce understanding and encourage critical thinking.

The second chapter focuses on the legal and regulatory dimensions of packaging. It introduces the national and international regulatory frameworks governing food packaging, discusses legal responsibilities within the food industry, and highlights the importance of packaging standardization. The final section examines packaging from the consumer's perspective, exploring consumer behavior, purchasing decisions, and perceptions of packaging attributes.

Throughout this handbook, particular attention is given to the interaction between packaging, food quality, consumer protection, and market competitiveness. The material has been developed with the objective of combining theoretical concepts with practical applications, thereby

enabling students to understand not only the scientific principles behind packaging but also its economic, legal, and commercial implications.

The review questions provided at the end of each section are designed to facilitate self-assessment and stimulate discussion. Students are encouraged to consult additional scientific literature, relevant international standards, and current regulations to further deepen their understanding of this rapidly evolving field.

It is hoped that this course handbook will provide students with a solid foundation in packaging science and technology and inspire them to contribute to the development of innovative, safe, sustainable, and consumer-oriented packaging solutions that meet the challenges of today's global food industry.

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List of abbreviations

AFCIQ: French Association for Quality

AFNOR: French Standardization Association

EEC: European Economic Community

CEN: European Committee for Standardization

DGCCRF: Directorate General for Competition, Consumer Affairs, and Fraud Control

DLC: Best Before Date

FAO: Food and Agriculture Organization

GENCOD: Group for Standardization and Codification Studies

ISO: International Organization for Standardization

VQPRD: Quality Wines Produced in Specified Regions

WHO: World Health Organizati

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In a context marked by the globalization of trade, increasing urbanization, and changing consumption patterns, food safety and quality are major public health issues. The food industry is thus faced with the need to ensure that products are safe, stable, and compliant with regulatory requirements throughout their lifecycle.

In this context, food packaging plays a central role. Far beyond its original function as a simple container, it now plays a decisive role in *the protection, preservation, distribution, and promotion of food products.* It acts as a barrier against physical, chemical, and microbiological agents that could compromise food quality, while ensuring consumer information and product traceability.

Furthermore, scientific and technological advances have led to the development of new generations of packaging, notably active and smart packaging, capable of interacting with the product or its environment to improve its shelf life and food safety. At the same time, growing environmental awareness has fostered the emergence of sustainable, biodegradable, or recyclable packaging that meets the requirements of sustainable development.

However, despite these advances, the use of packaging materials also raises concerns, particularly regarding the migration of chemicals into food and their potential impacts on human health. These risks require strict oversight through national and international regulations, such as those established by the Codex Alimentarius and ISO standards.

Thus, food packaging emerges as a strategic element at the intersection of *quality, safety, innovation, and regulation*, which explains the growing interest in research in this field.

This course aims to first analyze the various technological and economic functions of packaging, before addressing, in a second part, the legislative and regulatory framework governing its use, as well as the responsibilities that arise from it.

Packaging: etymologically, it comes from the prefix "en" and "ball," which itself comes from the Old German "balla," meaning to bundle or roll up; to package is therefore to bundle, and packaging is thus an assembly of materials intended to protect a product that must be transported.

Packaging: Derived from the Latin "condere," meaning to establish or stabilize. Packaging thus provides a definitive and stable presentation.

Packaging, both past and present, has always served specific functions that remain fundamentally unchanged; yet its importance in our daily lives continues to grow. This importance stems from the multiple functions that packaging fulfills, all of which are clearly recognized by consumers (**Table I**).

Food packaging is a key element in preserving the quality and safety of food products. It performs essential functions such as protection against spoilage, preservation of the product's properties, and extension of its shelf life. Furthermore, it plays a significant role in informing consumers and enhancing the commercial value of products. Thus, packaging is not merely a container but has established itself as an indispensable technological and marketing tool in the food industry (**Figure 1**)

- ✓ ***A container function:*** Packaging is first and foremost a container, subject to regulatory metrological requirements, such as the obligation to accurately indicate the mass or volume of the contents.
- ✓ ***A protective function (marketing function):*** designed to attract attention and appeal to the buyer.
- ✓ ***An informational function:*** through labeling, which is becoming increasingly important, associated with a regulatory requirement for the accuracy of the information provided
- ✓ ***A service function:*** insofar as the packaging provides an additional service—such as a spray bottle or a self-heating box—the concept of service also encompasses ease of use, particularly the ability to open the package without special tools
- ✓ ***Food safety function:*** regarding contamination or criminal pollution (theft by substitution, malicious acts, etc.).
- ✓ ***Preservation and protection of food quality*** against external agents causing physicochemical and biochemical deterioration of food, combined with a mandatory re e requirement for the

packaging itself to be safe and chemically inert with respect to its contents (the most important function of packaging).



Figure 1: Overview of packaging functions

Table I: Comparison between traditional and modern packaging

Criterion	Traditional packaging	Modern packaging
Primary function	Contain	Protect + communicate
Materials	Glass, metal, paper	Complex, multilayer plastics
Interaction with product	Passive	Active / smart
Storage	Limited	Optimized (ATM, vacuum, etc.)
Information	Basic	Very detailed (QR code, traceability)
Marketing	Low	Highly developed
Security	Average	High (seals, anti-fraud)
Environmental impact	Often high	Eco-design trend
Innovation	Low	Strong (smart packaging)

1. Food Preservation and protection

Preservation involves maintaining the highest possible **quality** of the food product for as long as possible by acting to slow down or eliminate the effects of various spoilage mechanisms. In many cases, it is the very goal of preservation that has led, in the past, to the development of "new products" that now occupy a significant place in our markets; this is the case, for example, with jams (fruit preservation), yogurts and cheeses (milk preservation), salad and smoking (preservation of meat or fish), etc. Before describing the role of packaging in food preservation, we must describe the mechanisms of food spoilage responsible for the risks of poor preservation.

2. Food quality (Table II)

What qualities must be preserved in a food product?

Generally speaking, AFNOR defines quality as "the ability of a product or service to meet user needs," but in the case of a food product, one must take into account the factors and elements corresponding to characteristics that change over time and are therefore closely linked to storage conditions; "Food quality—the ability of a product to properly nourish humans or animals, that is, to provide them, under conditions of complete safety and enjoyment, with the nutrients and energy necessary for their vital metabolism—can thus be analyzed as follows:

2.1. Hygienic quality

This corresponds to the non-toxicity of the food under normal conditions of use and is an absolute requirement; the food must not contain any toxic elements in doses dangerous to the consumer, the assessment of which takes into account storage frequencies, ingested quantities, and the degree of toxicity (concept of acceptable daily intake)

2.2. Nutritional quality

This refers to the food's ability to provide adequate nutrition and includes:

- On the one hand, a quantitative aspect: energy stored in chemical form (starch, fats)
- On the other hand, a qualitative aspect (the food's nutritional balance in relation to the consumer's needs; amino acids, vitamins, minerals, etc.)

2.3. Sensory or organoleptic quality

This quality is very important, but subjective and variable over time and space, depending on individuals and their cultural references. In a given situation, each consumer expects specific gustatory, olfactory, tactile, visual, and even auditory sensations (the crunch of bread) from a food. On an industrial scale, organoleptic quality is considered good when it satisfies the largest number of consumers under well-defined conditions.

Sensory quality is extremely sensitive to storage conditions and, consequently, to packaging. Indeed, improper storage or inadequate packaging can lead to the development of unpleasant tastes (musty, rancid, etc.), odors (musty smell), or changes in texture (hardening, liquefaction, etc.)

2.4. Technological quality

This primarily concerns raw materials and is of interest not to the customer, but to the industrial operator seeking raw materials or intermediate products that are well-suited to a given manufacturing process.

The "good quality" of a food product at the time of consumption is the result of the work of a whole chain of operators, ranging from the farmer to the consumer themselves.

Table II: Types of food quality

Type of quality	Definition	Impact of packaging
Hygienic	Food safety	Contaminant barrier
Nutritional	Nutritional value	Loss reduction
Sensory	Taste, smell, texture	Protection against spoilage
Technological	Process ability	Process compatibility

3. Mechanisms and causes of food spoilage

3.1. Mechanisms of spoilage

Food preservation essentially consists of maintaining the initial level of quality by combating a set of spoilage mechanisms, the nature of which depends on the presence of one or more causes of spoilage—intrinsic or extrinsic to the products—that are biological or physicochemical in nature. It is therefore the very composition of the food that determines the risk.

3.2. Causes of spoilage: These fall into three broad categories, each with very different effects:

3.2.1. Various chemical degradation reactions

which may be involved, particularly at high temperatures:

- Maillard reactions (non-enzymatic browning);
- Thermal transitions of macromolecules, including: denaturation of proteins and nucleic acids; physicochemical (non-enzymatic) modification of starch;
- Non-enzymatic oxidation (direct oxidation by oxygen in the air) (particularly harmful to lipids, especially unsaturated fatty acids: auto-oxidation); resulting in rancidity.

3.2.2. Enzymatic alterations*:* result from biochemical reactions catalyzed at moderate temperatures (15 to 50 °C) by the product's own enzymes or by exogenous enzymes introduced by microorganisms (hydrolysis and oxidation reactions).

3.2.3. Biological alterations: related to the metabolic activities (enzymatic systems) of living organisms present in or associated with the food product**.**

3.2.4. Physicochemical alterations: affecting the texture of products, which can occur at a wide range of temperatures, e.g., destabilization of foods (lipids in water): phase separation.

3.2.5. External environmental factors: the various factors that play a role in spoilage are as follows:

- ***Time factor:*** introduces the concept of reaction rate, knowledge of which is essential to determine the probable maximum shelf life. This time factor is concretely reflected in the best-by or sell-by date printed on food packaging.

- **From a preservation standpoint**, it is important to note that the higher the temperature, the faster the spoilage reactions (chemical, biological, microbiological) occur, thereby producing harmful effects.

  Note: Proper storage temperatures are indicated on the packaging and must be adhered to by all stakeholders in the quality chain.

- The ***hydration factor*** is perhaps the most important to consider; relatively complex molecular mechanisms occur between the hydrogen bonds between water molecules and the polar ends of macromolecules: carbohydrates, proteins), which are responsible for the affinity between specific relative humidity thresholds (or Aw values) below or above which, at a given temperature, the activity of spoilage agents is inhibited

- ***"pH" factor:*** significantly influences enzymatic activities and microbial growth, with acidic environments generally being conducive to good preservation.

- ***"Oxygen content" and carbon dioxide factor:*** affects the nature of aerobic or anaerobic metabolism in materials and living organisms, as well as the intensity of non- enzymatic oxidation and certain enzymatic oxidation reactions (lipoxygenase)

- ***"Mechanical stress" factor:*** (pressure, impacts, various stresses) may cause deformation, crushing, or breakage, which renders the product unappealing (unacceptable).

  In fact, these factors actually have combined, closely interdependent effects. In practice, to estimate the probable maximum shelf life of a food product, one must simultaneously take into account all environmental factors and their interactions, without separating them.

Table III summarizes the spoilage factors that can affect food products, as well as the various interactions between these factors (**Figure 2**).

Table III: Factors Contributing to Food Deterioration

Factor	Type	Main effect	Example
Temperature	Physical	Acceleration of reactions	Rancidity
Aw (water activity)	Physicochemical	Microbial growth	Mold
pH	Chemical	Enzymatic activity	Fermentation
Oxygen	Chemical	Oxidation	Rancid lipids
Light	Physical	Photo-oxidation	Vitamin degradation

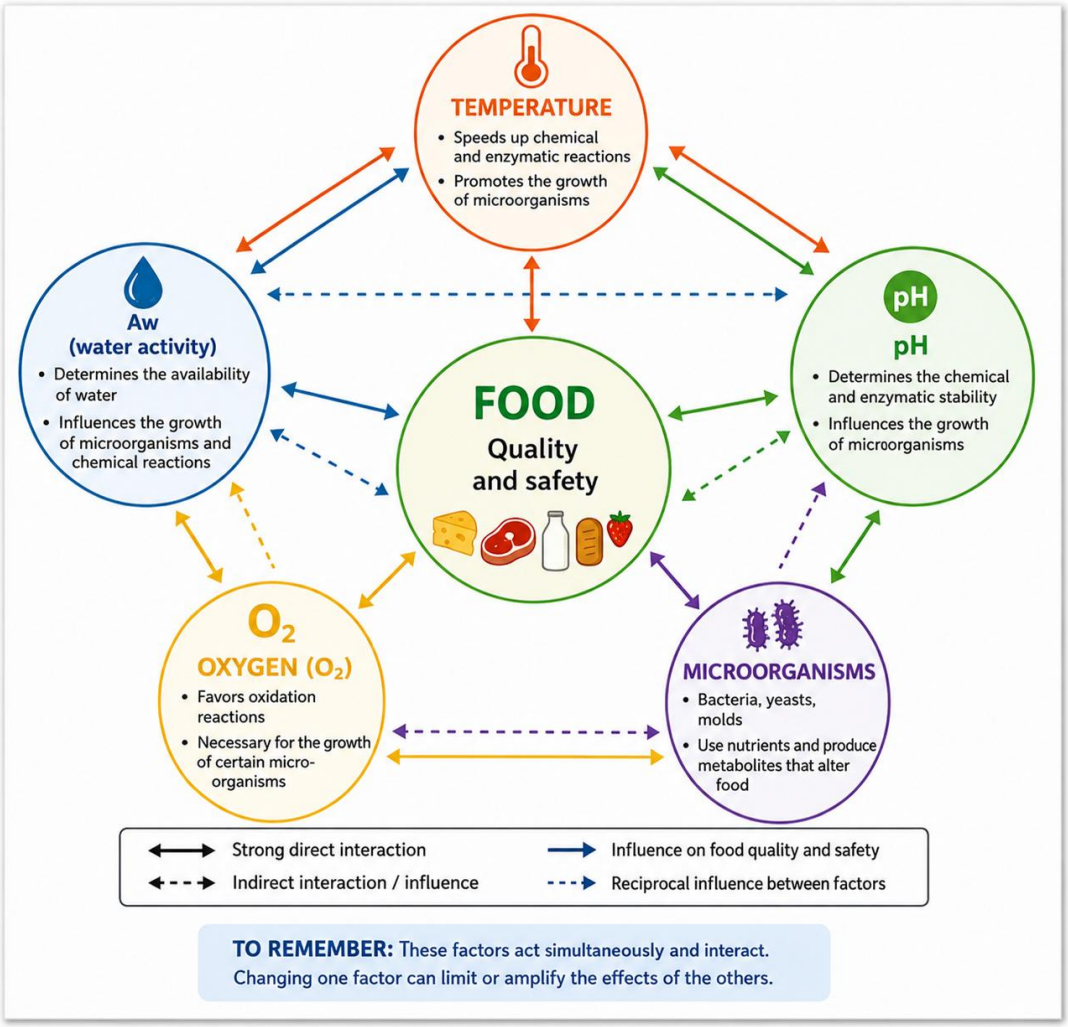


Figure 2: Diagram of interactions among food spoilage factors

4. The preservative function of packaging

As a tool to aid preservation, packaging plays a complex role:

- Either solely as passive protection, when it is independent of the food preparation and preservation technique: e.g., packaging for a cookie.

- Or it serves both passive and active protection, when it is closely linked to the food's preparation and preservation methods, or when it is designed to be the primary agent in preserving the product itself: packaging for modified atmosphere packaging or edible packaging.

In all cases, the primary ethical and regulatory requirement with regard to the consumer is that the packaging be inert with respect to the packaged product, i.e., that it itself in no way act as a factor causing spoilage.

4.1. Safety and inertness of packaging

While the necessity of packaging safety with respect to food may seem obvious, achieving this in practice is not simple, as the packaging itself can be a source of contamination and preservation issues.

The ever-increasing complexity of packaging, which consists of multiple components—often of different materials (plastic, metal foils, paper and cardboard…), with a more sophisticated presentation and appearance (designs, colors) requiring the use of numerous materials (inks and varnishes), significantly increases the risk of migration of volatile (particularly solvent) or soluble substances from the packaging into the food it contains.

These contaminants may be toxic (lead) or may alter the food's organoleptic properties, imparting an unacceptable taste or odor. Regulations governing materials in contact with food stipulate that they must be inert with respect to the food; in this regard, there are positive lists of substances that are permitted to be incorporated into the packaging (ink, varnishes, etc.). The manufacturer and the user of the packaging are jointly responsible for compliance with these obligations.

4.2. The passive protective role of packaging

Packaging is first and foremost a barrier between the product and the external environment, and thus provides passive protection against that environment. Just as the skin of

certain fruits (bananas, oranges, etc.), the shell (nuts), or the eggshell are natural forms of packaging, certain types of packaging made of a peelable film (e.g., cheese) are not very different from these.

4.2.1. Mechanical protection: this is the primary function of all packaging; indeed, food products, depending on their physical state, must be protected:

a. ***Against the transfer of momentum***

During handling and storage, that is, against sudden impacts that could break or crack fragile products such as eggs, pastries, and confectionery; or against more or less constant stresses that could deform products with a pasty, soft, or plastic texture (dough, fats such as butter or margarine, cheeses, etc.).

b. ***Against leakage of liquid products*** that may occur due to seams or closures (caps) that are not sufficiently resistant to impacts from objects capable of piercing the packaging.

c. ***Against insects that may puncture cardboard and plastic packaging***

4.2.2. Protection against material transfer

Such transfers may occur in the liquid phase (impermeability or porosity of the packaging to liquids), or more generally in the gas phase (sealing/porosity to gases, vapors, and other volatile substances)

a. Impermeability. Liquid transfer

The issue of permeability and gas-tightness (particularly of seams) to liquid products arises primarily with new packaging materials, whether simple or complex

b. Gas transfer:

Most materials used (cardboard, metal foils, various plastics) exhibit varying degrees of gas permeability; in contrast, welded metal cans or glass jars with so-called “cannette” or screw-on lids are normally gas-tight. With regard to these gas transfers, packaging plays a dual role:

- On the one hand, it acts as a barrier against transfer from the outside to the inside of the packaging:

- A barrier against oxygen and water vapor to protect products sensitive to oxygen (risk of mold or aerobic bacterial growth; risk of oxidation or rancidity) or prone to rehydration (risk of texture deterioration: loss of crispness, biscuit-like texture, etc.);

- It also acts as a barrier against any volatile substances that may be present in the environment (hydrocarbons, smoke, etc.) and that could alter the organoleptic properties (taste, odor) of the food.

➢ Furthermore, it acts as a barrier against transfer from the inside to the outside to prevent:

- The escape of the product's specific aromas;
- Dehydration of the product (when the formulation is that of a moist or semi-moist product);
- The escape of gases or gas mixtures that may have been introduced into the packaging for product preservation (CO_2, N_2, alcohol vapor, etc.).

Note: Gas impermeability is never complete, as it depends on several factors, including the composition of the packaging materials, the preservation method used, the type of product, etc.

- Oxygen permeability is important for two categories of products: those that are sensitive to oxygen and those in which other environmental factors (temperature, humidity, composition, etc.) allow microorganisms to grow;
- Water vapor permeability is particularly important for products with a crisp texture (cookies, chips, etc.) and for products susceptible to microbial growth, especially those intended for export;
- CO_2 permeability, as there are numerous applications for CO_2 packaging, particularly for protecting bread from mold, preventing oxidation in fruits and meat products, etc.

4.2.3. Protection against energy transfer

Two types of energy transfer can occur from the external environment to the product through the packaging, triggering or accelerating chemical or microbiological spoilage processes.

A. Radiant energy transfer: light

Many products are sensitive to light, which initiates photochemical reactions responsible, among other things, for color changes, vitamin loss, and the photolysis of amino acids. For these products, the role of packaging is either to filter out harmful wavelengths while still allowing the product to be seen, or to block all light from entering (opaque packaging, where the inability to see the product is generally compensated for by an appropriate image printed on the packaging).

B. Heat transfer (by Radiation, Convection, and Conduction)

Many products require a relatively stable temperature for preservation. Packaging helps preserve frozen products by preventing them from warming up during various modes of transport and handling, as well as during storage equipment failures.

Good thermal insulation properties are also sought for the packaging of products delivered hot for near-immediate consumption (train, airplane).

4.2.4. Protection against microorganisms present in the atmosphere

One of the essential roles of packaging is to maintain the hygienic and microbiological quality of food. On the one hand, it acts as a physical barrier between microorganisms—which are always present in large numbers in the surrounding atmosphere—and the packaged products, thereby preventing their recontamination or overcontamination; on the other hand, it limits or prevents gas exchange that could promote the growth of present microorganisms
Four cases must be distinguished:

- ✓ Non-sterile products (cookies, bread, etc.), which are generally not easily spoiled by microflora (dry products or those containing a preservative): packaging will prevent excessive contamination or the introduction of pathogenic bacteria by people handling the products;

- ✓ Products containing specific flora, which must not be contaminated by foreign competitive bacteria capable of displacing the original flora (cheese, yogurt, sausages);

- ✓ Products that, while not sterile, require extremely rigorous hygiene (meat, fish, vegetables) to prevent the risk of consumer poisoning by pathogenic flora;

- ✓ Sterile products (sterilized milk), whose packaging, in addition to being completely impervious to all microbial organisms, must be able to withstand sterilization conditions or be suitable for aseptic packaging; however, this already falls under the category of packaging with an “active role.”

4.3. The active protective role of packaging

In many cases, packaging does not merely play a passive role as a barrier between its contents and the external environment, but is an integral part of the food preparation and preservation process. It is designed for and adapted to a specific technology, of which it is an indispensable complement. Consequently, packaging plays an "active role" in these technologies, of which we will examine a few examples:

4.3.1. Canning

The first and oldest example of this role is packaging used for canning: jars and cans. These containers were designed:

- To be completely impermeable to liquids, gases, and microorganisms;
- To withstand heat treatments;
- To allow for the expansion and contraction of the atmosphere inside the container during heating and cooling, without breakage, explosion, or implosion;
- To allow for the expansion and contraction of the atmosphere inside the container during heating and cooling, without breakage, explosion, or implosion: this is the role of the deformable lid on metal cans, or the rubber gasket on glass jars.

4.3.2. Sterile (or aseptic) packaging

In this technique, which is mainly used for liquids (milk, fruit juice) but can also be applied to solids, the product—sterilized in bulk just before packaging—is aseptically introduced into packaging that is itself sterile. The container is most often formed continuously within the packaging machine itself; this involves either flexible cardboard-based composite films or plastic films, which are directly formed, sealed, and sterilized, etc., and immediately filled and sealed under perfectly aseptic conditions, ensuring the material and seals are completely impermeable to germs (absence of microporosity and micro-leaks).

4.3.3. Modified atmosphere storage and refrigeration of fresh products (4^{th}range) and5^{th}range products

Packaging of fresh and perishable products under inert gas or modified atmosphere (a gas mixture in specific proportions tailored to a given product), at positive (0 to 5°C) or negative temperatures. This growth has been made possible by simultaneous advances in packaging machinery and in materials (plastic, metal, cardboard) with selective and controlled permeability, which allow for the maintenance of constant gas proportions within the packaging's inert atmosphere, despite the active metabolism of the packaged products.

4.3.4. Special packaging

For certain high-value products, special packaging has been developed, such as: pouches with a valve (allowing the release of internal pressure), or pouches made of a multilayer composite incorporating a layer of oxygen-scavenging reagent (thereby preventing any risk of oxidation).

4.3.5. Other future prospects

a. ***Irradiated products:*** this creates a new need for packaging: materials that, in addition to the properties already mentioned—which are necessary for microbiological protection—must withstand irradiation to allow the product to be treated directly in the packaging;
b. ***Vacuum cooking:*** the packaging must be able to withstand the treatment and subsequently ensure the product's protection;
c. ***It is possible to incorporate capsules*** containing an antiseptic agent ***into the packaging along with the product***, ensuring its slow and gradual release into the packaging's inert atmosphere throughout the product's intended shelf life, etc.

5. Review questions

1. Explain how environmental factors (temperature, water activity, pH, oxygen) affect food stability.
2. Analyze the interactions between the various spoilage factors and their impact on food shelf life.
3. Discuss the importance of controlling water activity (Aw) in food preservation.
4. Compare enzymatic and microbiological spoilage in terms of mechanisms and control.
5. Explain the role of Maillard reactions and their effects on food quality.

Food packaging generally serves as a medium for a label bearing information about the food product and the container, or the packaging itself carries this information. Packaging serves an informational role.

Furthermore, insofar as it prevents misrepresentation regarding the quality of the contents, packaging serves an economic protection function, provided that the packaging itself is neither unsuitable nor misleading.

1. Packaging as a medium for information through labeling

1.1. Information required on the label: The labeling of a prepackaged food product must include the following information:

1.1.1. The trade name:

This is the regulatory name of the food product, or, failing that, the customary name or a precise descriptive name. It includes, where applicable, a reference to the physical treatment undergone—pasteurized, frozen, concentrated, etc.—when there is a risk of confusion between the treated and untreated food product

1.1.2. The list of ingredients

Ingredients are the substances, including additives, used in the preparation of the food product and ultimately present in it, even in modified form. These ingredients are listed in descending order of weight. When the name refers to the presence of ingredients, their percentage must be indicated, with the exception of flavorings.

- ✓ ***Net weight:*** when the net quantity is less than 5 g or 5 ml, its indication is optional, unless it is a spice or aromatic herb (the drained net weight must also be indicated if the food product contains a liquid coating);
- ✓ ***Date:*** This is the date until which the food retains its specific properties, along with storage instructions. For perishable foods, this date is a "use-by" date within the timeframe set by health authorities. The label must state: "Use by, etc." Otherwise, it is a "best-before" date. The label must state: "best before, etc." Selling a food product after the use-by date is a violation;
- ✓ ***The name*** (or business name) and address of the manufacturer or packager (or of a seller established within the Community);

- ✓ ***The place of origin or provenance***, in cases where the absence of this information would cause confusion;
- ✓ ***Instructions for use,*** in cases where the absence of such information would prevent the proper use of the food product;
- ✓ ***Any other information required by regulations specific to the food product***

In the case of prepackaged foodstuffs grouped within outer packaging, if the outer packaging is opaque, it must include the information required on the prepackage as well as the number of prepackaged units and their weight or volume. If the outer packaging is transparent, there is no such requirement.

The table below illustrates the mandatory labeling information.

Table IV: Mandatory Labeling Information

Information	**Role**	**Example**
Product name	Identification	Pasteurized milk
Ingredients	Composition	Sugar, milk
Date	Safety	Best Before
Origin	Traceability	Local product
Instructions	Usage	Keep refrigerated

1.2. Exemptions from labeling rules:

- ✓ Application of EU regulations (fruits and vegetables, etc.)
- ✓ Exempt from the requirement to list ingredients (vinegar, etc.)
- ✓ Exempt from the requirement to indicate a date (fruits and vegetables, beverages, etc.)
- ✓ Exempt from indicating net quantity (e.g., cheese sold by the piece)

2. Packaging, a medium for special information through administrative marking

A mark is a distinctive sign. It is an indication intended to highlight a characteristic of the food product, in addition to the information provided by the labeling described above. There are marks that fall under industrial property rights, e.g., trademarks, trade names, and service marks, as well as administrative marks; these are indications subject to government oversight.

- **Health mark:** a mark required by various regulations concerning food products of animal origin, certifying that the prepackaged products in question have been inspected by the veterinary food hygiene service. The stamp is circular in shape and bears the words "veterinary health inspection" or the initials "ISV." Reuse of this stamp is prohibited;

- **Health stamp (EEC and NATIONAL):** For poultry, there is either an EEC health mark on a tag or sticker bearing the letters FR, the slaughterhouse registration number, and the EEC abbreviation, or a national health stamp on a tag or sticker bearing the department and slaughterhouse numbers, in accordance with the design, color, and size specifications set forth in the decree. Reuse of the stamp must be prevented;

- **AO designation of origin:** a designation of origin is the name of a country, region, or locality used to identify a product that originates from that area and whose characteristics are attributable to the geographical environment;

- **VQPRD control number:** quality wines produced in specified regions (in France);

- **Agricultural label:** the logo is the Label Rouge. It is a national or regional collective mark certifying that a product possesses a distinct set of specific qualities and characteristics, managed by a certifying body;

- **Sticker for exported fruits and vegetables:** Packages of fruits and vegetables intended for export must be affixed with a sticker after inspection by the fraud prevention agency.

- **International olive oil stamp:** This is a circular stamp issued by the International Olive Council to guarantee the quality of olive oil;

- **Products from so-called organic farming:** these are products obtained without the use of pesticides or synthetic fertilizers, in accordance with specifications approved by

interministerial decree, and monitored by a managing body responsible for the logo for partners in the sector;

- **Quality improvement agreement:** these are private-law contracts entered into between a company and consumer organizations, under the auspices of the Ministry of Consumer Affairs, certifying an improvement made to the products or services in question. The logo is a rectangle containing the word "approved" within an oval;

- **Certificates of qualification:** these do not apply to food products but to industrial products and may therefore pertain to packaging. Certification bodies are accredited by the relevant ministries to manage certificates awarded in accordance with technical regulations and displayed as logos or marks on products;

- **Stamped caps:** these are caps indicating the payment of excise taxes that are placed on the tops of bottles of various beverages.

3. Packaging, a medium for barcode markings (GENCOD)

Since 1980, consumers have seen a small rectangle containing parallel lines and numbers appear on product labels. This is the implementation of the GENCOD system (Groupement d'Etudes de Normalisation et de Codification), which allows manufacturers and distributors to convey product characteristics using a combination of bars and numbers.

In stores equipped with the necessary technology, electronic cash registers connected to a computer scan these barcodes, displaying clear information on a screen for the customer—information that is also printed on the receipt. Devices are also available to help consumers understand the barcode symbols. The system facilitates the management of supplies and inventory, as well as the speed and security of sales transactions.

4. Packaging as a medium for price information

The prices of goods, products, and services are governed by well-defined regulations, which stipulate that these prices are freely determined by market competition, except in certain exceptional circumstances justifying a temporary exemption.

It is thus worded: *"Any seller of a product or any service provider must, by means of marking, labeling, posting, or any other appropriate method, inform the consumer of prices,*

any limitations on contractual liability, and the specific terms of sale, in accordance with the procedures established by decrees of the Minister of the Economy, after consultation with the National Consumer Council."

5. Eonomic protection of consumers through packaging

This applies much more to food products, due to the methods of distribution and sale. Most of these products were transported and traded in bulk. Carriers and retailers (the parties involved) therefore had ample opportunity to tamper with the goods. Once products are prepackaged, the consumer is protected against all such fraud involving quality and quantity, as the prepacked commits to providing a product of a specified quality in the advertised quantity. Packaging thus serves a clear function of economic consumer protection.

The economic protection of the consumer through packaging is also achieved by meeting all the specific performance requirements mandated by regulations, as food-specific regulations sometimes emphasize a characteristic expected of the packaging that is linked to the preservation of the product. Here are a few examples:

- Strength as of July 18, 1977, cut meat
- Leak-proofness D 02/10/1955 canned goods
- Overall packaging D 09/09/1964 frozen foods…

It is clear that packaging must not be misleading: for example, the use of false backgrounds or colored films to give the impression of the food's natural color. Nor must it be used to convey false advertising, which is prohibited by law.

6. Review questions

1. Analyze the regulatory requirements for food labeling and their importance.
2. Discuss the role of the barcode (GENCOD) in traceability and logistics management.
3. Explain the different types of administrative markings and their purpose.
4. Demonstrate how packaging contributes to market transparency and fair trade practices.
5. Analyze the limitations of packaging in terms of protection against fraud.

In addition to the technical functions of protecting, transporting, and storing the product it contains, packaging serves a significant marketing function as a means of communication—that is, a set of information, whether clear or coded, that is consistent with itself, whose ultimate goal is to convey the product's message and image to the consumer or end user.

Indeed, particularly for mass-market food products sold in large retail outlets, the producer's challenge is to ensure that their product is seen, decoded, and understood—and that it appeals to the consumer enough to prompt a purchase. Here we find the role of the "silent salesman," extensively described throughout classical marketing literature.

From the very first contact between the product and the consumer, two key functions stand out: *the functions of recognition* and *identification*. Subsequently, to reassure and inform the consumer about the product—and before encouraging them to buy—two other functions come into play: the *functions of information and persuasion*. Finally, once the product is in the consumer's possession, the packaging serves a *service function* in accordance with its instructions for use.

1. Locating function

In a supermarket, for example, there is a range of products with several brands and SKUs; in this case, the consumer faces difficulty in making the right choice. This is why the manufacturer must take great care to ensure that the shape, graphic design, and color scheme of the packaging are highly visible and recognizable from a distance.
Example: The Coca-Cola brand, with its highly distinctive bottle and simple, single-color packaging in a six-pack, is globally recognized and easily identifiable.

2. Identification function

Similar to the previous function, this one differs in that behind a brand or a shape, there is often a product family, a reference universe, and sometimes a brand universe, and it is necessary to be able to unambiguously attribute the product in question to its reference universe.

It must therefore enable consumers to interpret the visible markings on the packaging, compare them with what they are accustomed to seeing on products in this category, and thus be confident that the product they are purchasing belongs to the correct category.

3. Informational function

This encompasses the label and its standard content (product name, brand, ingredients, and legal or mandatory information, such as the sell-by date or best-before date), but it goes far beyond that. The informational function may cover instructions for use, usage suggestions, or the presentation of other products in the line. Promotions may also be included. However, there are packaging designs where the *informational function* is more indirect: transparent packaging that aims to fully display the product inside in order to definitively reassure the consumer.

Ex: "Super View" meat trays. This function, which is fairly objective, is essential for attracting and convincing the consumer. It also serves to reassure the consumer, especially regarding new products.

4. The function of seduction

Attractive packaging catches the eye and drives sales; it is the most subjective and important function of packaging: *"it sparks desire and triggers the purchase."*

The imagery on a product's packaging plays a significant role in its appeal.

The shape, aesthetics, and material chosen for the packaging—all these factors can enhance the product's appeal. Thus, the packaging must convey the image desired by the manufacturing company.

5. Service function

This function only becomes apparent after the purchase, in the consumer's home, even if it is sometimes perceived and highlighted at the time of purchase. It encompasses all the functional qualities or ease of use that packaging must provide for the consumer.

Ex: a safety cap for hazardous cleaning products, or the ability to easily reseal the product after initial use if it is intended for multiple uses.

Table V specifies the objectives set for each marketing function of packaging and the means used to achieve them.

Table V: Objectives and means used in marketing functions

Function	Objective	Means Used
Identification	Attracting attention	Color
Identification	Recognition	Logo
Information	Reassure	Label
Appeal	Encourage purchase	Design
Service	Ease of use	Easy to open

6. Review questions

1. Explain the concept of the “silent salesperson” as it applies to packaging.
2. Analyze the impact of visual elements (shape, color, design) on purchasing behavior.
3. Discuss the complementary relationship between the marketing and technical functions of packaging.
4. Evaluate the role of packaging in building consumer loyalty.
5. Analyze the importance of consistency between brand image and packaging design.

The factors to consider when choosing packaging boil down to asking several questions, which are directly linked to the various functions generally required of packaging. Several criteria influence the technical choice of packaging: the product contained, the storage requirements for that product, specific constraints, etc. (**Table VI).**

1. Depending on the nature of the product contained: The first criterion is the nature of the product contained. We will examine this from the following perspective:

- *It is a gas:* several factors can be evaluated. Its chemical properties may make it corrosive. It is important to know its storage and usage conditions;
- *It is a liquid, effervescent or not:* physically, liquids are less disruptive than gases. Still liquids pose no problems other than those caused by expansion. However, effervescent liquids—primarily food liquids (sodas, cider, etc., which contain CO_2)—at high temperatures (around 100°C) may exhibit the combined drawbacks of both liquids and gases;
- *It is a paste:* if they are hydrophilic, they must be protected from moisture to prevent them from turning into a liquid. If they are intended to remain in paste form, without adequate protection, they will harden into a solid block (shoe polish, for example, dries out once the package is opened);
- *It is a powder:* the powder may be hygroscopic and become pasty if not stored in a dry environment, etc.

2. Depending on transport, handling, and storage conditions

2.1. During transport: Products being stored and handled are subjected to numerous dynamic stresses. The extent of these stresses varies depending on transport conditions and the number of load transfers. The resulting damage may include punctures or deformation of the packaging, with the associated consequences. This risk can be mitigated by creating solid protection, such as shielding, or conversely by leaving a void between the packaging wall and the product to be protected.

2..2. During handling: It is important to know the destination of a package and the handling conditions upon arrival and departure before making a choice.

2.3. During storage: Two types of precautions must be observed during storage: verify that the physical environmental conditions are appropriate (temperature, hygiene, etc.), and ensure the mechanical conditions of storage are adequate. If there is a recommended orientation (such as "Top-Down" or "Fragile"), the instructions must be clearly visible and unambiguous.

3. Depending on specific constraints: certain products have characteristics that impose specific constraints. These must be precisely understood to propose a perfectly tailored solution; here are a few examples:

- *Airtightness:* It is essential to ensure that the can is immediately airtight and remains so over time.
- *Easy opening:* Cans that open easily by hand by pulling a tab.
- *Safety closures:* conversely, in some cases, we want to prevent children from opening packages of medications or cleaning products. A solution often used is a counterclockwise twist, for example…

4. Based on needs and marketing criteria: this encompasses everything that may be required of packaging beyond its standard function, which is primarily to facilitate the use of a given product, etc.

4..1. Choice of materials: It is important to understand that, from a marketing perspective, the choice of a material for a given package involves not only its specific characteristics and technical properties but also its marketing qualities. The material should be selected based on the technical requirements for protection, preservation, and use of the product, as well as the image one wishes to convey for that product.

4.2. *The choice of shape:* Shape is often the first thing people notice about an object. It is closely linked to the type of product and also to its intended use.

4. 3. *Graphics and colors:* a domain typically handled by the advertising agency or designer, it is through the graphics that the core message regarding the product's positioning and marketing pitch will be conveyed.

Table VI: Criteria for selecting packaging

Criterion	Requirement	Example
Product type	Compatibility	Liquid → bottle
Transport	Strength	Reinforced cardboard
Storage	Stability	Moisture resistance
Marketing	Appeal	Design
Safety	Protection	Safety cap

5. Review questions

1. Analyze the technical constraints associated with packaging products in different physical states.
2. Discuss the impact of logistics conditions (transport, storage) on the choice of packaging materials.
3. Explain the trade-offs between technical and marketing requirements in packaging selection.
4. Analyze specific constraints (sealing, safety, easy opening) in packaging design.
5. Discuss the importance of material selection from a sustainability perspective.

In a context marked by heightened vigilance regarding food safety and consumer protection, food packaging occupies a strategic position within the agri-food chain. Far beyond its primary function of containing food, it is an essential element in ensuring the quality, safety, and traceability of food products. As a result, its design, manufacture, and use are governed by an increasingly stringent set of laws and regulations.

The food industry is thus required to comply with strict requirements concerning, in particular, the nature of the materials used, their suitability for food contact, and the manufacturing processes employed. These regulations aim to prevent any risk of chemical, physical, or biological contamination that could compromise product safety and harm consumer health. They also impose obligations regarding labeling, traceability, and operator liability.

At the same time, technical standards and quality frameworks play a fundamental role in harmonizing practices and continuously improving packaging performance. Systems such as ISO standards or quality management systems ensure product compliance with regulatory requirements while strengthening the confidence of consumers and business partners.

Thus, the objective of this chapter is to examine the main legal and regulatory frameworks governing food packaging. It will highlight the obligations to which companies are subject, as well as the control and certification mechanisms that guarantee the safety, compliance, and reliability of packaging in the food industry.

Due to the expanding use of packaging, the emergence of new materials, and for several other reasons, public authorities have deemed it necessary to establish rules in the interest of public health, protection against fraud, measurement accuracy, and the facilitation of trade. These rules stem from various pieces of legislation, each of which is dedicated to a specific area.

1. National and International regulatory framework

To ensure consumer safety, the use of food packaging is strictly regulated by international standards.

The Codex Alimentarius (FAO/WHO) establishes the general principles of food hygiene. Similarly, ISO 22000 defines the requirements for food safety management systems.

At the European level, Regulations (EC) No. 1935/2004 and (EU) No. 1169/2011 govern, respectively, materials in contact with food and product labeling. These regulations aim to ensure transparency, traceability, and consumer protection.

E.g.: *Law of August 1, 1905,* on fraud and falsification regarding products or services. *Law of July 8, 1965,* on the inspection of animal products.

Note: These rules are established in French law through decrees or orders.
For example, the *decree of February 12, 1973*, regarding food contact materials**.** This decree, derived from *the Act of August 1, 1905*, contains several articles relating to materials and objects intended to come into contact with food, which include five requirements:

- Inertness (requirements based on the non-migration of packaging components into the food product)
- Requirement for authorization of packaging components
- Special measures, if the packaging is exposed to ionizing radiation
- Information on suitability for food contact
- Cleanliness of packaging

2. Examples of packaging regulations: among these, we cite:

2.1. Packaging regulations under the public health Code

This code imposes requirements on certain materials or items intended for food contact: for example, regarding food packaging, and in the interest of hygiene in the trade of such goods, the regulation (Article 127) stipulates that these must be provided to consumers either pre-packaged or protected by a wrapper made of insulating material or paper.

2.2. Regulations on packaging for foodstuffs of animal origin

The *Decree of July 21, 1971*, established the following principle in Article 10: *"Wrappers, containers, and packaging for foodstuffs of animal origin must not be used or reused under conditions that would compromise the sanitary condition of such foodstuffs.*"

Ex: *Art. 15.05.1974* concerning ground meat, which sets forth the temperature, storage, and sale deadlines that must be observed.

2.3. Regulations on measuring containers and prepackages with a fixed nominal quantity

- ***Measuring containers:*** Decrees define measuring containers as bottles with metrological properties that allow for the measurement of their contents' volume.

- ***Prepackaged goods with a fixed nominal quantity*****:** prepackaging in fixed nominal quantities is governed by the *decree of January 31, 1978*; this allows for the standardization of packaging capacity ranges and is carried out under the conditions set forth in this decree, under the supervision of the Measurement Standards Office.

3. Roles of various stakeholders in the enforcement of regulations

Packaging manufacturers and food packagers are required to comply with the regulatory provisions outlined above:

- The Directorate General for Competition, Consumer Affairs, and Fraud Control (DGCCRF) has a dual role: to propose amendments (corrections, modifications, etc.) to regulatory measures if scientific or technological progress, or if health or economic necessities or international agreements necessitate changes. Second, to monitor how regulations are applied in industry and commerce and to correct deficiencies through preventive or enforcement inspections;
- Veterinary Food Safety Service, which conducts inspections focused on the sanitary conditions and quality standards of food products of animal origin;
- Measurement Instruments Service, which includes central services (metrology, methods, techniques, etc.) and verification services, etc.
- General Directorate of Health, which plays an important role in the field of packaging and issues recommendations regarding hygiene and health.

4. Review questions

1. Compare national and international regulations regarding food packaging.
2. Analyze the requirements for materials in contact with food.
3. Discuss the challenges of traceability in packaging regulations.
4. Explain the principles of inertness and food compatibility.
5. Analyze the implications of regulations on innovation in packaging.

1. Types of liability

Liability in the agri-food sector is defined as the obligation to compensate for damage caused by a fault, in certain cases defined by law.

Legal frameworks delineate the boundary between civil and criminal law; in the first case, the issue of contractual liability is specified, which concerns the relationship between the buyer and the food supplier and between the business and the consumer (assessment of non-compliance of the goods supplied at the time of sale with specifications, references, etc.). In the latter case, which falls under both criminal law—such as fraud and forgery, misleading advertising, etc.—and administrative law for failure to comply with a mandatory rule (e.g., price display).

Liability thus extends from the supplier of substances used in the manufacture of a given product to the manufacturer, importer, and retailer.

The law of July 21, 1983, for example, specifies the liability of the party responsible for first placing a product on the market…who is required to verify that it complies with applicable regulations, without specifying whether this refers to the manufacturer, importer, or distributor.

This responsibility is fulfilled through the preparation of a final report, which is issued after completing a full procedure. Depending on whether the case involves damage or a criminal offense, the procedure will include the following steps: assessment of the damage by the fraud investigation unit (documented in a report), collection of three samples of the goods, which are sealed and sent either to the expert (appointed by the court) or to an accredited or official laboratory; and finally, submission of the reports to the investigating judge, who decides whether to dismiss or prosecute the case.

2. Problems encountered:

Among these, the following may be noted in particular:

- Deceptive practices that may be carried out regarding the food product (through the use of misleading labeling and packaging): the product (misrepresentation of its nature, composition, etc.), misleading packaging (inappropriate capacities, reuse of packaging, etc.);
- Product adulteration (adding additives in non-compliant doses, using unauthorized substances, etc.) and packaging adulteration (using false measuring containers, using packaging hazardous to health, etc.);

- Misleading advertising, whether regarding the product (its quality, origin, etc.) or the packaging (selling a product in previously used packaging, etc.);

- Use of medicinal substances in the food or cosmetics industries (trace elements).

3. Actions among the various parties

Following a given problem, any entity bearing responsibility within the food chain must take all necessary measures to ensure the safety of goods delivered to consumers, an effort that is generally collaborative:

- The government's action against the manufacturer(s) or seller(s) of the food product
- Action taken by professionals among themselves when the goods sold do not meet the buyer's requirements
- Action taken by the business against the government, when the latter has ordered the detention or seizure of the goods
- Action by recognized consumer organizations, etc.

4. Remedies and sanctions

Civil remedies are intended to compensate the plaintiff—whether a purchaser or an accidental victim of the product—for the harm suffered; criminal penalties generally apply in cases of fraud (an offense sometimes punishable by imprisonment…), false advertising (corrective advertising…), and consumer safety violations (seizure of the goods or a ban on their sale).

5. Prevention and insurance

- Product quality control by qualified personnel to ensure and maintain quality. For this control to be effective, it must be conducted by the company at its own suppliers to identify risks at various levels, and by external bodies such as quality control departments and fraud enforcement agencies.
- Preventive legal insurance; regular consultation with legal counsel is particularly useful in the areas of trademarks and advertising…

6. Review questions

1. Distinguish between civil and criminal liability in the agri-food sector.
2. Analyze the procedures in the event of a dispute related to food packaging.
3. Discuss the role of prevention in legal risk management.
4. Explain the relationships between the various actors in the food chain in the event of non-compliance.
5. Analyze the impact of sanctions on industrial practices

The competitiveness of agri-food companies and their ability to grow their market share depend on potential customers being willing to purchase their products and finding satisfaction in using them; in other words, the food product must retain its qualities from the factory floor to the point of consumption. At the same time, packaging, in its various roles, must contribute to the success of products; it is at this point that the French Association for Quality (AFCIQ) states that packaging is an element of food product quality assurance.

Standardization is of great importance for implementing this approach in food processing companies, whose role is to improve packaging functions on par with other functions—such as quality, production, and marketing—which is far from always being the case.

1. Standardization of packaging in the food industry

1.1. Definition of standardization

Standardization is a process in which all partners in the food chain—producers, processors, and administrators—must, in collaboration with researchers, compare their perspectives on various aspects (technical and economic) in order to jointly find optimal solutions to the problems at hand. AFNOR is one of the organizations that plays a key role in this effort.

1.2. French Standardization Association (AFNOR)

AFNOR, founded in 1926, is responsible for coordinating all standardization activities in France, managing the NF certification, and extending its work to the European Committee for Standardization (CEN) and the International Organization for Standardization (ISO), of which it is the French member. In addition to defending national technologies, AFNOR's role is to: to ensure an international presence both at the global level through ISO and at the European level through CEN; and to provide companies with the services they are entitled to expect regarding training on all aspects of quality tools for various business functions, certification of products compliant with standards, etc.

For example:

- CEN has established two committees: CEN on glass containers (CEN/TC 78) and on metal containers for canned goods (CEN/TC 81);

- ISO, for its part, works on light metal containers (ISO/TC 52), glass containers (ISO/TC 63), and packaging in general (ISO/TC 122),

1.3 French Association for Quality (AFCIQ)

This association was founded in 1957 and is recognized as a public-interest organization. Among other things, it aims to study and develop, by all means, the application of quality management and assurance methods. It works with French associations on all matters related to food quality and packaging.

Among the objectives of this association is to establish recommendations to ensure the maintenance of food product quality from the processing stage through to the distribution stage.

2. Constraints of distribution channels

A food product, whether raw or processed, must, between its place of production and its place of consumption, undergo storage, handling, and transport operations during which its packaging, if any, and its transport packaging play an essential protective role.

For packaging to be suitable for all distribution conditions, the food industry must, at the time of packaging design, analyze with its packaging manufacturer the various constraints it will encounter—a process that has, in fact, led to the development of several current standards.

2.1. Properties of packaging materials

As the world of materials evolves and new techniques emerge, the designer must have a thorough understanding of the materials at their disposal, just as they must master the product to be packaged (container-content), analyzing and quantifying, where possible, important characteristics such as sensitivity to environmental conditions, fragility, and the inertness of packaging components with respect to the pre-packaged product and its contents, etc. To this end, several standards have been developed, namely: standards determining volatile material losses; standards assessing water vapor permeability; standards addressing sampling issues, etc.

2.2. The properties of the packaging itself

Certain specific types of packaging have been standardized: tin cans and other various metal packaging; bottles and other glass packaging; aerosol containers; packaging for fruits and vegetables; other types of packaging: lightweight wooden packaging for transporting oysters, packaging, etc.

The standardization of packaging in the agri-food sector certainly does not address all the issues that may arise and will increasingly arise in a rapidly changing environment. Standardization is therefore a means of providing the agri-food sector with solutions to the various problems it faces.

3. Review questions

1. Explain the role of standardization in the continuous improvement of packaging.
2. Analyze the contributions of standardization organizations (ISO, AFNOR, CEN).
3. Discuss the advantages and limitations of standardization in the agri-food industry.
4. Explain the link between standardization and quality assurance.
5. Analyze the impact of standards on international competitiveness

Food reaches consumers in packaging that allows for transport from the point of production. Consumers may ask several questions: What are consumers' concerns? How can they exercise free choice? What guarantees are required?

1. Consumer behavior

1.1. Rights and needs

Consumer behavior is based on the exercise of consumer rights, which can underpin any positive or negative action. In 1962, U.S. President John F. Kennedy proclaimed four rights that address all consumer issues: the right to health, which encompasses what we refer to as the obligation to ensure safety; the right to know, which we represent as the right to information, particularly through labeling; the right to choose, which is shaped by the issues of desire and price, and the economic ability to satisfy those needs; the right to be heard, which implies, in addition to consumer representation, the possibility of mutual understanding in the desirable dialogue between producers and consumers.

1.2. Expectations and desires

To identify the various consumer requirements and expectations that food packaging must meet, a survey was conducted by researchers specializing in the field. The survey results revealed that packaging material is considered essential by 55% of respondents, aesthetics by 24%, and size and shape came in last.

On the other hand, 72% believe that packaging should not affect the organoleptic properties of the food product, 65% want packaging to be natural and healthy to ensure long-term preservation, and 56% believe that packaging should be sturdy, durable, and practical, etc. (**Table VI).**

Table VII: Consumer Expectations

Criterion	**Importance (%)**	**Expectation**
Material	55%	Safety
Aesthetics	24%	Attractiveness
Functionality	56%	Practicality
Health	72%	Neutrality

2. Use and perception of packaging

The functions of packaging are appreciated by consumers during use, as they also concern other actors in the food chain (producers, transporters, sellers), who must be well-informed about the reasons for its use and the properties of the packaging in order to provide consumers with technical information and to report any difficulties encountered in using the packaging. Several institutes and organizations have frequently studied the issues of packaging effectiveness, compliance, and safety, as well as their socioeconomic implications.

The reasons for using packaging can be classified based on its function: sanitary or hygienic protection, insulation and maintenance of physical condition, preservation of organoleptic properties, sales unit and practical usability, information carrier, etc.

In practice, the consumer wants to receive the food product—whether solid or liquid—in perfect condition, whether fresh or preserved, for the specified duration. It is essential to ensure perfect sanitary conditions from the outset, which are often regulated and monitored by the veterinary services of the quality control department. All manufacturing and usage conditions must align with performance standards, the products to be packaged, specifications, codes of practice, etc.

Packaging can never improve the product's qualities, but if well-designed, it must be able to maintain the product's physical, sanitary, nutritional, and organoleptic condition—as well as its practical usability—for a limited time. It is these properties that consumers expect to find in the product through the use of appropriate packaging.

It can thus be shown that the effectiveness of packaging is the primary criterion for selection and that it is this property, in addition to compliance with regulations, that professionals must ensure and verify.

To best meet consumer demands and requirements, standards exist, published by various organizations (AFNOR, ISO, CEN, etc.), which devote significant effort and resources to improving the various functions and services of packaging, and even the product it contains.

3. Review questions

1. Analyze consumer expectations regarding food packaging.
2. Discuss the influence of subjective perceptions (aesthetics, practicality) on product choice.
3. Explain the role of packaging in consumer satisfaction.
4. Analyze fundamental consumer rights related to packaging.
5. Discuss current issues related to sustainable packaging and consumer perception.

Food packaging plays a central role in the food industry, performing multiple functions that go far beyond the simple role of containment. It serves as a tool for protecting, preserving, and enhancing products, thereby helping to ensure their quality, food safety, and consumer acceptance.

Through its technological functions, packaging helps limit physical, chemical, and microbiological changes in food while extending its shelf life. Furthermore, it plays an essential role in conveying reliable and transparent information, strengthening consumer confidence and protecting consumers from fraudulent practices.

Furthermore, packaging has emerged as a strategic marketing tool, significantly influencing purchasing behavior and contributing to product differentiation in an increasingly competitive market. However, the selection of packaging materials and systems must meet increasingly stringent technical, economic, and environmental requirements.

From a regulatory standpoint, the legal and normative framework governing food packaging is an essential safeguard for consumer safety and product compliance. Manufacturers are thus subject to rigorous obligations regarding quality, traceability, and liability, within a context marked by the harmonization of standards on an international scale.

Finally, in light of current challenges related to sustainable development and environmental protection, innovation in the field of packaging is essential. The emergence of eco-friendly, recyclable, and smart packaging reflects a shift toward more responsible practices, balancing industrial performance with environmental stewardship.

Thus, mastering packaging functions, regulatory constraints, and consumer expectations is a major challenge for professionals in the agri-food sector, who are called upon to integrate these dimensions into a comprehensive approach to quality and sustainability.

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Abstract

This course handout is intended for undergraduate students in food science, packaging and quality specialization, and aims to provide a comprehensive understanding of the role of packaging in the food industry. Its objective is to analyze the main functions of packaging, including its technological, informational, marketing, regulatory, and standardization dimensions, as well as its importance in ensuring food safety and quality. Packaging ensures the protection, preservation, and stability of food products, while also providing essential consumer information and contributing to economic protection against fraud. It also plays a key marketing role by influencing purchasing behavior. The document highlights the importance of a strict legal and regulatory framework, as well as the role of standardization in harmonizing practices and improving packaging quality. Finally, it emphasizes the growing consumer demand for safer, more practical, and more sustainable packaging solutions. Thus, packaging appears as a strategic element serving quality, safety, and competitiveness in the agri-food sector.

Résumé

Ce polycopié de cours est destiné aux étudiants de licence en sciences agroalimentaires, spécialité emballage et qualité, et vise à fournir une compréhension globale du rôle de l'emballage dans l'industrie agroalimentaire. Il a pour objectif d'analyser les fonctions essentielles de l'emballage, notamment ses dimensions technologiques, informatives, marketing, réglementaires et normatives, ainsi que son importance dans la sécurité et la qualité des aliments. L'emballage assure la protection, la conservation et la stabilité des produits alimentaires, tout en facilitant l'information du consommateur et en contribuant à la protection économique contre la fraude. Il joue également un rôle marketing majeur en influençant le comportement d'achat. Le document met en évidence le cadre juridique et réglementaire strict, ainsi que le rôle de la normalisation dans l'harmonisation des pratiques et l'amélioration de la qualité. Enfin, il souligne l'évolution des attentes des consommateurs vers des solutions d'emballage plus sûres, pratiques et durables. Ainsi, l'emballage apparaît comme un élément stratégique au service de la qualité, de la sécurité et de la compétitivité dans le secteur agroalimentaire.