TRAINING MANUAL

- FOOD SAFETY -

TRACEABILITY

COLEACP

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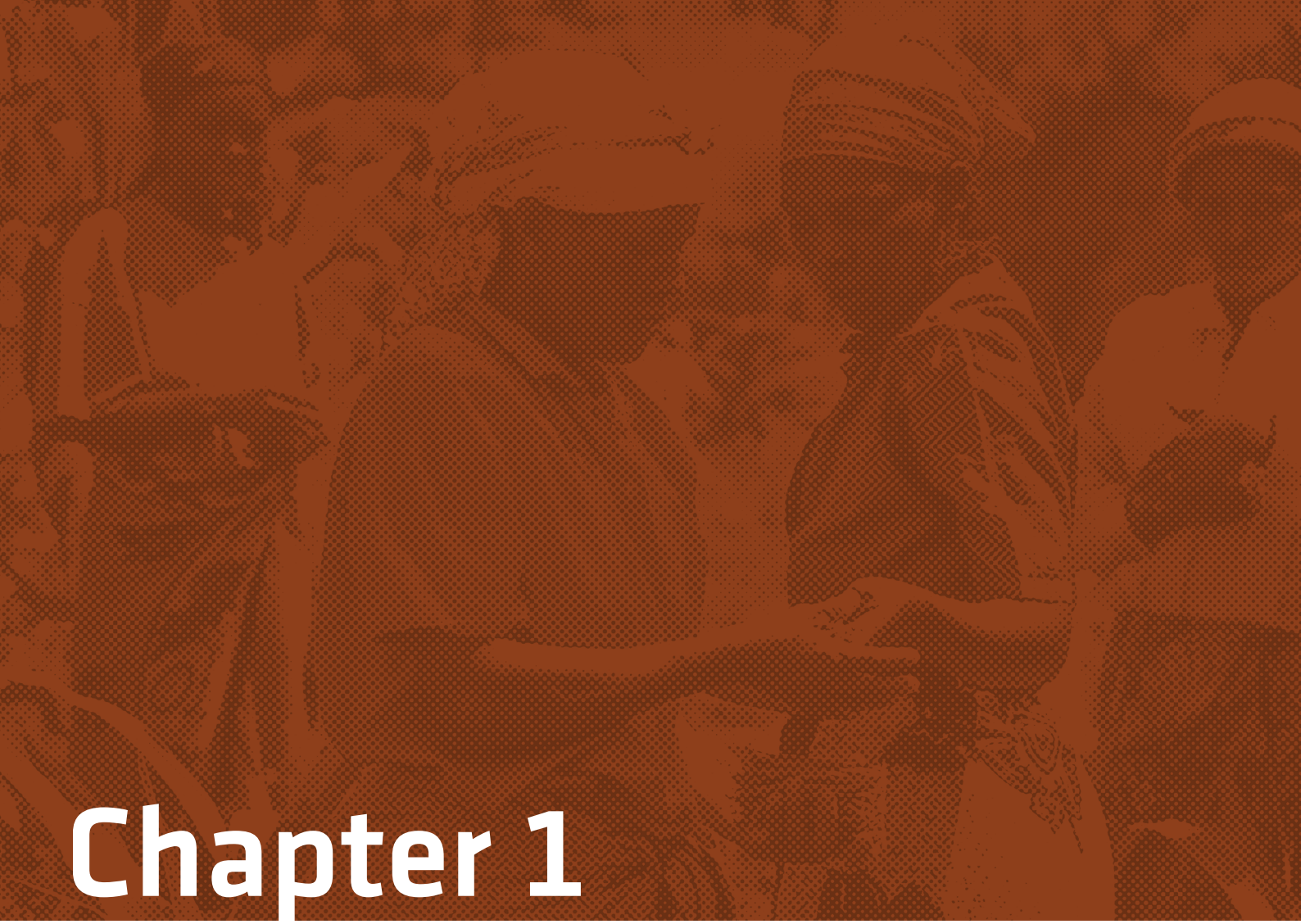


Chapter 1

Goals and components of a traceability system

1.1. What is traceability?

1.1.1. Concept definition and implications

From an etymological standpoint '**traceability**' is related to the word 'trace' which, figuratively, means a 'mark left by an event'. 'To trace' can also mean 'to indicate the path to be followed' or 'to draw contours'. Use of the word 'traceability' to describe the process of identifying the origin of a product and reconstructing its movements from production to distribution is fairly recent.[1] Born in the mid 1980's, traceability was the answer to a basic logistics problem: it guaranteed control over the flow of goods within a chain of partners and enabled significant savings.

According to the ISO 8402:1994 standard, traceability is defined as: *"The ability to trace the history, application or location of an entity or activity or of similar entities or activities by means of recorded identifications*".

The ISO 9000:2000 standard defines traceability as "*The ability to trace the history, application or location of that which is under consideration".*

It is a process that **makes it possible to find the trace** of the various steps and locations a product has passed through from its creation through to its final disposal. In other words, traceability makes it possible to identify the following for a product:

- all of its manufacturing steps;
- the sources of its components and their suppliers;
- the places the product and its components have been stored;
- all controls and tests carried out on the product and its components;
- the equipment used to make and handle the product;
- direct customers who bought the product.

Traceability has two key characteristics:

- It is intentional: recorded identifications are the result of a system organized to ensure the consistent collection and recording of identifications.
- It has several uses: to track history, locate entities and find operations. These uses combine and define the organization of the identification system.

Traceability is **a concept** applicable to many business sectors including chemicals, pharmaceuticals, automotive, research, testing laboratories etc.

[1] The word has only been included in some French dictionaries since 1998.

It has become a requirement for more than purely logistics reasons: relationships of trust with consumers, regulatory and legal requirements, standardization, recalls of defective products, e-commerce etc.

Traceability is **a tool** intended to enable tracking of a product throughout a production and distribution chain, from raw materials supplier to end-consumer.

The traceability process is based on:

- identification of the companies involved (supply chain partners);
- product identification;
- identification of logistics units (pallets, containers, etc.);
- information flows and data exchange.

In the agri-foods industry, it has become a factor in guaranteeing food safety.

Given the increasing complexity of flows, it is no longer sufficient to set up traceability in production companies alone. It must be present throughout the entire food chain.

Safety is the result of a **global**, **integrated** and **partner-oriented** approach throughout the entire chain. In order to guarantee good traceability, every operator in the chain must identify their products in a unique way and record their destinations and the links between incoming and outgoing products in databases.

In order to achieve this, each link is responsible for ensuring that **data is correct** and for guaranteeing that they are accessible to other operators in the chain.

Consumer safety is not an issue for confrontation. It's a matter of **cooperation** between all involved. This collaborative approach implies:

- dialogue between supply chain partners (information exchange);
- use of a common language (e.g., international codes).[2] The adoption of common standards leads to improved inter-company communications.

The *Coca-Cola*® affair (withdrawal of millions of cans following consumer complaints) proved that it isn't enough for a producer to have a good traceability system. Although the Atlanta-based company and its European subsidiaries did have a traceability system in place, the sale of their products was forbidden by the Belgian and French governments because wholesalers and retailers were not able to trace their commercial exchanges.

[2] Used by more than 800,000 companies worldwide, the EAN.UCC system is an international standard for codification (consumer units, logistics units and companies), automatic identification (EAN-13, ITF 14, UCC/EAN 128, etc.) and computerised data exchange. EAN communication standards enable the automation of data entry and processing, faster information exchange with improved reliability and lower transaction costs.

Recorded information provides detailed knowledge, immediately or after the event, to support analysis, decision-making, monitoring, etc. With this information, it is possible to take either preventive or remedial action on an entity or batch of entities in the event of danger.

However, in the end, traceability is simply a system that provides results and information. It cannot ensure product safety alone and does not enable either decision-making or the evaluation of results obtained.

1.1.2. Track and trace

Traceability seeks to achieve two different and complementary goals. It therefore implies at least **two different concepts**:

- Traceability of a **product's logistics**: the ability to **locate** a product in space and time. *Tracking* meets operational goals: physical tracking of an entity through to its final destination or the end of its life cycle (for example, spare parts for airplanes or technical products requiring regular maintenance). It can be used in the event of product withdrawal or recall if there is a threat to health.

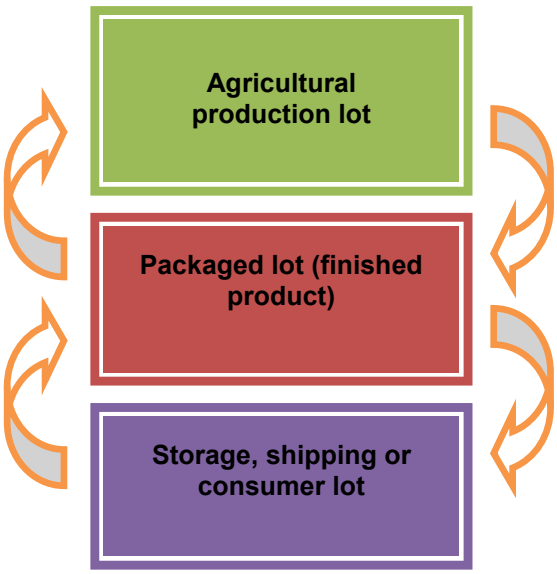
Tracking answers the questions: 'Where?' and 'When?'

- Traceability of a **product's contents**: the ability to provide all **information** about the life of a product (origin of seeds or seedlings, growing operations, the inputs used in production, animal feed, veterinarian services, phytosanitary treatments, processing operations, etc.); tracing to know the uses or composition of a food (the substances used to make it). ***Tracing*** is qualitative. It is used to find the cause of a quality problem, to verify the conformity of the stated characteristics of a product (organic agriculture, *fair trade*, etc.) or the product's itinerary. It works backward from the point-of-sale to the producer (and, potentially, to the plot on which the fruits, vegetables or potatoes were grown).

Tracing answers the questions: 'What?', 'With what?', 'How?', 'By whom?', and 'Why?'

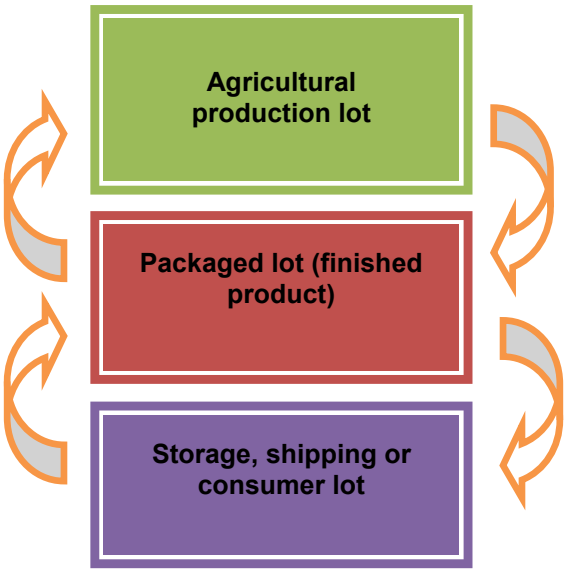
Product traceability:

Information is inter-linked to provide lot history.



Data traceability:

The documents and recorded data at each step of the lot's life are linked thanks to unique identifications.



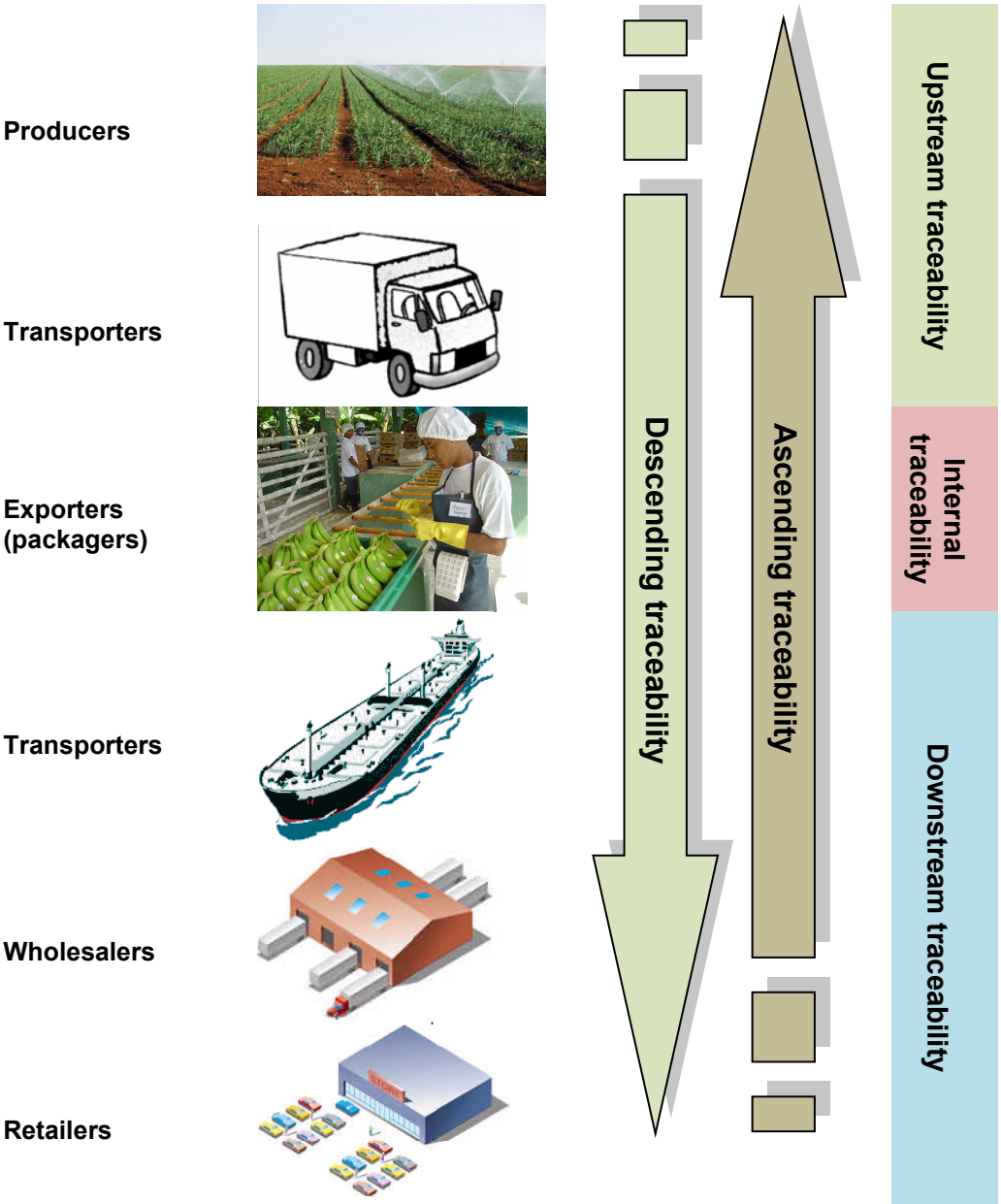
1.1.3. Traceability directions

Traceability ('trace' or 'track') can be used **bi-directionally**:

- **Descending traceability (downstream)**: makes it possible to find the destination of a lot or product unit at every step of the product life cycle. The associated data must make it possible to follow the chain from upstream to the finished product.

- **Ascending traceability (upstream):** makes it possible to find the production and packaging history and the origin of a lot at every step of the product life cycle starting with the lot or product unit. The associated data must make it possible to follow the chain upstream from product to raw materials. Ascending traceability helps **make an**

observed result understandable (e.g.: exceeded MRL in a batch of fruit) to find its causes.



1.2. The purposes and objectives of traceability

1.2.1. The purposes of traceability

The traceability of activities is "*the ability to ensure the tracking, if possible in real-time, of activities (and of information related to the activities) and of information flows (associated with physical flows within the logistics chain) linking activities. Activities traceability must enable companies to combine the data collected this way to reconstruct a picture of the entire process in question (through a network of inter-related flows and activities)"* (Romeyer, 2001).

The basic principle consists in linking information flows to the physical flows and activities of a given process.[3]

Traceability has **two complementary purposes**:

- **Safety**: to ensure product conformity with rules and requirements. The purpose is to prevent excesses and anomalies, to understand them, to deter any irrational use of inputs, to deter theft, hijackings and counterfeiting, to monitor behavior and practices, to ensure compliance with the cold chain, etc.

- **Implementation**: to monitor operations or chains and the successful completion of industrial, logistics and administrative sequences.

According to Wancoor (2008) there are **four main categories** of traceability:

Tracing	***Tracking***
Safety	
Tracking of intrinsic product characteristics (food and medical safety etc.).	Fight against counterfeiting, hijackings
Implementation	
Tracking of commitments (ethical, standards, procedures, administrative operations, sustainable development, etc.), of behavior, of practices etc.	Operations piloting and reliability (tracking of files, products, vehicles, orders, deliveries etc.).

[3] By process, it is meant: "*A set of activities inter-linked by meaningful information flows (or materials carrying information: the flow of products in the factory is a materials flow; these materials carry information) that combine to create a significant and well-defined material or immaterial product*".

Examples of cases of applied traceability (from Wancoor, 2008)

Tracing	***Tracking***
Safety	
Preventing and managing risks: - Tracing products and services - Tracing procedures - Tracing events *Food products, fertilizers, pesticide products, additives, biocides, spraying equipment maintenance, etc.*	Tracking of a process or service to ensure its quality, that deadlines are met and that special rules are implemented. *Product batches used, machines used, intermediaries involved in the process, waste management handling, sub-product follow-up, etc.*
Implementation	
Tracing operations *Administrative files (quality manual, logs, etc.), equipment maintenance logs, audit and inspection reports, training certificates, CVs, etc.*	Tracking of operations or objects for customer information and to improve the quality of services. *Product shipments, lots created, luggage (in airports), documents, deposit packaging, etc.*

1.2.2. The main purposes and benefits of traceability

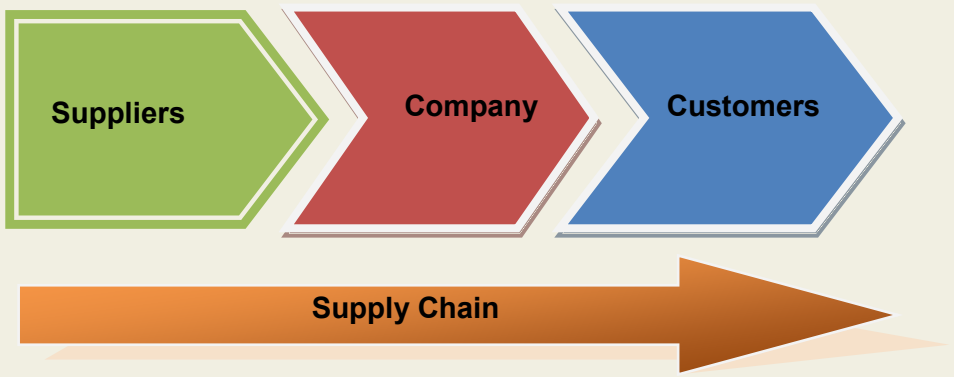
A traceability system must meet many objectives:

- regulatory compliance;
- greater efficiency of processes;
- communication with suppliers and customers;
- commercial benefits;
- financial benefits (e.g.: reduction of inputs used and theft).

Traceability must enable those involved **at every level** of the process and the chain:

- to **follow the flow of production:** Raw materials (animal feed, raw materials, inputs used), foodstuffs, their ingredients and packaging. From the agri-foods standpoint, a traceability system is a system that ensures that suppliers and the batches of raw materials used to manufacture each lot of finished product are known;
- to identify the **documentation required** to be able to track every operation and follow every production, transport, packaging, processing, storage and shipping step;
- to ensure adequate coordination between the various players involved (small producers, 'merchants', transporters, exporters etc.);
- to ensure that everyone involved knows, at a minimum, their direct suppliers and customers and more if possible.

Traceability and the 'Supply Chain'



The traceability of direct customers and suppliers is important to every company. ***The concept of a production chain is important****. It isn't an industrial chain in the strict sense of the word but rather a chain of steps that combine to make a given product. This can sometimes lead to the* ***identification of players involved from outside the actual production chain***[4] *(e.g.: a supplier of phytosanitary products).*

Traceability must also make it possible:

- **to follow the chain backwards to be able to react as quickly and as far upstream as possible,** to withdraw products, to recall products and/or take any defensive measures needed. The **impact of an event will decrease** as the effectiveness of traceability and the vision companies have on product lots increases;
- to **guarantee product authenticity** and the characteristics that result from the production method described on the label (e.g.: 'organic' products, fair trade products, products sold under a special 'label', products from controlled and guaranteed sources). The implementation of food traceability makes it possible to **add value to niche products** (regional products, products guaranteed free of GMOs, products without allergens etc.). As a result, there is also a commercial motivation for manufacturers.

1.2.3. The information and transparency objective

The public authorities have an **information and transparency obligation to consumers**.

Although food has never been as safe as it is now, and although risks really are lower than in the past, incidents are possible despite the many measures taken. Management procedures must be implemented for non-compliant products, notably **procedures for recalls, withdrawals and notification** of the authorities.

[4] For example: an ink manufacturer (chemicals chain) may supply a customer who makes wood crates (wood chain) with inks intended for printing on the crates (fruits and vegetables chain).

If required, it should be possible for the public authorities to activate an **alert system** in the event this isn't done by the company or organization involved and legally responsible for bringing the products to market.

RASFF or *Rapid Alert System for Feed and Food* is managed by the European Commission. It links all of the competent authorities monitoring foodstuffs in the European Union. RASFF has been in place since 1979 and its legal basis is found in Regulation (EC) 178/2002.

It provides a quick way to **inform** the EU monitoring authorities of the existence on the market of foodstuffs that are:

- Non-compliant with food legislation
- Unhealthy
- Dangerous to public health

Users can search for alert data in a **database.** These data, called 'notifications', are also viewable by other countries and their operators located outside of the European Union, whether they are shipping or receiving goods.

The number of 'notifications' exchanged by the system has increased consistently over time, reaching about 3000 in 2008.

For more information, go to: *ec.europa.eu/food/food/rapidalert/index_en.htm*

When an 'alert' is given, **products at risk can be searched for** in order to withdraw them from points-of-sale and to inform consumers so that they can return defective products if they have purchased any.

In the event of a product alert on an exported product, the health authorities of the importing country must be informed to enable them to take action. Agricultural attachés and veterinarians working at embassies are responsible for liaising with local health officials in other countries.

Traceability is a daily event. End-consumers and professional customers appreciate having traceability information on item location (*track*) and characteristics (*trace*). Increased product *tracking* functionality and heightened safety expectations have increased the level of requirements. Guaranteeing the traceability of a product is no longer enough to make a difference: access to information must be facilitated, more detailed and precise data provided and new functionality offered.

Traceability in 'reactive' mode will gradually give way to 'on demand' traceability. It will become increasingly important to **prove the truthfulness** of ethical commitments, ingredients (allergens, GMOs, sources etc.) and statements about sustainable development made by companies.

1.2.4. The ethical objective: traceability and sustainable development

We now have an obligation to, on one hand, monitor the use of natural resources and take into account **product life cycles** and, on the other, to monitor **the circulation and use of hazardous products** in order to guarantee the quality and composition of products.

Traceability is therefore doubly interesting within the framework of sustainable development.

A **traceability system is based on the analysis of a product's life cycle**. Likewise, in order to measure the impact of a product on the environment and on health, it's necessary to understand its entire life cycle (*Product Life Cycle Management*), from design (eco-design) through disposal (deconstruction, recycling). This is also true to meet the requirements of an Environmental Management System like ISO:14001 which require taking a look at product life cycles.

What's more, counterfeit phytosanitary products can lead to the contamination of product development chains because of products that don't comply with regulatory quality standards.

Traceability and sustainable development are very closely linked. Traceability is an indispensable lever for sustainable development.

1.3. Approaches to traceability

1.3.1. The 'customer' approach

The **first purpose** of traceability is to **prove** (thanks to product and process histories) that there is a **match with customer requirements** which, generally, relate to:

- the making of the product: where, when, how and with what the product was made;
- compliance with specifications: management, monitoring, audit;
- crisis management: finding and withdrawing defective or dangerous products from sale;
- communication: reassuring concerned consumers following food and health scares.

In addition to establishing trust with consumers, traceability enables **development of the product's production** and distribution chain. It provides added value to the product.

Lastly, traceability has become a key element of logistics chain management, from production through distribution, and for tracking product quality.

This is a key **element for marketing differentiation** because consumer demand for information is very strong.

The data collected during a survey ordered by the European Commission showed that, for 46% of those surveyed (56% in France), fraud and cheating that threatened food safety was the second greatest concern.

The diversification of product sources, resulting from **trade globalization**, has added an additional source of concern in that the origin of the product is 'distant' and counterfeiting is becoming generalized in all industries. What's more, quality and authenticity are 75% of the reason French consumers make a purchase.

(CREDOC, Centre de recherche pour l'étude et l'observation des conditions de vie - 2003).

1.3.2. The 'food safety' approach

Food-related health threats can occur at any step of the agri-food chain. It is therefore essential that appropriate controls and communication be implemented throughout the process. A weak link can compromise the safety of food products. This can be a serious threat to consumers and can have costly repercussions for suppliers. Food safety is, therefore, the joint responsibility of all involved in the agri-foods industry. **Consumers demand food safety**. Following crises such as the so-called 'mad cow' episode, the need has become even more acute and regulations have been strengthened.

A traceability system must make it possible to **reliably find products and product history**. In fact, in the event of a problem, it's necessary to have an organized recording system in place to:

- **find products** (lot or product unit) along the entire product life cycle to be able to **withdraw** and/or **recall** them if need be;
- have the most complete manufacturing history possible for the product;
- facilitate **transparency** between every link in a chain;
- **communicate** relevant information on the making of products and on their specific characteristics to the authorities, customers and commercial partners;
- find and **store information** about a given product/process and determine the respective responsibilities in the event of a problem.

Organized traceability ('a traceability system') makes it possible to record the entire history of a product in writing and/or to locate it at every step and operation of animal feed or foodstuffs manufacturing, processing, distribution and maintenance from primary production through consumption. We now speak of traceability from 'plough to plate'. It facilitates identification of the causes of non-conformity and, if need be, enables withdrawal and/or recall of the non-conforming product.

1.3.3. The 'regulations' approach

Since 1 January 2005, a rule has required that EU countries implement **labelling** and **identification procedures for products** sold by farmers, producers and first importers to the EU to enable and facilitate their traceability when they are put on the market. The main purpose is to be able to initiate a **withdrawal and/or recall procedure for products in the event of a food crisis**. The quality of traceability will enable targeted and precise withdrawals. It will also **limit the extent of recalls** and ensure the removal of holds on products that are not involved.

❑ Operator traceability requirements

These are defined for the most part in **Regulation (EC) 178/2002**.[5] It defines traceability as "*the ability to retrace, through all production, processing and distribution steps, the progression of a foodstuff or of a substance intended to be incorporated or that could be incorporated in a food product*". Compliance with regulations means that operators must be able to identify their **direct** suppliers and customers.

It should be pointed out that '***substance that could be incorporated***' means any compound that can be directly (e.g. wax applied to fruit) or indirectly (e.g.: pesticide product residues, products resulting from their decomposition or metabolites; substances that migrate from packaging or inks; traces of biocides or hydrocarbons, etc.), enter at any time into the 'composition' of a product and, therefore, transit into the food chain.

As a result, traceability must cover raw materials, packaging, inputs used, cleaning products, disinfectants, veterinary medicines, technological additives etc.

Photo Maud Delacollette

It is therefore recommended that producers **keep records** and **archive** their data.

➢ **Incoming log**:
- type of incoming product;
- product identification;
- product quantity;
- date of receipt;
- supplier identification;
- other data required by legislation.

➢ **Outgoing log**:
- type of outgoing product;
- product identification;

[5] Regulation (EC) 178/2002 defines the general principles and provisions of food legislation, creates the European Food Safety Authority and sets procedures for food safety, OJEC, L31/1 of 1 February 2002.

- product quantity;
- delivery date;
- purchaser identification;
- other data required by legislation.

In addition, it should be possible to reliably establish the **relationship** between incoming and outgoing products.

These data should be kept for the entire validity period of the product in question (minimum two years). **Primary production** (producer level) data should be kept for at least **five years**.[6]

❑ **Traceability requirements for a competent authority at the national level**

These requirements are defined in the principles of the *Codex Alimentarius*. They cover the context, reason for being, design and application of product traceability as a tool that can be used by a **competent authority** and **within the framework of its inspection** and certification system for foodstuffs.

The product traceability/tracing tool can be applied to part or all of the steps of the food chain (from production to distribution) depending on the goals of the inspection and certification system for foodstuffs.

Product traceability/tracing is a tool that:

- must be able to identify the origin of a product (upstream step) and its destination (downstream step) at any given point in the food chain (from production to distribution);
- *in itself* does not improve the results of food product safety unless it is combined with appropriate risk management measures and requirements. In this case, it can help to **significantly improve the effectiveness of these measures**;
- can help protect consumers against misleading commercial practices and facilitate commercial exchange based on the precise description of products.

European regulations state that an exporting country does not have to reproduce the same traceability/tracing 'tool' as the one used by the importing European country. They also state that the importing country should accept any type of organization in a third country (with or without this type of traceability tool) as long as the latter can provide the same level of protection to its consumers.

1.3.4. The 'company management' approach

❑ **Traceability and company responsibility**

Traceability has **become a requirement in trade relations**. The current environment puts pressure on companies because of:

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[6] Why require such a long data archiving period for perishable products? Note that in primary production, certain 'crop operations' can have an effect over several years (e.g.: changes to the soil, use of fertilisers, soil disinfection, deep ploughing, etc.), and even over several decades (e.g.: planting of an orchard). The rule is that data should be archived for as long as necessary.

- heavy competition between sources, products, claims;
- increasingly complex circuits (number of intermediaries) and logistics;
- distant supply points (North-South trade);
- complex and fluctuating distribution schemes.

Companies are liable for their products.

They are liable for product deficiencies and their consequences (e.g.: food poisoning) in addition to any legal guarantees in place.

'Tracing' enables companies to contain a problem to reduce its impact and communicate with customers.

By keeping and using a history of products, of main processes used, of suppliers, of raw materials used, of incidents, of customer complaints etc., companies can:

- get a better understanding of products and a better handle on processes;
- improve practices and the overall operation of their organization and of production processes (e.g. fewer inputs);
- immediately correct the manufacturing process when non-compliant products are found and the identified cause is tied to the process;
- identify complementary training requirements;
- improve work station safety;
- track the effectiveness of corrective actions implemented;
- reduce the costs related to incidents, losses, theft and wastage (costs tied to alerts, withdrawals or recalls, repairs or damages, loans, penalties payable to partners, lawsuits etc.);
- improve management of business relations, of importers with exporters and of the latter with producers;
- reduce lot production costs (materials used, salary costs, etc.) not covered by income, insurance costs tied to company risk.

However, the stakes of traceability **are not solely 'defensive': it is also a performance lever** for companies. The visibility it provides on current and past processes contributes to operational excellence and to supply chain management.

It can also enable a company to prove its claims about the origin of its products, its ethics, its compliance with the rules of sustainable development, the absence of GMOs etc. It provides better services (real-time order tracking, ability to find a product etc.) to customers. It limits the risk of losing markets when customers demand traceability.

❑ **What are the risks for a company that does not have, or loses, traceability?**

➢ Poor execution (particularly from a logistics standpoint) and, therefore, poor customer service.

➢ Being last in the chain, or a weak link. Not being able to make a (reliable) link upstream or downstream in a product traceability chain (due to lack of tools or practice) means being the last liable entity to be identified! And, therefore, the one automatically at fault.

- Unclear sharing of risks and liability. Poorly defining liabilities and commitments to partners doesn't make them less important or lighten their consequences.
- Potential loss of competitiveness against competitors who have reliable traceability. When competitors offer detailed tracking facilities and your company doesn't...the risk of being left behind increases.
- Inability to deal with events.
- Setting off a disproportionate reaction to an incident.
- Inability to prove the truth of commitments made for products and services (ethical claims, organic products, labels etc.).

1.4. What are the obstacles to and limits of traceability?

1.4.1. Technical limits

❑ **Traceability can only find items that have been previously defined and recorded**

In a **crisis situation**, the information communicated by an operator may not be fully authenticated. It may also be difficult to reconstruct the progress of information from one step to the next, particularly at break points between upstream points (raw materials) and processing or downstream at the wholesale stage when products are repackaged or heterogeneous batches are created.

Weak implementation can make the system unworkable. The **absence** of certain useful data (not recorded during the production or packaging steps), **loss of data** (destruction of media) or **information entry errors** can lead to the non-recall of a contaminated lot. This is an important point because the loss or breakdown of traceability **will negatively impact the effectiveness and speed** with which corrective actions can be implemented (withdrawal or recall of products).

If they suspect that the information is unreliable, importers may require the implementation authentication mechanisms by third parties (e.g.: **traceability system audit** or other procedures).

In this case, traceability obligations could penalize companies competing with foreign companies that are not subject to the same audit and inspection requirements, unless greater consumer confidence in the products compensates for the potentially higher resulting price (which is rarely the case in practice).

❑ **Traceability is not a tool for managing product characteristics**

Traceability **does not guarantee the healthiness** of foods and, consequently, should only be implemented as a complement to a food safety management system that applies risk analysis and prevention concepts throughout the production chain.

❑ **The weakest link in product traceability occurs upstream**

The weakness of this link is primarily due to the raw materials **supply method** when it is tied to one of the following situations:

- small farm size (small producers), which means **a limited supply** of products deliverable at one time, or only over a limited time period and, consequently, a diversity of lots;[7]
- **poor organization** of producers and producer associations (the local market is not

[7] When an exporter does not have enough products from certified sources, they can be tempted to complete lots to be shipped with available products harvested from non-certified producers.

organized or regulated);

- some operators buy products from local markets or from unplanned cropping. This also leads to a diversity of lots from unknown sources;
- use by some processing and packaging units of supplies from **intermediaries** that are often numerous and sometimes difficult to identify. This results in a range of quality levels from different sources;[8]
- a **low level of** upstream-downstream **integration and a lack of contractual relationships** between producers and processors (sale to the highest bidder at harvest time).

❑ **Production methods can limit traceability**

They can also be a constraint on the implementation of traceability. For example, in pickle processing during which brine has to be added several times to maintain conditions favorable for ripening. The result is an end-product containing several salt batch 'parts' that are very difficult to track down!

1.4.2. Economic and commercial limitations

These, like technical limitations, are tied to the intrinsic conditions of the chains and the products which affect their profitability.

In client-supplier relations, information exchange between partners must be designed to ensure that business relationships remain balanced: both must accept that certain data cannot be exchanged, notably when they are related to manufacturing processes (manufacturing secrets, 'recipes'). There must be an **ongoing concern to maintain a balance between useful transparency and the confidentiality** of information of each entity in the chain.

Selecting a traceability system must take into account, on one hand, the relationship between the goal pursued and the effectiveness sought and, on the other, the cost of implementation compared to the **specific margin** of the product. It is the result of arbitration between the different requirements and, in particular, customer or consumer demands, technical feasibility and economic acceptability.

The **selection of a traceability system** must therefore take into consideration, on one hand, the relationship between the goal pursued and the effectiveness sought and, on the other, **the cost** of implementation compared to the product's specific margin. The result is an optimal equilibrium between different requirements and, in particular, the demands of customers and consumers (the propensity of the consumer to pay to 'know more'), technical feasibility and economic acceptability (agreement on the part of economic operators to invest to "*gain the means to know more*") (ONUDI, 2007).

[8] A typical example is that of 'pisteurs' in the mango production chain.

1.5. Traceability requirements

1.5.1. Regulatory safety requirements

Following the various **health scares** around by the world in the past few years (mad cow, foot and mouth disease, bird flu, melamine in Chinese powdered milk), food traceability has become a necessity to prevent the circulation of foods that could be harmful to consumer health. Legislators and standardization bodies have put in place a number of regulatory and standards texts that require or recommend the implementation of traceability as an indispensable part of food safety.

❑ The basic requirements of European regulations

Since 1 January 2005,[9] European importers must be able to identify their food product suppliers and their customers. Traceability regulations are common to all chains and Member States of the European Union. The goals are:

- Product safety (with self-monitoring within companies)
- Product compliance with legal and regulatory requirements
- Cooperation with the competent authorities in the event of a health alert
- Trade transaction loyalty
- Information to consumers

Regulation (EC) 178/2002 sets the requirements for companies in the agri-foods sector, including import companies. It is important to note that these rules require traceability at every step of the chain with an **obligation to provide results but not to use specific methods**.

Producers are **free to choose** a traceability system and media suitable to their environment, the size of their company and the cost of implementing and maintaining traceability.

Article 18 of Regulation (EC) 178/2002 provides a **set of basic rules** designed to ensure that the market only contains safe foodstuffs and animal feeds:

1. The traceability of foodstuffs, of animal feeds, of animals used for food and of any other substance intended to be incorporated, or which could be incorporated in foodstuffs or animal feed, is established **at every step** of production, processing and distribution.

[9] Regulation (EC) 178/2002 establishes the general principles and provisions of food legislation, creates the European Food Safety Authority and sets procedures for food safety, *OJEC*, L31/1 of 1 February 2002.

2. Operators in the food and animal feed sectors must be able to **identify everyone** who has supplied them with food, animal feed, food-producing animals or any substance intended to be incorporated, or which may be incorporated, in foodstuffs or in animal feed. For this purpose, operators must **have systems and procedures** that enable them to **put the information in question at the disposal of the competent authorities**, at their request.

3. Food and animal feed sector operators have systems and procedures that enable identification of the companies to which their products have been supplied. This information must be made available to the competent authorities at their request.

4. **Foodstuffs and animal feed** marketed in the Community, or which may be, **must be adequately labelled or identified** to facilitate their traceability. This is done using documents or data relevant according to applicable instructions contained in more specific provisions.

Other rules and directives also impose specific traceability requirements. We note:

- Regulation (EC) 1830/2003 on the use of **GMOs** (labelling and traceability): identification of GMO products and of GMO-derived products at every step to market. This information must be kept for five years
- Directive 2003/89/EC on the ingredients of food products.

❑ Practical consequences for producers

The rules therefore require that producers be able to communicate precisely, and as quickly as possible, with **suppliers** and **direct customers**.

Given the requirement to identify any substance entering the food chain via their products, it also requires that producers know precisely the **composition of their products** (e.g.: raw materials batch numbers, inputs used) and that they implement **labelling** procedures for products to enable and facilitate their traceability when they are sold.

On the other hand, the rules do not provide any practical indications on how to record the information needed or on the length of time the recorded traceability data must be kept.

Reality is more complex than would appear from simply reading the rules. To comply with the rules, and to be able to implement a withdrawal and/or recall procedure for products in the event of a crisis, producers must be able to provide all of the information requested (result requirement). The focus isn't on the precision of traceability results but on the ability to provide:

- the names and addresses of suppliers and the types of products supplied;
- the names and addresses of customers and the types of products shipped;
- the transaction and/or delivery date.

Although the rules do not specify the timeframe in which the traceability data must be provided to the competent authorities (e.g.: official monitoring services), the information must be transmitted **as soon as possible**. Lot numbers, volumes and quantities, and the detailed composition of the products must also be provided at the request of the authorities within a reasonable timeframe (which may differ from one State to another, but only by a few hours to a few days).

In order to meet this requirement, producers must set up an effective traceability system, have a withdrawal and recall plan and define procedures to inform the authorities. On-site controls will enable the competent authorities to check for the existence of these three items and ensure that they are working properly. In fact, producers have **a two-fold obligation**: for results and resources.

❑ **The impact of rules on packaging traceability**

Regulation (EC) 1935/2004 (in effect since 27 October 2006) is applicable to materials and objects intended to come into contact with foodstuffs.[10] It defines specific packaging product conformity and manufacturing rules. It requires traceability at every step (including for food packaging manufacturers) via suitable labelling or identification in order to facilitate monitoring, withdrawals and consumer information.

Moroccan tagine dishes officially banned in Australia!

Following a routine control, Australian health officials discovered that tagine dishes sold in shops contained high levels of lead and cadmium.

1.5.2. Regulatory safety requirements

Regulation (EC) 2200/96 on the common organization of the market on fruits and vegetables provides an overview of rules for the classification of products by quality category as well as calibration, presentation and labelling rules for fresh fruit and vegetables. In 2004, **Regulation (EC) 907/2004** amended the marketing **presentation and labelling** standards applicable to fresh fruits and vegetables.

These regulations require that the following information be clearly and legibly provided on the label:

- packager and/or shipper identity (plus, if available, their authorization number to be able to identify them);
- the country of origin (and optionally, the region of production, or national, regional or local appellation);
- the nature of the product (only if the contents are not visible from outside the package);
- the commercial variety or type (based on the corresponding instructions of the EEC/UN standard);
- size grade (if the product is classified according to its size);
- product category or class.

[10] It has been proven that toxic substances can migrate from packaging and seriously contaminate products that come into contact with them (e.g. Bisphenol-A which is used to make polycarbonate plastics, epoxy resins and PVC antioxidants. It is used to make baby bottles and has already been forbidden for this use in several countries). Another example is ceramic containers (teapots, tagine dishes) which leech heavy metals.

Complementing this legislation is **Regulation (EC) 2379/2001**, amending Regulation (EC) 1148/2001, which covers **controls for compliance** with the marketing standards applicable in the fresh fruit and vegetables sector (including EEC/UN standards[11]). This regulation was established to monitor the standards implemented in the fruits and vegetables sector, with the exception of controls carried out during retail sale to the end-consumer.

To be thorough, we should also mention Regulation (EC) 510/2006 on protected geographical indications and protected designations of origin of agricultural and food products.

1.5.3. International and national standards

Several international organizations have published traceability standards. The most important standards are those of ISO and *Codex Alimentarius.*[12]

❑ **The ISO 22000 standard**

The ISO 22000:2005 standard describes the requirements of a Food Safety Management System that can be **certified to demonstrate its ability to manage identified dangers**.

The goal is to harmonize practices globally, to promote mutual recognition of certificates between countries and to guarantee the on-going supply of safe products that meet both requirements agreed to with customers and regulations. This international standard takes into account the documents developed by *Codex Alimentarius* on HACCP and is compatible with ISO 9001:2000. It has been in place since September 2005.

The standard recognizes that food product safety can only be guaranteed through the combined efforts of all those **involved** in the food chain:

- farmers;
- animal feed producers;
- foodstuff manufacturers;
- transport and warehousing operators and sub-contractors;
- wholesalers, retailers, food services and restaurant operators;
- packaging equipment and materials manufacturers;
- cleaning products, additives and ingredients manufacturers;
- phytosanitary products, biocides, fertilizers and veterinarian medicines producers;
- service providers.

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11 United Nations Economic Commission for Europe

12 The Codex Alimentarius Commission was created in 1962 after agreement between FAO and WHO, two UN institutions. It was the result of, on one hand, progress made in biological and chemical knowledge about food products which enabled a much finer analysis of their properties and, on the other, the use of new production techniques based on this new knowledge. The Codex has over 220 standards for individual foods or groups of foods.

The ISO 22000 standard is based on the 'Deming wheel' principle and its PDCA (*Plan, Do, Check, Act*) continuous improvement loop which is now recognized as a simple and universal managerial behavior principle.

The standard, which can be used as the basis for certification, requires that companies set up a traceability system in addition to PRP (*Pre-Requisite Programmes*) and HACCP. With ISO 22000, the ISO standardization system built a health safety management system that **integrates traceability**: the standard emphasizes the **importance of communication** between the company and its customers, suppliers and employees to identify and manage all relevant dangers related to food security throughout the entire food chain.

Chapter 4 of the ISO 22000 standard covers general requirements, notably in terms of communication and the management of documents and records. According to the standard, the traceability system must enable the identification of the direct suppliers of inputs and the direct customers of finished products.

ISO 22000:2005 is the first standard of a family that includes ISO 22005, *Traceability in the feed and food chain – General principles and basic requirements for system design and implementation*.

❑ **Codex standards**

Codex Alimentarius published a **General Standard for the Labelling** of Pre-packaged Foods (STAN 1-1985) and a series of **Official Codex Standards (STAN)** on the quality and conformity of fruits and vegetables.[13] These product standards provide additional information on product descriptions, product composition and quality, authorized food additives, contaminants, hygiene, weights and measures (calibers), labelling rules - in accordance with the Codex General Standard for the Labelling of Pre-packaged Foods – and on monitoring analysis and sampling methods.

❑ **National standards**

Some countries, and notably those with trade relations with European Union countries, have also established traceability standards to align themselves with international requirements in this area (e.g. Moroccan standard NM 08.0.012).

1.5.4. Commercial requirements

European legislation has no legal force on territories outside of the European Union. However, for importers, EU regulatory requirements on traceability and product safety can translate into 'commercial requirements' **imposed *de facto* on ACP exporters**.

Many private standards covering various areas (health quality, fair trade, etc.) have one or more sections dedicated to traceability **in their specifications**. Among the goals of

[13] www.fao.org/fao-who-codexalimentarius/standards/en.

these sections is the intent, on one hand, to ensure **separation of certified and non-certified products** and, on the other, to provide support to producer-exporters in meeting traceability requirements that usually fit into the framework of private contracts with their European partners.

European operators (importers, buyers, retailers) usually ask that ACP exporters be able to trace the 'history' of their operations and of their goods. Although internal traceability assuring the link between incoming and outgoing products is not required by regulations it is, however, often required by retailers. All producers must have data recording procedures that establish the **relationship between incoming and outgoing products** at every production, processing and distribution step. Given the complexity of crop operations and the great variation in contractual conditions between producers and exporters, companies producing fruits and vegetables must decide for themselves to what extent they want to, and can, actually go.

It must be emphasized that most traceability and labelling requirements are **part of private contracts** between European operators and their ACP export partners. It is a **voluntary approach**, based on the marketing strategy of the European importer or retailer and not strictly on regulatory imperatives.

It is recommended that, at a minimum, they be able to identify suppliers and incoming products **that may be a danger to health** (seeds, pesticide products, disinfectants, fertilisers, irrigation water, packaging, additives etc.).

❑ GLOBALG.A.P. requirements

GLOBALG.A.P. is a **private sector** body that defines standards for the certification of agricultural products worldwide. Its goal is to establish standards for '**Good Agricultural Practice**' with different applications by product suitable for agriculture worldwide.

GLOBALG.A.P. is a so-called **'*pre-farm gate*' standard** which means that its certificate covers the progress of the certified product, including agricultural inputs like forage and seedlings, and all agricultural activities, until the product leaves the farm.

GLOBALG.A.P. is a *business-to-business* label and is, therefore, **not directly visible to consumers**.

Generally speaking, GLOBALG.A.P. stipulates that any product that meets the requirements of GLOBALGAP standards, and is marketed as such, should be traceable and handled in such a way as to avoid any mixing with products that are not approved by the organization.

Within their control points and conformity criteria[14] for all operations, GLOBALG.A.P. requires that producers have documented procedures to identify the type of event that

[14] All applicable control points mapping to major requirements and to the QMS (Quality Management System) must be fully complied with.

might lead to a withdrawal, the persons responsible for taking decisions about a potential product withdrawal, the consumer information mechanism and the certification body (CB) GLOBALG.A.P. (if a sanction has not been issued by the CB and the producer or producer group recalled the products on their own) and the methods enabling inventory reconciliation. This control point is a **major requirement** of the standard and all procedures must be reviewed annually to guarantee their effectiveness.

The most recent version of the GLOBALG.A.P. standard (version 4.0, compulsory as of January 2012), describes a series of control points and **additional conformity criteria** for companies that are registered as having so-called 'parallel' operations (that is, certified and non-certified production units within the same legal entity).[15]

In this case, **it must be possible to differentiate the products at all time**, all the way back to their original production unit. All certified products must be identified with a GLOBALG.A.P. number (GGN). The GGN number[16] is unique for every producer or any other legal entity in the GLOBALG.A.P. system. It can be used on the end-product and/or packaging at the point-of-sale.

Sales logs must be kept and must differentiate between the quantities of product sold with and without certification. Work procedures and instructions must **prove that orders for certified products are not filled with non-certified products**. All of these documents must prove that the **mass balance** of inbound and outbound products is met, for both certified and non-certified products

In its crop module, GLOBALG.A.P. mentions that traceability must facilitate food sales and enable customers to obtain targeted and valuable information on the products in question. As already mentioned, there must also be a documented identification and traceability system that enables products registered with GLOBALG.A.P. to be tracked back to the registered farm or, for a producer group, back to the group's registered farms, and to be traced to the immediate customer. Harvest information must **establish a link between lots and the data recorded** about production or the farms of specific producers.

❑ BRC requirements

The ***British Retail Consortium*** (BRC) is an **association** that brings together a large number of **retailers** in the United Kingdom.

BRC GLOBAL STANDARDS
THE WORLDWIDE STANDARDS OF CHOICE

In 1998, BRC responded to industry needs by creating the *BRC Food Technical Standard*, intended to be used to evaluate food product processing units in order to assist

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15 Note that it is strictly forbidden to grow certified and non-certified products within the same production unit.

16 The GGN (*Global Gap Number*) is a 13-digit number. It is a unique number that belongs to the legal entity (e.g.: the producer) for as long as it exists.

retailers and owners of food brands in complying with European regulations in matters of food safety.

The standard includes **a set of specific requirements** for traceability in its 5th version. In summary, the overall goal of the BRC standard is to ensure that certified companies have an effective system for identifying and tracing product lots from the purchase of raw materials (base products, wrapping and packaging) through distribution of end-products to customers, including all processing steps.

Companies must also be able to trace their products within a practical timeframe. Among the various control points, we should note the **obligation for companies to test their traceability systems** in order to ensure that they are implemented from raw materials through to finished products and vice-versa. This is to be able to carry out weight assessment/quantity control. The standard also requires that product traceability be maintained and respected regardless of changes made to the product.

❑ GFSI recommendations

The *Global Food Safety Initiative* (GFSI) is **a non-profit foundation** created in 2000 and managed by the *Consumer Goods Forum*.

The primary goal of the foundation is to **compare and approve** (through a process known as *benchmarking*) **a series of food health standards** against a reference document (*GFSI Guidance Document*).

In 2007, eight major retailer brands reached an agreement on this reference document. The goal of the process is to reduce the growing number of audits suppliers are facing by implementing the philosophy “once certified, accepted everywhere”. GLOBALG.A.P. and BRC are among the standards that have been benchmarked against GFSI reference documents.

A section of the GFSI reference document is dedicated to traceability. The standard requires that companies develop and use procedures and a system that:

- enables **identification** of each product, ingredient or service coming out of the company;
- includes the **complete logs** of packaged product batches, with their packaging, throughout the packaging process;
- includes the **purchaser references and destination market** of every product sold.

❑ Fairtrade Labelling Organization (FLO) requirements

The international Fairtrade Labelling Organization (FLO) has **two separate legal entities**:

➢ **FLO e.v.**: a **non-profit organization** with several stakeholders (bringing together 19 labelling initiatives, three producer networks and two marketing organizations). The organization coordinates

the **Fairtrade** label at the international level. Its primary missions are to establish international fair trade standards and to organize support for producers worldwide.

- **FLO-CERT**: **a private for-profit entity** that **carries out audits** and authorizes companies to use the 'Fairtrade' brand which is now one of the most widely recognized social and development labels in the world.

The goal of fair trade is to **create opportunities** for poor producers and workers who are marginalized by the traditional trade system. Trade operators can become Fair Trade if they commit to supporting its goals. The standards, called 'Generic Trade Standards', are the minimal requirements to be applied to industrialists to prove their commitment to Fair Trade. The requirements of these standards include a section dedicated to traceability.

Fair trade traceability requirements are implemented to **protect operators and consumers**. They insure that the **authenticity** of Fair Trade products can be verified and that operators only sell Fair Trade products that are in fact fair trade. They **guarantee the origin** of products back to producers thanks to documented verification and the assurance that the products are physically separate and distinguishable from non-fair trade products. The standard emphasizes that the method used to prove physical traceability is **at the discretion of the operator**. In this commercial standard, traceability requirements are applicable from the producer onward.

- ***Physical product traceability***

All operators must be able to prove the physical traceability of their products.[17] For product traceability, operators must demonstrate that the origin of certified products bought, sold or processed is guaranteed from their purchase from the supplier through their sale to their customer (downstream - upstream). It is up to the buyer to make sure that the origin of the products purchased as certified can be demonstrated from the producer on.

Products must be physically identifiable. The identification method is at the discretion of the operator but must be verifiable via the presence of the FLO identifier ('FLO ID') or of the words 'FLO Fairtrade' on the packaging.

- ***Traceability through documentation***

The standard also requires that buyer and seller clearly use an identification method on corresponding documents (such as Contracts, Maritime Bills of Lading, Delivery Notes, Invoices). All operators must ensure that they and the certifying body can identify:

- the product supplier;
- the physical appearance of the product before transaction (purchase or sale);
- modifications made and corresponding yields;
- waste;
- volumes bought and sold (upstream - downstream);

[17] A transition period is required when operators cannot prove complete conformity with the standard's physical traceability criteria. This period cannot be greater than two years from the effective date of Fair Trade's 'Generic Trade Standards'. Additional studies will determine if the physical traceability principle is feasible, and to what extent, for operators certified according to standards for sugarcane, cocoa, fruit juices and tea. Until a decision is taken based on the results of these studies, operators certified for Free Trade sugarcane, cocoa, fruit juices and tea are exempt from physical traceability criteria.

- the dates of the various transactions;
- payment of the Fair Trade price and pre-financing (when applicable).

Certified products bought and sold in bulk must be **stored in a special area and remain in a separate space or be stored at a separate time** from non-certified products. When this isn't possible, the operator must take all necessary measures to ensure that the risk of substitution of certified products by non-certified products is minimized. Traceability documentation criteria must always be complied with.

Regulations, Norms, Certifications and Standards: a helpful reminder

Legal **regulations**:

- are part of either a national or European legislative framework;
- are a legal obligation that companies must comply with (or face sanctions);
- impact sector perimeters or specific products.

Example: Regulation (EC) 178/2002 on the traceability of food products.

Norms are tied to a reference:

- recommended practice (Best Practice): the best way to proceed on a given issue;
- generally the result of studies and discussions carried out by companies within standardization bodies.

Example: ISO 17025 – "General requirements for the competence of testing and calibration laboratories" (ISO/CEI 17025 September 2005)

Certifications are tied to transversal systems:

- based on sets of standards guaranteeing a certain quality level in company operations;
- validation of conformity (by audit) with standard practices;
- certification is part of quality (assurance) management.

Example: ISO 900, ISO 14001 etc.

Standards are tools:

- shared by those involved in a given sector or activity;
- to have common operating methods to facilitate and increase the reliability of interactions between them.

Example: EAN 128 barcodes

1.6. The components of a product traceability system

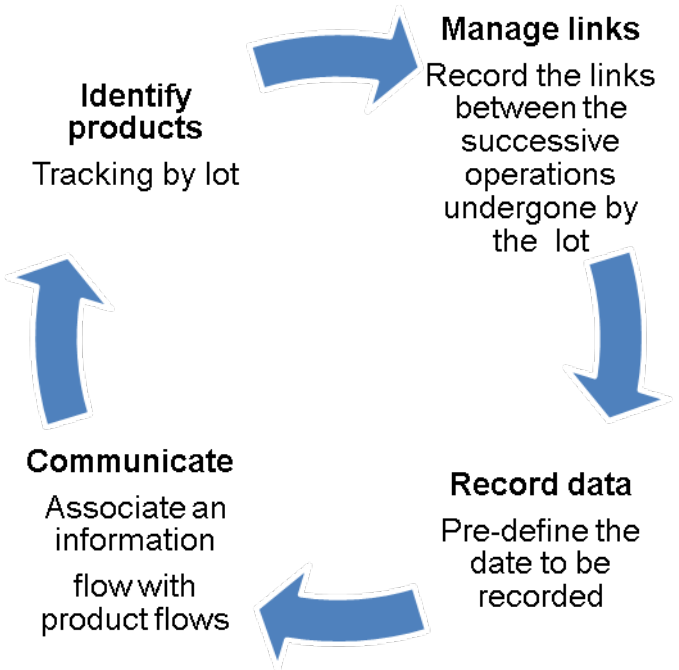
1.6.1. What is a 'traceability system'?

A traceability system is a **system integrated in a production structure** (company, packing station, workshop, site, group, etc.) that makes it possible to trace an entity chosen in advance to pilot risks and quality from the originator and, sometimes, to the customer. A traceability system increases the reliability and proper use of information and improves company efficiency and profitability.

The following **four key points** must be implemented by the company:

- Product identification: tracking by lot.
- Management of links between the operations carried out for each lot.
- Data recording: pre-selection of information to be recorded.
- Communication: association of an information flow with a product flow.

Key principles of traceability



A traceability system consists of a **set of correlated or interactive items** designed to provide ***tracing*** (qualitative tracking) and ***tracking*** (quantitative tracking).

As a system intended to provide traceability of processes within and between organizations and, more precisely, within a *supply chain*, a traceability system is intended to:

- **provide real-time tracking** of activities and of the flows connecting the activities;
- **highlight** as quickly as possible any **problems** that might arise during a process in order to be able to take action as quickly as possible (and resolve issues);
- **illustrate the activities** (and the flows linking the activities) that make up a process through systematic modelling, in order to describe the operation of the organization in concrete terms and to highlight the value chain. This is the basis for the development of a competitive advantage.

1.6.2. The functionalities of 'traceability system'

To achieve its goals, a traceability system must include:

- a **series of actions to be carried out during production**, particularly at certain key process steps (e.g.: data collection during operations, checking and recording of this data, information archiving);
- a **documentation system** to:
  - record the data required to build a product's history;
  - tie the information together with robust links (relational database, data capture forms);
  - enable use of the information (give them meaning);
  - circulate the information among partners (upstream and downstream);
- a **coherent identification system and batch labelling** of incoming and outgoing products.

Consequently, a traceability system must have various functionalities:

1. **Data acquisition**

   Data capture must take place at the place and exact time they are generated and the information must be recorded by the person best prepared to explain their existence and meaning: the person carrying out the action.

   Data acquisition implies the ability to concurrently identify: physical flows, players, locations, the documents required for item movement, the equipment used for processing, handling and transporting the flows, the activities that make up the process and the sequence of activities.

   It is, therefore, based on the implementation of a coherent identification system throughout the entire process that ensures that the data tracked will have the same meaning for all involved.

2. **Storage of collected data**

   Data storage is absolutely necessary to provide an overall picture of the processes traced. This stored data is important for analysis of the processes which have been completed.

3. Data processing

The system must be able to process the data to have a real picture of the activities carried out in the company and of the links between activities (that is, a picture of the processes). This is to enable examination of the organization's activity overall rather than in parts or in isolation. The result is the creation of the performance indicators required to pilot processes and compile statistics.

4. Information dissemination

The dissemination of tracked information enables the exchange of information to follow up on flows and activities and the transmission of special instructions in the event of problems. The challenge for dissemination is to ensure continuity at the information flow level in parallel with physical flows and production activities (better coordination among operators).

1.6.3. A few thoughts on data collection

Data collection cannot be done haphazardly. It must be:

- **organized and coherent** to obtain complete and detailed data;
- **systematic** to ensure that nothing is missed and to be able to gather all of the information needed;
- **structured** to facilitate the reconstruction of chains of states and situations.

Traceability is an enabling tool for action on, and decision-making about, given objectives. Tracing is, therefore, more than data collection. It means:

- using data in a way that gives them meaning by inter-connecting them;
- validating their reliability;
- having usable and relevant results on hand at the right time.

Three important points should be mentioned:

1. The entity is followed: information is structured and organized around the entity and its potential circuits.
2. Exhaustive information is meaningless: accumulating data in bulk isn't tracing! Only reliable and meaningful data is relevant to the goals of traceability.
3. The information is intended to be used. It isn't quantity that counts, **but quality and reliability**. Having a great deal of unusable data will not very helpful when they are needed (generally after the fact). For example: is it important to know the location of a product when its composition or lot number is needed? This is a good reason for thinking about items and needs before starting to collect data. The three evaluation criteria are:
    - data reliability: 100% of data is correct;
    - data relevance: ability to answer the questions asked;
    - system effectiveness: the information meets (internal and external) needs.

1.6.4. Inadequate or failed traceability: consequences

'**Inadequate traceability**' results in **insufficient information** or unsuitable information (quality or quantity). Traceability is not interrupted but is carried out less effectively. When traceability is inadequate, the required analyses cannot be carried out... and expected decisions cannot be made (e.g.: when managing a food crisis). This can lead, for example, to a more extensive recall than would have been needed if all required data had been available.

When linking the identities of entities is or becomes impossible, there is '**traceability failure**': it is no longer possible to move from one step to another in the history of the entity within the process.

The causes of traceability failure can be:

- a defect in traceability system design: certain links between recorded identifications are omitted because they related to special cases or exceptions.
- poor use in practice: an unidentified component is introduced into manufacturing, a tool is replaced without being recorded, a batch is used in production without being identified, a product is labelled instead of another one etc. ;
- system error: an error or technical problem affects records and breaks the link between them.

Regardless of the quality of the recorded data, they become useless. The upshot is that the traceability chain is interrupted: upstream and downstream traceability is no longer possible.

An internal traceability failure in a company means that the traceability system becomes unusable overall. Certain steps may work but the overall view expected from traceability (for safety or execution) is no longer available.

When the failure is within the chain, traceability stops at the doors of the company where the failure took place. It becomes impossible to move upstream or downstream to find the real causes or effects of the problem to be analyzed. The cost of the problem (expenses incurred, legal liability, etc.) will be for this company.

Appendices

A.1. Some definitions

Ascending traceability (ascending): Ability to find the history and origin of a lot at every step of the product life cycle from a lot or unit of product. Within the chain, the associated data must provide the ability to follow movement from product back to raw materials.

Barcode: Identification and management system that uses a set number of digits to carry product information including country code, company identifier, item identifier etc.

Blocking: Any temporary measure that stops the movement of products and withholds them from consumers for a given period of time. Subsequent analysis leads either to the renewed sale of the products (unblocking) or to the initiation of a withdrawal procedure.

Certification: Procedure by which official certification bodies and officially certified bodies provide written or equivalent assurance that foods or food control systems conform to specified requirements. Certification of food may be, as appropriate, based on a range of inspection activities which may include continuous on-line inspection, auditing of quality assurance systems and examination of finished products (according to the *Codex Alimentarius*).

Chain: All players who, through their successive activities for a given product or category of products, contribute to producing, processing, warehousing, transporting and selling the product.

Descending traceability: Ability to find the destination of a lot or unit of product at every step of the product life cycle. Within a chain, the associated data must enable tracking from upstream through to the finished product.

EAN (*European Article Number*): European standard for the identification of trade products using barcodes.

Entity: A set of real or abstract objects that exist independently and share a set of common properties.

Equivalence: Ability of different inspection and certification systems to meet the same objectives (according to *Codex Alimentarius*).

Identification: Unique relationship between a reference or identifier and a lot, product unit, player, activity or place. Written and recorded identification enables the transmission and storage of information about an entity, from production through finished product.

Inspection: Is the examination of food or monitoring systems for food, raw materials, processing and distribution, including in-process and finished product testing, to verify that they conform to requirements (according to *Codex Alimentarius*).

Lot: The concept of a lot is set based on the context pre-defined by the operators of the chain. A lot is a group of units of a food with identical characteristics produced and/or

packaged in virtually identical conditions. At inspection time, lot units have identical characteristics in terms of type, variety, caliber, packaging, brand and origin.

Product traceability/tracing: Ability to follow a food through specified stages of production, processing and distribution (according to the *Codex Alimentarius*).

Recall: Any measure intended to ensure the return of a harmful product which distributors or retailers have already delivered to consumers or made available to them.

Record: Document that provides tangible proof of activities carried out or of results obtained (ISO 8402:1994).

RFID (*Radio Frequency IDentification*): Identification system consisting of radio frequency labels (electronic chips), antennae to receive signals and decoders integrated in the computer system to read data.

Traceability: Ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution (according to Regulation (EC)178/2002).

Traceability system: Set of correlated or interactive elements intended for the *tracing* (qualitative tracking) and *tracking* (quantitative tracking) of one or more categories of given items.

Withdrawal: Any measure intended to prevent the distribution and exposure of a harmful product and its sale to consumers.

A.2. Sample descending traceability diagram

Type 1 requirement: Customer
Type 2 requirement: Regulations
Type 3 requirement: Specific to the company

Steps	Type of requirement:	Information and data	Recording media
Pre-requisites	1, 2 and 3	- Plot identification and references	- List of referenced plots - List of producers - Producer commitment contract - Plot codes
Type selection	1, 3	- Agronomic, taste and storage tests	- List of types selected - Test results

Planting	1, 2 and 3	- Seed or seedling batch n° - Supplier name - Name of the preceding crop - Name/quantity/date of pesticide products used by the seedling supplier - Planting date - Agronomic value of the soil	- Crop sheet - Plant passport - Delivery slip - Seedling/seed labels - Soil analysis
Organic and mineral fertilization	1, 3	- Product type/quantity spread/date/proof - Sprayer checks - Residue analysis	- Crop log - Product invoices - Soil analysis results
Crop protection	1, 2 and 3	- Product type/quantity or dosage/date/proof - Organic fertilization	- Crop sheet - Sprayer maintenance and calibrating sheet - Analysis results - Product invoices

Irrigation	1, 3	- Water source/quantity pumped/date/proof - Mineral and bacteriological water analysis results	- Crop sheet - Water analysis result
Harvest	1, 2 and 3	- Ripeness level/quantity harvested/date	- Compliance sheet - Harvest crate sheet - Crop sheet
Receipt by station	1, 2 and 3	- Quality control of lots received (ripeness, caliber, weight, appearance, residue)	- Reception control sheet - Residue analysis results
Refrigerated storage	1, 3	- Duration, conditions (T°, hygrometry, controlled atmosphere), product location in coolers - Fruit development	- Control sheet for coolers and currently stored fruit - Storage plan - Box pallet/crate labels

Sorting-calibrating-packaging	1, 2 and 3	- Sorting inspection results (type, caliber, weight, appearance, category)	- Inspection sheets
Shipping	1, 3	- Lot destination - Quantity/date/quality level/lot number - Transporter/date/ temperature during transport - Customer complaints: reason/quantity/ product	- Shipping slip - Sales invoice - Transport slip - Temperature record - Complaint form

A.3. Sample ascending traceability diagram

Identification documents	**Steps**	**Information available**
• Label/product	Sorting, calibrating, packaging	- Lot reference - Producer reference - Type, caliber, weight, category
• Box pallet/crate labels • Refrigeration inspection sheet • Storage plan	Refrigerated storage	- Plot reference - Producer reference - Harvest date - Type - Conformity inspection results - Storage inspection results - Storage condition inspection (temperature, hygrometry and controlled atmosphere
• Harvest crate label • Compliance sheet	Reception	- Plot reference - Producer reference - Harvest date - Type - Conformity inspection results
• Identification of harvest crates • Crop sheet	Harvest	- Plot reference - Producer reference - Harvest date - Type - Quantity - Ripeness

• Crop sheet • Product invoice	Crop supervision	- Plot reference - Producer reference - Pesticide products used - Fertilizers used - Source and quantities of water pumped
• Crop sheet • Seedling and seed labels	Planting	- Seed and seedling n° - Supplier name - Preceding crop - Planting and disinfection date - Agronomic value - Plot reference - Producer reference - Record of weeding operations - Herbicide products used before planting
• List of types selected	Type selection	- Sensory and agronomic test results - Test and experimentation results
• List of referenced plots • List of producers • Producer commitment contract	Pre-requisites	- Plot reference - Producer reference
• Shipping slip • Sales invoice • Transport slip • Temperature record • Customer complaint sheet	Shipping	- Lot destination - Quantity/date/quality level/lot number - Transporter/date/ temperature during transport - Customer complaints: reason/quantity/product

A.4. GS1 labelling recommendations

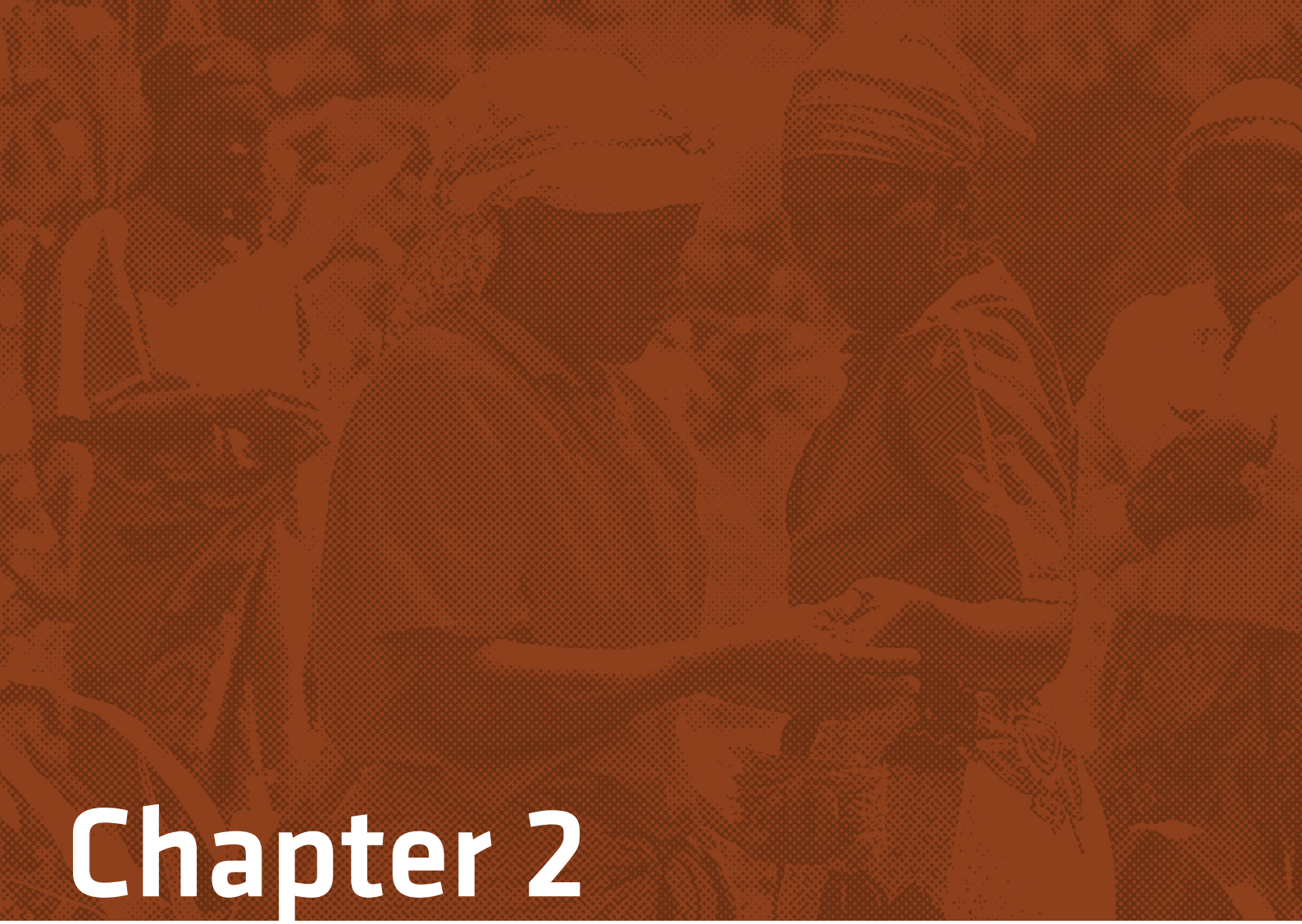
The overall goal of GS1 is to enable every operator in a chain to label the products they make and sell using information that the preceding operator has supplied them with. In order to be able to transmit the information required to the next steps, GS1 gives recommendations on the **minimum data** to be forwarded to the next operator. These data can be put on the rack sheet, on adhesive labels, etc.

Data to be written on the card or label:

- producer/grower number (authorization number);
- product name, variety or commercial type;

- class/category (not valid for potatoes);
- size/caliber;
- country of origin;
- net weight (if compulsory or agreed to);
- lot number (see below);
- harvest date (optional);
- plot number (optional);
- date.

The grower can put a lot number on their products. If they do, the combination of lot number and grower identification will ensure traceability. If they don’t put the lot number on, the auctioneer/packer/importer must put one on at a later time. The harvest date can be useful in helping producers obtain more information on a product's best by date or in the event of a recall. The plot number provides additional information on the origin of the product.



Chapter 2

Implementing a traceability management system

2.1. Implementing a traceability management system

Basic principle: the implementation of traceability **must be adapted to** the objectives of the sector, to the company, to its environment and to its regulatory, contractual (client requests) and internal constraints.

2.1.1. Implementing a 'traceability system'

A traceability system is a **technical tool** intended to help companies comply with **set objectives** and it is used, when necessary, to determine the history and/or location of a product and all of its components.

The **ISO 22005:2007 standard**[1] sets the principles and specifies the basic requirements applicable to the design and implementation of a traceability system in the food chain. It can be applied by any 'organization' operating at any level of the food chain. It must be designed to **flexible** enough to enable operators to meet the objectives they have identified as being **relevant for them**.

Traceability is usually initiated by an outside request that combines **regulatory obligations** with **client demands**. The latter may also be subject to a regulatory traceability obligation at their level or may be interested in having complete traceability without having to bear the cost alone.

Since traceability requests **usually come from the outside with specific goals**, the challenge resides in implementing an **effective** traceability system in the company that will be **suited** to the size of the company, to its resources and to the qualified people available.

The implementation of a traceability system must be viewed as a '**project**' by the company. It requires a structured approach, that is, a methodology. Throughout the project, it will be important **never to lose track** of the fact that traceability is simply a tool for product **safety** and **quality** and not a goal in itself.

Implementation of a traceability system will be facilitated by:

- a degree of organization in the company and of the project ;
- known and stable processes and operational methods (a minimum number of operations that repeat over time must be identified);

[1] ISO 22005:2007, *Traceability in the feed and food chain — General principles and basic requirements for system design and implementation* was developed by ISO/TC 34, Food Products. It is available from ISO.

- well-documented processes and modes of operation;
- the presence within the company of quality management systems (traceability provides visibility and understanding, not a way to solve problems or reduce risk). The temptation to link *traceability and quality* is great: this is, however, truer for '*tracing'* than for '*tracking*';[2]
- the availability of qualified staff informed about the project. The entire company is affected by its implementation. Although the actual use of traceability only involves a few players or services, it must take into account all operations and all employees. Everyone must answer the question: *"What can I do to enhance visibility of products and flows?".*

Cutting the project up into 'pieces' can lead to the implementation of several complementary, competing or incompatible traceability systems.

2.1.2. The basics of the methodology

A **four-step** methodology is usually used:

1. Environment definition and needs assessment (external and internal)

The company must identify the data to be traced, particularly those that:

- meet regulatory requirements;
- meet market needs (clients);
- meet the company's own requirements (organization, reactiveness).

Who requests traceability, how and why?
Is it really a basic need or just a fad?
What do business professionals think about the trend and what are competitors doing?

Even if the trigger is a request from a business partner, time must be taken to analyze the subject to understand its positive and negative effects on the company (business opportunities provided by better traceability) and the resources available (state of the art).

This analysis will be used to create a '**business vision**' of traceability for the company: *What are the purposes, formats, benefits for the company's operations and for the target markets*? Only a well-designed 'business vision' will provide a return on investment.

2. Assess internal capacities

All companies have a minimum amount of data recorded and stored for customer and production management, market studies, cost price calculations, marketing, accounting, tax returns, etc. They all provide implicit traceability systems. During the internal assessment, these existing internal capacities will have to be carefully identified and compared with external requirements.

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[2] *Tracing* and *tracking* are equally important and required within the framework of food safety.

What is already in place and what has already been recorded?
What in-house experience does the company have with traceability?
What are the weak and strong points of existing traceability compared to the specifications of the external request?

Lastly, a traceability project should not be viewed solely as an 'exercise' to be carried out internally since it also involves suppliers (direct) and service providers. The latter will have to be involved during traceability analysis and implementation.

3. Bringing internal and external together

The decision to implement traceability must bring together the 'internal' and 'external' aspects of the company. A traceability action plan and response strategy must be established given external requirements in order to sell the future system to clients, suppliers and, especially, to internal employees. Everyone in the company has to understand and accept the value of the project.

What can be gained from traceability within the organization?
For example, what management benefits will it provide?
Will well-organized traceability help me complete my tasks more effectively?

These are important questions and the answers must clearly show the benefits for everyone at their own level.

4. Putting together a real project

Development of the traceability system must be **set up as a company project** with: a steering committee, a team, a working methodology, a schedule, a budget and validation of, and reporting on, each step.

It is important to follow the steps below when setting up the project to successfully implement a useful and effective traceability system:

- define and plan the project; keep employees informed;
- set up a suitable steering committee;
- define the parameters of traceability (context, existing elements, objectives) and the tools to be used;
- test on a process on site or on a 'pilot' case and improve the system if need be;
- train employees on new requirements and obligations;
- extend the system to the entire organization while communicating internally and externally about the traceability system;
- assess the robustness of the system: internal audits (based on previously defined indicators), test product withdraw/recall systems (simulate a crisis) and verify operator qualifications;
- periodically review the system (analyze changes in client, regulatory, process and product requirements).

Implementing a traceability system requires an action plan coordinated by a steering committee.

Once the system is set up, an **'administrator' must be designated**. They will be responsible for managing traceability in the company and will work with a set of indicators to evaluate the results, benefits, malfunctions and effectiveness of the system.

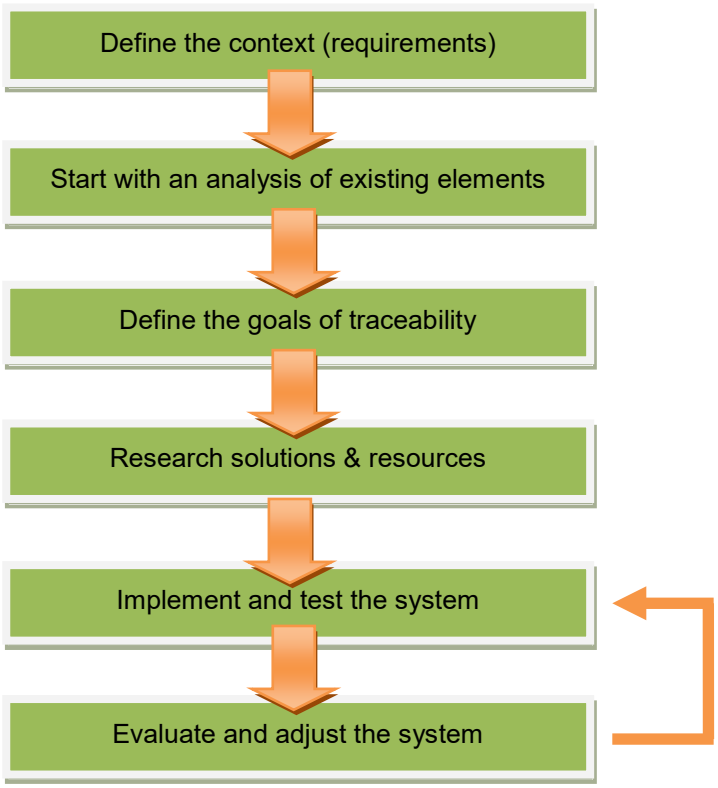
2.2. Creating an action plan

2.2.1. How to create an action plan

Implementing an organized traceability system in a company requires the creation of a coherent 'Action Plan'. It should include:

- a description of the project and an analysis of existing elements;
- the definition of goals and a schedule of the steps to be completed (timing chart of tasks to be completed);
- the implementation of tools and a test phase of the system ('pilot project');
- an employee training programme and an information programme (that includes customers);
- a follow-up programme/evaluation of the system that makes any required adjustments.

Traceability: Start with existing elements and develop an action plan



This implementation scheme is the most logical approach to setting up an **effective and relevant traceability system** (meeting identified external and internal needs).

2.2.2. Important steps for consideration

A series of steps is required to effectively implement a traceability system:

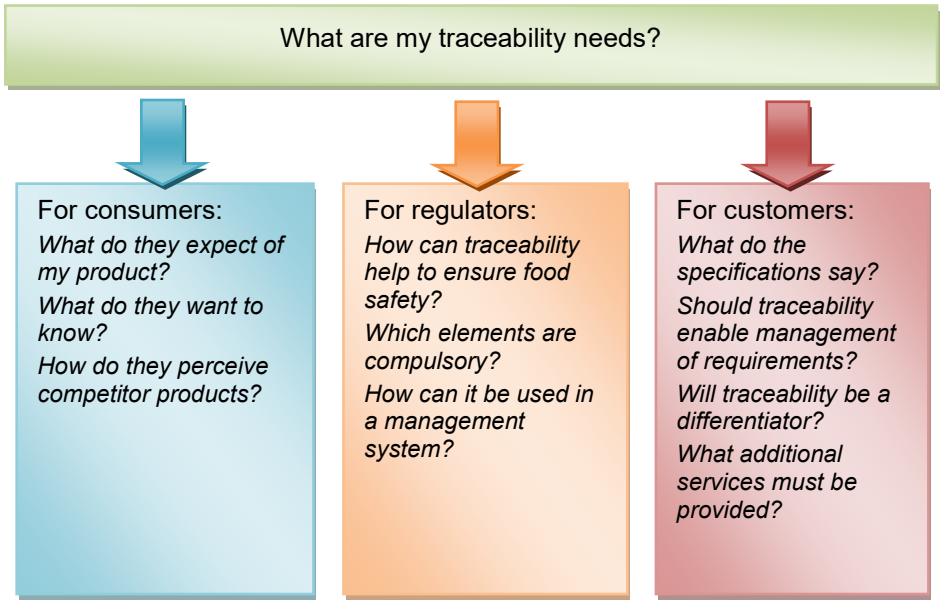
❑ **Step No. 1 – Define the project**

Implementation will be difficult if objectives and expectations are not defined, or change constantly. The following must be defined to enable study of what is expected from the traceability system:

- ***The 'entities' to be tracked:*** To trace effectively, **products** must first be clearly **defined** (type, composition, properties, commercial specifications, regulatory specifications, etc.). It is much easier to trace a defined product than a product that is either not defined or ill-defined. Likewise, tracing a product with few components is easier than tracing a product with many components. This is the case for many of the chemical products used (e.g. mixes of pesticide products, compound fertilizers, etc.).[3]

- ***The issues that must be addressed or dealt with*** and the information to be provided. If the purpose of traceability is **product health safety**, **risks must be correctly evaluated ahead of time**: they must be known and measured and solutions must be found to reduce them. Implementation of traceability will be difficult if there are many risk factors and/or they are difficult to control.

Traceability: Define the context



[3] Note that it is also easier to implement traceability on lots and product units than on 'continuous' products, especially if continuity leads to chaining of batches that will be mixed in the end-product (pallets consisting of products from several sources, products stored in silos, fruit jams etc.)

- ***The boundaries of traceability*** (where it starts, what it covers and where it ends). That is: questions about what really needs to be done in practical terms must be answered:
  - Track and/or trace?
  - Which entity and why?
  - What level of detail is required?
  - To take what decisions?
  - To answer which questions (e.g.: audit, inspection) or handle which situations (e.g. crises)?

- ***Required information***. Generally speaking, it's better to have too much information that not enough. But it's also better to have some reliable information rather than too much unusable information. The ideal is to have a lot of useful information... It's always too late to find the missing information after the fact. Creating a list of required information is a **key step** that will condition the rest of the implementation. Note that it's impossible to *trace* using a system set up solely for *tracking*.

❑ Step No. 2 – Project coordination

A steering committee must set up to coordinate actions. It must be a reflection of the entire company and not of a particular sector (e.g.: field production and packaging station). It must bring together all of the potential **users** of the traceability system (e.g.: commercial services) and all **producers** of traceability elements (e.g.: all operators in the field). It shouldn't only involve people who handle systems (whether computerized or not). It should be headed by a 'Project Leader' who knows the subject and the company well!

All actions must be planned and coordinated by the **steering committee.** The traceability system will have to become part of a managerial, business, regulatory, technical, IT, cultural and human environment. An overall understanding of all contextual elements, including the workings of the **food safety management system (FSMS),** is required to build an effective system based on objectives useful for the company and accepted by those involved on a daily basis.

❑ Step No.3 – Define the elements of the traceability system

The following is required, at a minimum, to build a traceability system suited to the objectives defined in the company project:

- describe the product life cycle (process details);
- describe information flows and the documentary base of the traceability system;
- define the human, technical, IT and financial resources needed.

❑ ***Describe the product life cycle and the ascending and descending traceability schemes***

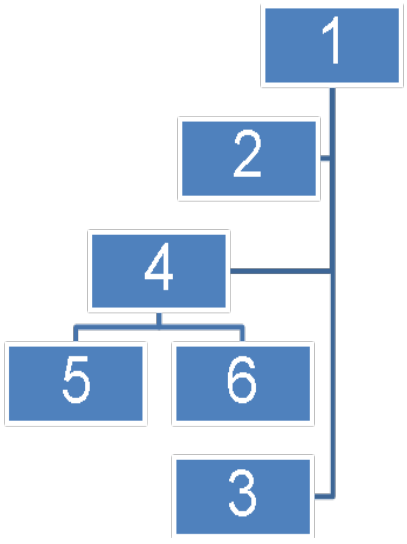
Traceability presupposes the existence of a circuit followed by the entity: this is the product's 'life cycle'. The goal is to recover all of the information and data required for traceability management throughout the entire life cycle. Traceability therefore requires full knowledge of the **logical sequence** of operations.

The more complex the circuit, the more variations or degrees of variation it will have, the more unstable and changing it will be and the more difficult establishing traceability will be because the links to be built will themselves be multiple, changing and complex. A continuous flow is also difficult to track: only its beginning and end are known! Steps, sequences and markers must be defined to structure traceability.

Therefore, the following must be done:

- create a **life cycle for products**, link by link, and describe the existing links between each step and everyone involved in the chain
- define the **markers** of the life cycle within which traceability will be implemented: from where until where; what level of precision is required; what are the key steps, etc.?
- develop **ascending and descending traceability schemes.**

Analyze the product life cycle: create a diagram of operations[4] based on a logical sequence.



Analysis of physical flows and processes

Analyze the **flow of items** to identify their key points:

- Operations carried out
- All changes of state or packaging
- Transport, movements, warehousing or removal from inventory
- Assemblies (components brought in at a certain point of the process) and mixes

It is important to identify how continuity of information will be guaranteed throughout the process steps.

[4] Identify essential operations moving from raw materials to finished products.

The data recorded, the basis of the company's traceability system, **will not be the result of chance.** A good understanding of flows and processes (of the operations carried out) will enable identification of which data should be captured and where and how it should be recorded.

Establish '**traceability procedures**' for the company's employees. This will ensure that the data considered to be indispensable will be recorded at the right place, at the right time and in the right format and that they will be kept and communicated under the required conditions.

❑ ***Establish information flows and the documentary base for the traceability system***

Traceability is a matter of information. Its implementation is tied to the company's information flows and to the systems implemented. It feeds off of them and feeds them. Knowing these flows and systems will ensure that they are used as effectively as possible.

System documentation and the resources to be used are part of the documentary basis of the food safety management system:

- starting with the life cycle, **inventory all data** and information to be recorded, step-by-step;
- create a list of the different **records used** as traceability media (**analysis of existing elements!**) and their normal retention periods (the life expectancy of products and regulations must be taken into account to determine the retention period);
- write out the **procedures** to define the steps to be taken for each link. The procedures implemented must provide control over the traceability continuum at the critical points identified;
- if computer program development is required, write out the **functional specifications** and infer the **appropriate tools and management resources** required. Tools already in place aren't usually suitable for traceability. Adjustments will be necessary and their complexity will reflect that of the information system.

❑ ***Define the human, technical, IT and financial resources required***

For each step and for each recording media, it will be necessary to define the **responsibilities of each person** doing the recording, the frequency of data collection and the processing required for the data.

The tools and data management resources must ensure:

- identification of the object traced. **'Lots' must be defined** to accomplish this and it must be determined whether or not their definition complies with customer, regulatory and company requirements;
- information collection, transport and reproduction;
- guaranteed **data integrity;**
- that **information and product become inseparable** (**labelling** that guarantees a **consistent link between information and the product traced**).

In order to select data tools and transmission methods, it is necessary to **first** evaluate the data collection and transmission systems that already exist in the company: can they simply be adapted?

The implementation of a traceability system is not limited to selecting markers, identifiers and authenticators. Although these choices are important for the project, it is imperative to have a global, organizational and technical approach.

❑ **Step No. 4 – Agricultural production pilot project**

With respect to agricultural production, it is recommended that a pilot project be carried out with a limited number of representative producers.

A simulation of the traceability approach based on the pre-established objectives should be carried out to validate the proposed implementation. An evaluation of this operation will enable adjustments to be made before roll-out.

❑ **Step No. 5 – Training**

The company must implement a training program.

It must be suitable and designed to inform all operators in the chain about the approach and to train them to use the tools.

❑ **Step No. 6 – Internal and external communication**

This is proposed by the steering committee to company management and is intended to explain and promote the approach implemented internally and to the company's customers.

Feedback must be provided (impact measurement) to improve system effectiveness.

❑ **Step No. 7 – System assessment**

Assessing the system will enable verification of its relevance compared to the goals set beforehand. The traceability system must be assessed periodically during internal audits of the food safety management system.

The data input to this review can be:

- results (tests, audits etc.);
- modifications to the process;
- changes in regulations;
- corrective actions;
- new expectations in the chain.

2.3. Developing traceability procedures

2.3.1. Sample approach

To develop traceability procedures: understand the context, carry out needs analysis as explained above and create a list of instructions to be followed based on the operations diagram.

We will use the concrete example below to facilitate understanding of the procedures used to illustrate the approach.

Description of the company environment:

The family company GIANT GREEN grows vegetables and fruits that it sells to supermarkets throughout the country. Part of its production is also sold to small local processors for canning. After attending a trade fair, Mensah Kyra, the owner of GIANT GREEN, understood the benefits of exporting certain products to Europe. However, he also understood that his future customers would ask for a great deal of information on his production and packaging practices. He therefore decided to implement a traceability system in his company right away. He felt that implementing traceability would also help with inventory control, to improve his practices and to increase his profit margins.

Crops are planted to meet expected market needs, but during the season, GIANT GREEN also buys products from small producers nearby. GIANT GREEN buys its seed and seedlings from a few local suppliers. Mensah or his assistant spray pesticides and fertilizer themselves. They hire labor for some fieldwork and for packaging. GIANT GREEN also sometimes takes care of packaging for several other producers.

Harvested products are brought directly from the fields to the station and placed in one of the chillers. In general, pickers put the products in plastic containers and transport them to the station in GIANT GREEN trailers. The produce brought in from the fields or taken from the chiller is emptied into a wash basin at the start of the packing line. Each product is then sorted according to its appearance, caliber and color then packaged in printed boxes. Packaged products are placed on a pallet and, if not shipped immediately, returned to the chiller until shipping time.

While preparing to implement his traceability system, Mensah Kyra realized that he had to be able to track all of inputs, in the field, and from harvest through shipping, including products packed for other growers. This means that he has to collect data on the fields, varieties, quantities, harvest dates, packaging and shipping. What's more, he has to keep logs of all fertilizer and pesticide spraying. He needs to know what information has to recorded when inputs are received, what information has to be archived and what information has to be shared with his customers when products are shipped. Since GIANT GREEN produces several types of vegetables and fruits that require fairly different processing and handling, Mensah Kyra realized that he would have to create different recording systems for each operation when harvesting, storage and data sharing processes are very different.

2.3.2. Step 1 - Creating an operations diagram

The first step consists in creating a **diagram** to show the logical sequence of the company's operations.

It will provide a clear guide to sources of information useful to traceability for all operations carried out during the production and packaging process.

- ***Identify the main activities carried out by the company***

  There are several activities taking place in the company in the horticultural example (reception of inputs, planting and spreading, harvesting and storage, sorting and packaging, warehousing and shipping)

- ***Create a list of all of the company's different activities and put them in a flow chart. For example, for this case study***

  For example, in this case study:

- ***Number every activity to help you identify them and to be able to refer to them in traceability protocols***

  Every activity can also produce and use several types of inputs and outputs. There can, therefore, be several ways to collect different types of data. It may be necessary to identify and separate these different types of activities in order to create clear protocols.

  For example, the reception of inputs includes all of the products, consumable items and materials required to carry out the company's activities.

  Although these inputs are all received within the framework of the same activity, different employees may manage each input and the data may be collected and stored differently.

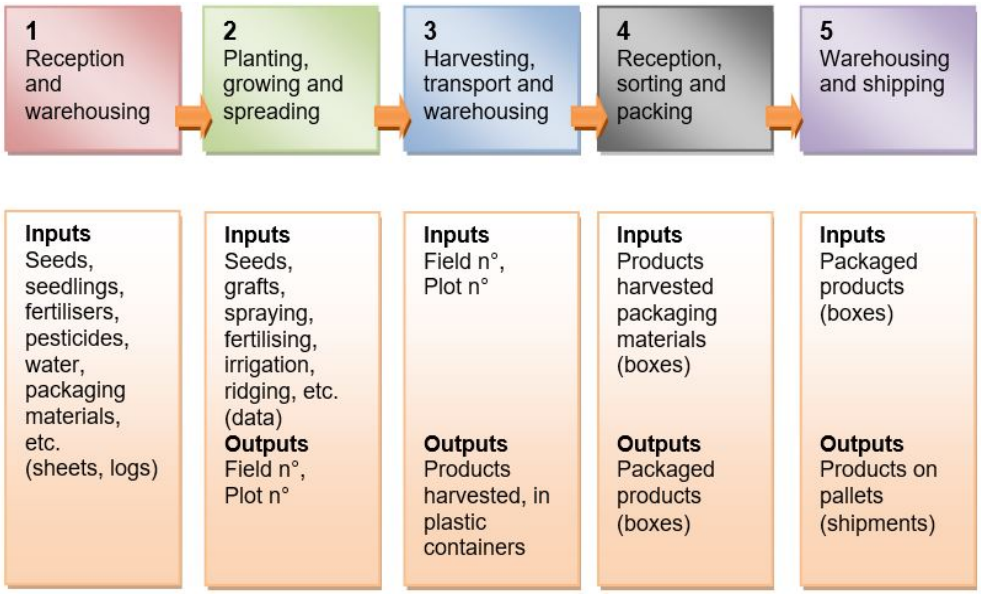
  The decision about whether or not to create different procedures for each type of activity must be decided by management.

- ***List all inputs and outputs used for each activity***

  Inputs are all products, consumable items and equipment needed to carry out activities within the framework of each operation.

  Outputs are the works in progress, finished products and sub-products of each operation.

Generally speaking, the outputs of one activity are the inputs of another one.



2.3.3. Step 2 – Write-up the instructions to be followed as procedures

At each step of the process, a **series of 'procedures'** (instructions to be followed) will explain to company employees how to capture and document traceability information.

These procedures can change and will need to be updated as the company changes... like all other company procedures.

For each activity in the operations diagram:

- identify the type of activity by name (and number);
- briefly describe the activity carried out;
- **identify the person responsible for the activity, the data to be captured and the traceability data documentation to be kept;**
- **explain how to capture traceability data;**
- **indicate where the data must be saved**.

This approach will help you ensure that you are collecting, saving and sharing all of the traceability data needed in your company. It's often helpful to include samples of forms to be filled out and documents to be collected (invoices, product use logs, production sheets, receiving and shipping logs etc.)

Use these procedures to train employees and to explain to them their role and responsibilities in the traceability system.

2.3.4. Sample data recording procedures

❑ **Example 1: 'Planting, Growing and Spreading' procedure**

Activity: Activity No. 2 – Planting, growing and applying pesticide products

Description: Planting seed/seedlings and spreading agronomic inputs (fertilizers, pesticides, manure, compost)

Person responsible: Production Manager

1. Take seed or seedlings out of storage for planting. Write down seed batch numbers, planting dates and the product and variety planted in each field and block on up-to-date field sheets.
2. When pesticide products and fertilizers are taken out of storage, cross them off the inventory lists in the storage area.
3. When inputs are spread, write the following information for each type of input on the appropriate forms:

Input used	Data to be recorded	Form to be completed
Fertilizer	Operator name (signature) Application date Field/block number Quantity/ha Composition of the mix Batch number	Agronomic inputs log
Pesticide products	Operator name (signature) Application date Field/block number Brand name Active compound(s) Quantity/ha Time to harvest (TTH) Batch number	Agronomic inputs log
Manure, compost	Operator name (signature) Application date Field/block number Quantity/ha Product spread and type (e.g.: chicken manure)	Agronomic inputs log

❑ Example 2: 'Harvesting, Transport and Warehousing' procedure

Activity: Activity No. 3 – Harvesting, transporting and warehousing products

Description: Harvest products, transport them to the station and warehouse them.

Persons in charge: Production Manager, Transporter and Station Manager.

1. Before harvesting, pick up clean containers in the clean container warehousing area (see the Buildings Diagram), load them onto a trailer and take them to the right fields (Transporter).
2. While harvesting, manually fill out the product harvest form (form 'X'), with the product harvested, the variety, the harvest date, the amount harvested, the field or block, the name of the person responsible and the amount harvested (Production Manager).
3. Form 'X' is kept in the office of the Production Manager. When form 'X' has been filled out, sign and date the bottom of the form and file it (also kept in the office of the Production Manager).
4. Transport the harvested product to the harvested products cooler (Transporter).
5. At the station, write down the field number and the harvest date on stickers and place on each container. This will be the batch number of the harvested produce. The field number and harvest date should be written as: *xx-mm-dd* (field number-month-day) (Station Manager).

Keep the field data through to the station!

❑ **Example 3: 'Warehousing and Shipping' procedure**

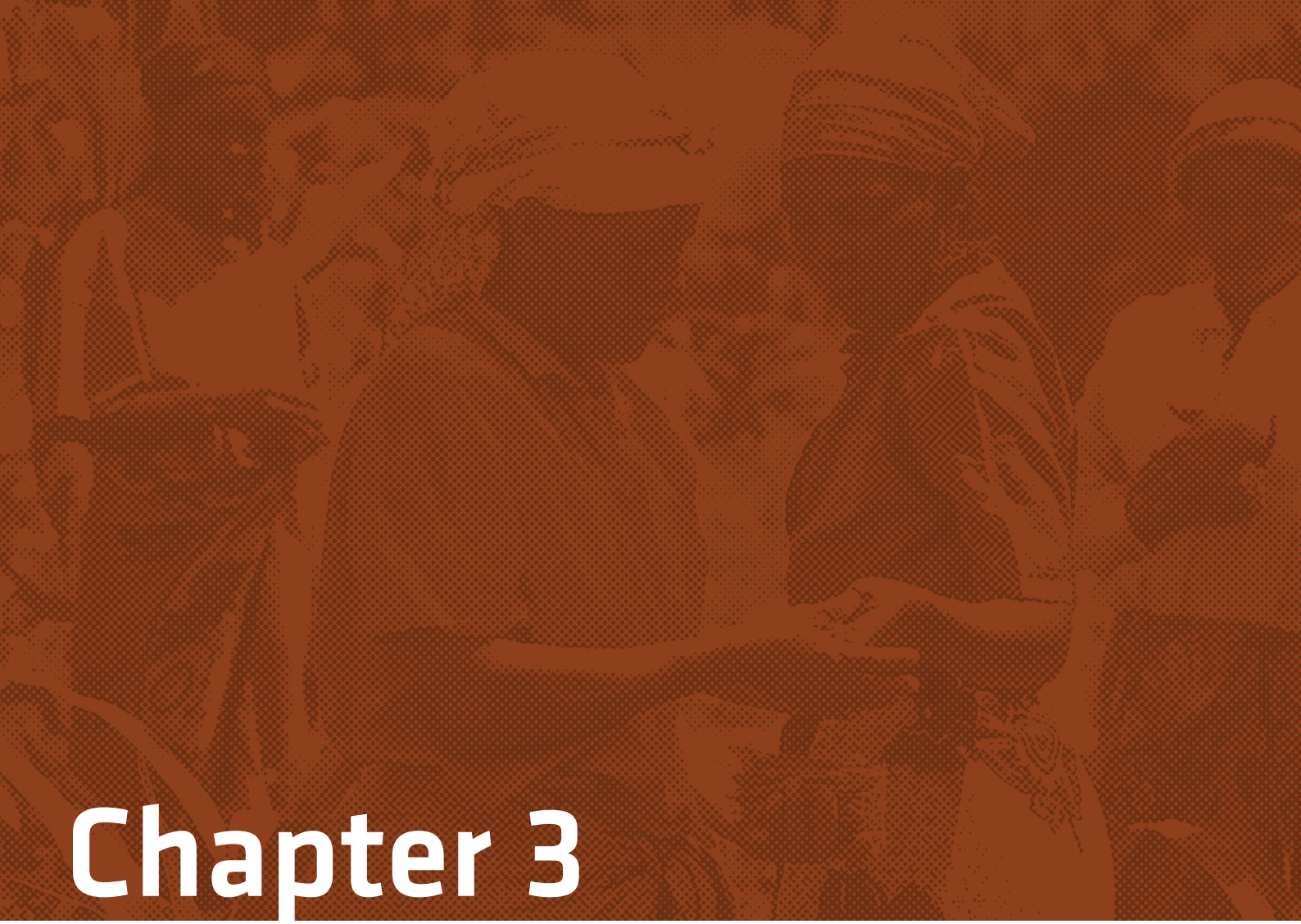
Activity: Activity No. 5 – Product warehousing and shipping

Description: Load the product onto the lorry and ship

Persons in charge: Station Manager

1. Fill out the pick-up list for each order.
2. Find the produce corresponding to the order in the chiller. Make sure the packaging identifier and label are on each crate. Take the packaged produce out of the cooler and to the loading dock.
3. A lorry is assigned when the produce is ready for shipping. Inspect the lorry to ensure that it is clean.
4. Load the product onto the lorry.
5. Check the contents of the lorry by comparing it with the order sheet.
6. Write out the shipment information: product/variety, packaging, quantity, destination, lorry number, shipping date and packaging identifier on form 'Y'. Fill out a Transport sheet. Give the Transport sheet to the lorry driver.

Data collected	**What should be recorded?**
Output lot number	Packaging identification
Product identification	Product code
Product description	Product description
Shipping date	Order preparation and ship date
Identification of origin	Company name and address
Shipment identification	Customer order number
Shipper identification	Company name and address
Identification of destination	Customer name and address (destination)
Receiver identification	Customer number
Quantity	Number of pallets shipped
Units (box)	Number



Chapter 3

Traceability tools

3.1. Data media

For operators, selecting traceability media means the **freedom to choose** the system best-suited to the specificities of the chain, to product production and distribution methods and to the company's volume of activity (there is an obligation to obtain results, but also a degree of freedom in terms of the methods used).

There are **two types of traceability media:** paper and electronic media. The latter can also be coupled with automatic identification equipment such as barcodes and smart labels.

3.1.1. Paper documents

Traceability systems based on paper documents and manual transmission of information can be used in companies/organizations in which the number of 'documents' and 'recording sheets' is limited.

This solution, which offers the advantages of **low-cost**, **ease of implementation** and ease of use by employees, can be **sufficiently effective** to allow a company to tell its customers that it has a traceability system for its operations and products.

However, to be truly effective, data collection must be uniform and objective. The preparation of recording forms is of utmost importance as is the training of the operators who will be required to collect data.

Paper documents can:

- be tied to the product (label, packaging);
- physically follow the product (traveler, delivery slip, invoice).

The documents must both be written and validated by the various people responsible (Station Manager, Quality Manager, Production Manager, Warehouse Manager, Purchasing Manager etc.).

They normally exist as **forms** to be filled out by an operator. They are generally **record cards**, **logs**, record sheets and data collection cards. Their size must be optimized to collect as much useful data as possible.

There are several steps to creating a data collection form:

1. Selecting the data to be collected (type of data: measurements, observations, etc.). The importance of a good definition of '**useful recording**' **(usable)** should not be underestimated.[1]

[1] For example, take the case of a usage log for pesticide products in the field. At the time of dosing to prepare the spray mixture, the operator has to enter the amount measured out (in ml) or weighed (in g) and the amount of mixture (in litres) to be prepared on the quantity form rather

2. Designing the record form (data collection sheet). This form is usually a table. It is designed to enable systematic recording of data using numbers (e.g.: temperature in °C), ratings (e.g.: good), dates (of the operation) or symbols (code).
3. Determination of the data collection period, frequency and place.
4. Identification of the person recording the data (e.g.: operator) or of the manager responsible for supervising data collection (e.g.: Production Manager, who signs the form).

In large companies, paper media is often difficult to manage given the large number of sheets that must be kept for a long period of time (at least, for the life cycle of the product). A **combined system is used in many companies**: paper forms are used first then the information is entered into the computer (with a risk of error during this operation).

3.1.2. Electronic media

The advantage of using a computer system for managing traceability is that it solves paper problems. A computer system provides:

- easier management of records while reducing concerns about storage time;
- immediate storage of data within the company;
- linking of workstations with the same data (e.g.: lot numbers) accessible to all operators involved thanks to data centralization;
- reduced reaction time for the creation of data reports on a given lot (e.g.: to respond to an importer or a public authority in the event of a problem).

The effectiveness of this system increases when it is coupled with an identification system like '**barcoding**' or '**RFID**'. Use of these identification systems replaces manual data entry on the computer and **eliminates typing errors.**

However, it should be pointed out that this isn't a miracle solution and that a computerised system is only effective if paper traceability is already well organised and operational!

What's more, computerizing traceability requires qualified staff and will be more expensive (purchase of computer equipment and user licenses, employee training).

❑ **Barcodes**

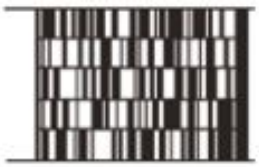
Using barcodes enables producers to identify every unit in a production batch. It also enables retailers to manage their inventory better.

than the 'dose/ha' indicated on the label. In the event of a problem with residue, the theoretical dose per hectare provided will not be helpful in identifying a calculation error made when the product was measured out.

There are several types of barcodes. The main ones are: Code 39, Interleaved 2 of 5, MONARCH (CODABAR), Code 11, Code 93, Code 128, Code 49, Code PDF417, Code 1 and EAN.[2] This information coding system uses as **succession of bars and spaces** of different widths. Their juxtaposition represents numeric or alphanumeric data.

Labelling with this code can be done several different ways using ink jet, laser or thermal printing. The code is read with an optical device such as a pencil, laser gun scanner etc.

There are also two-dimensional codes that provide more information:



Example of code with 49 to 81 characters

There are **two types** of barcodes:

- internal barcodes: code created by a company for internal use only;
- external barcodes: usually of the GENCOD type. This consists of a number code and a symbology using bars: **called Gencod EAN** (*European Article Numbering (article code)*), an international code standard that includes several standards of which **EAN 13** is the most widely used. The code consists of 13 digits representing a national identifier, a manufacturer and product code and a control key. This system makes it possible to identify each unit in a lot from manufacturing through distribution.

❑ Radio frequency or smart labels

RFID (Radio Frequency IDentification) is based on the principle that any object can be equipped with lightweight chips (tags, transponders[3] or microchips) that provide information readable from a short distance using small portable readers. The information is contained in the marker and can be used to track inventory or trace products. This is a contactless labelling and reading technology. The system is still not very widely used in the fruits and vegetables sector.

Smart label applications are **not widely used** in the agri-foods industry. This is primarily due to the cost for products with low added value like most agri-foods products, including fresh fruits and vegetables.

A RFID system consists of **three parts**:

1) A tag which manages:
    - physical aspects of exchanges (frequency, transfer speed, modulation etc.);

[2] EAN combines a standardised code and symbology.

[3] A system able to respond to a radio signal is called a transponder.

- logical management of exchanges (protocol);
- data storage.

Tags can be packaged in a number of formats (cards, tags, tokens, capsules, labels, etc.). There are two types of tags, also called 'smart labels'.

- Read-only (passive): they contain recorded data entered by the manufacturer which cannot be changed or added to. These labels (most common) are woken up by electromagnetic induction (the radio wave sent by the reader) and return an agreed-to signal at short distance. Data life is estimated at 10 years and 100,000 write cycles.
- Active tags: (more costly) are equipped with their own energy source (battery or solar panel) and a microchip. They can emit a signal alone and/or have a more complex dialogue with the reader. They have autonomy of several months to several years. Write-once/read-many labels contain information recorded by the first user which can be read but not changed or added to. On the other hand, write-many/read-many labels can be written several times, erased, changed, added to and read many times.

In all cases, RFID tags are characterized by:

- their small size (to 1 mm);
- their low cost (a few euro cents for the least expensive ones);
- the presence of a relatively large antenna;
- the potential for update during use.

2) An interrogator (or reader) which ensures communication with the tag:
   - data encoding and decoding, verification, storage and transmission;
   - management of communication with the tag (activation, session initiation, read, write, authorization etc.);
   - data transmission management (frequency, transfer speed, modulation, emission power etc.).

   The interrogator can be either fixed or mobile. Antennas can be internal or external, depending on the application.

   Information exchange in a RFID system takes place as follows:
   - the interrogator transmits a radio signal at a given frequency to tags in its read zone;
   - the signal provides the tags with the energy needed to respond;
   - the 'activated' tags send a signal to the reader to establish a dialogue using a predefined communication protocol.

3) The information system (IS):
   Manages the functions and processes that either act on the data exchanged with the tag, or uses them.

❑ Databases

A database provides a way to **manage information**. It is a tool for managing data about a specific subject or for a particular purpose (for example product traceability).

A database management system is an optimized and secure physical and logical file storage tool which provides access to saved information: these data are accessible from remote work stations.

The data stored in the database can be queried: detailed information about an entity with a code can be found in the database to which the code refers. Databases must include:

- data search interfaces;
- alert interfaces.

The effectiveness of these systems depends on their overall design and the rigor with which they are used.

❑ Traceability software

There are many software packages available and it isn't always easy to appreciate their relevance and effectiveness.[4] The cost of user licenses can also be relatively high, as can keeping software up-to-date.

A computerized traceability system is simply a data recording system. It enables effective structuring and filing of data and the quick production of reports that would be more difficult to create using a manual system (paper). As with a manual system, great care must be paid to the procedures implemented to ensure effective and safe use of the software.

Procedures can vary from one company to another but it should also be remembered that if a manual traceability system is already in place, and the system is operational and used effectively, the computerized system will work the same way and should be modelled on the manual system. If a manual system isn't used, or is poorly used, **the computer system will not solve any problems**. In the best case, installing a software application will underscore the need to be able to produce traceability sheets and will give rise to advice on the implementation of procedures.

[4] This is the case of HORTITRACE software which was developed by COLEACP/PIP.

3.2. Product labelling

3.2.1. Product labelling and traceability

Labelling is a pre-requisite for traceability. However, 'labelling' doesn't mean 'tracing'. Putting a mark on a product **facilitates its identification and contributes to the reliability** and systematization of traceability, be it *tracing* or *tracking*.

On the other hand, while traceability implies several companies along the industrial and logistics chain, the mark will only be useful if it can be used by the other companies involved: this is why it is necessary to use 'marks' or 'codes' that are legible and usable by all operators in a chain (see below).

Labelling must:

- be done with a system other companies can use;
- refer to code that is comprehensible by these companies (standards): reading and not understanding a label is of little use;
- be suited to the purpose and visible: an inaccessible or hidden label is useless.

Labelling products implies pre-definition of the relevant labelling level. Labelling at the unit level can be useless (and, therefore, be a useless cost) if **labelling lots** or **logistics units** is sufficient.

The answer will depend on the use made of the product downstream and on the identification needs that arise during its life cycle.

3.2.2. Data carried by products

The information carried by an entity is **isolated** traceability data which are, therefore, incomplete and of little interest in themselves.

Traceability data can be categorized as:

- **information** (best by date etc.);
- **legal information** on packaging;
- **labelling formats** (e.g.: EAN 128, a widely used product identifier).

The following is used when **tracing at the unit level**:

- a product identifier;
- a unit serial number.

The following is present when tracing at the group level (**product lot**):

- a product identifier;
- a lot number (logistics lot or production lot) that can be expressed several different ways:

- incremental sequential number (including the SSCC or *Serial Shipping Container Code*[5] for the logistics unit);
- time chart information (date and time).

Identification information must always be **in plain text** and **visible**.

3.2.3. Labelling requirements for product safety

Every lot of food products sold must be unequivocally identifiable. In the event of an emergency, or if a withdrawal or recall must be organised, the identification must enable suppliers, customers and the competent authorities to **find the lot(s) in question** and their origin without error.

In compliance with the ***Codex Alimentarius standard***,[6] each package must, at a minimum, have the following information printed on the same side, in legible, indelible characters visible from the outside (identification, nature, origin of the product, commercial characteristics etc.).

This information can also be included in the product shipping documents.

In addition, certain lots of plants or plant products intended for the European market and potentially carrying pests must include a **Phytosanitary Certificate** (see Directive 2000/29/EC).

3.2.4. Benefits of coding for traceability

❑ **Why is traceability based on coding systems?**

In order to obtain useful traceability information, data on product locations, movements, operations carried out, contextual data etc. must be recorded. However, to trace, the exact product being traced must be known. **Items must be named and specifically identifiable** to collect, organize and use information about them.[7]

An **unequivocal relationship** between the item traced (identified) and the information (recorded about it) underlies all traceability.

Identification consists in retrieving information about the entity, at specific times in its movement though the production, packaging and sales processes. It **combines five elements**: an object (the entity), a location, a point in time, a context and an operation.

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5 A number unequivocally identifying the goods on which it is placed, from exporter to end-customer. Thanks to the SSCC, the product's movement can be followed through the supply chain and links created to corresponding information (e.g.: data previously recorded in producer logs).

6 CAC/GL 60-2006 - *Principles for traceability/product tracing as a tool within a food inspection and certification system*.

7 Having identification information may also be insufficient: **authentication** information may be required for the product.

It provides information for a precise time and location but doesn't provide the history of operations carried out before that moment or indicate what will happen afterwards. An identification is only meaningful when it is connected to others, not in isolation: it isn't the collection of information that matters but **its organization** for the purpose of meeting pre-defined objectives.

As soon as processes become complex, or there are many entities, it is preferable to use a **coding system** to identify them. A system should provide the following benefits:

1. Reduced subjectivity: fewer errors or interpretations.
2. Linking of entities (relational or sequential hierarchy trees).
3. Increased automation.
4. Disconnection of entities from operations and the changes that affect it.

Coding doesn't mean description: it means naming the entity to be able to identify it precisely. The format of the "name" can have meaning but the meaning is not descriptive. The code has no meaning in itself: it is an identification number that can be built using a given set of coding rules (coding structure). Coding enables the naming of objects with greater or less precision. The actual information about the coded product is found in the database, to which the code refers.

Coding, like labelling, is a **pre-requisite** for traceability, but isn't sufficient to meet regulatory and business requirements.

How is a coding system designed?

Coding means providing entities to be traced with a unique "identification number" that must enable **identification** of entities throughout their life cycle.

For example: code 2411 983 7:

- 2411 : product type (e.g.: fresh mango)
- 983 : registration number for this type of product (e.g.: the mango lot number)
- 7 : control key

Coding can go down to the unit level within a production series. The only limitation is complexity: using a 40-digit code will increase the precision of traceability but decrease productivity (especially if the codes are recorded manually).

The use of control keys in coding systems helps to reduce the risk of error. A control key (one or more digits) is created by applying an algorithm to the code. Entering the key validates whether the code is good or not. In the event of an error, the key calculation will return a different key than the one entered. The system will detect errors.

Once identification is complete, databases are tasked with storing all of the information about a product (exact origin, content, composition, circuit, manufacturing dates, delivery dates, expiration dates etc.). The information is forwarded via electronic exchange (EDI) during product transport time.

❑ Why use standards?

Traceability can be carried out internally in a reliable, relevant and effective way. However, companies rarely use traceability in isolation because of their relationships with their suppliers and customers.

If every company in a chain applied its own identification rules, **every point of contact between two companies would become a source of difficulty** (e.g.: **traceability breakdown**) because of differences in coding. Ensuring continuity of traceability in the chain would require significant effort because of the necessity of connecting the codes used by each link:

- by re-coding products at their entry into the next company which requires adding a new label (with a new code);
- or by ensuring that there is a match between the coding systems used thanks to concordance tables.

These relationships call for the use of the **shared rules** provided by 'standards'.
The role of standards is to provide common rules to those involved in an industrial chain or sector to facilitate information exchange and interactions.

Traceability, by its nature, encourages the use of standards because it overflows from companies both upstream and downstream. Inventing rules is a waste of time: at some point or another, it will be necessary to provide consistency with a standard. A typical example is the **EAN code** which is used to identify everyday consumer products. This code is placed by the manufacturer and is readable by all of the shops in which the product is sold.
The use of standards has **four benefits**:

1. Standards are the common language of an industry: **using them strengthens sector integration** and, over time, provides the means to enter into a relationship with other sector partners.
2. Standards are created through consultation and are related to good practices. Using them results in greater expertise.
3. Standards are designed to cover all possibilities. Using standards increases reliability.
4. Most solutions and tools available conform with standards. Using them leads to time and resource savings.

Standards exist in all sectors and can be of several types.

For example:

- GS1/EAN UCC **for fast moving consumer goods**;[8]

[8] Prior to this standard, European manufacturers and retailers used EAN (European Article Numbering) standards and North Americans used UCC (Uniform Code Council) standards. The GCI (Global Commerce Initiative) is a working body created in 1999 by industrialists, retailers (Auchan, Carrefour, Tesco, etc.) and manufacturers (Nestlé, Coca-Cola, Procter & Gamble, Johnson & Johnson, etc.) to facilitate integration of the supply chain and to simplify business processes. It works toward the convergence of current coding standards. For example, GCI projects include support to GLN (Global Location Numbers) and GTIN (Global Trade Item Numbers). It launched the GSMP (Global Standard Maintenance Process) in January 2002. EAN (European Article Numbering) and UCC (Uniform Code Council) also joined forces and new standards are being designed for the global **EAN-UCC standard**.

- GLN (Global Location Number): identifies **destinations**;
- SSCC (Serial Shipping Container Code): **identifies packages**;
- GTIN (Global Trade Item Number): **identifies products** (units sold to consumers);
- CIP 13: identifies medicines;
- Galia: identifies cars;
- Etc.

All of these codes are structured in a similar way:

- a prefix variable by situation;
- a company identifier usually assigned by a national standards body;
- a specific identifier (location, product, package, etc.) assigned by the company;
- a control key to ensure code integrity and correct reading.

In fact, international convergence is theoretically easy to establish via the addition of prefixes, suffixes, etc. In practice, of course, this is far more complex since nomenclatures and directories must be harmonized and, in addition, industrial software and readers must be modified.

3.3. International codes

3.3.1. GLN (Global Location Number), international location-function code

This is a unique international 13-digit code used to designate a location. It can be:

- **a company:** company, subsidiary, etc.;
- **a functional entity:** accounting department, warehouse, etc.;
- **a physical entity:** room, hospital room, warehouse aisle, etc.

'301' or '302'	National supplier or retailer code	Internal code	Control key
3 digits	5 to 8 digits	1 to 4 digits	1 digit

3.3.2. GTIN (Global Trade Item Number)

This is a unique international 13-digit code used to designate product units that can be purchased by consumers. It is an extension of the EAN-13 code.

Generally speaking, a unique international number is assigned to each commercial unit (for example, a plastic-wrapped tray with a bunch of tomatoes intended for a point of sale) or a standard group of commercial units (for example, a pallet with several crates of tomatoes, transferred from the warehouse to a retail shop). This is the **GTIN** number (Global Trade Item Number). The GTIN contains no information on the product. It is simply a unique key providing access to information stored in databases. Four GTIN numbering systems are available for the identification of commercial units: GTIN-14, GTIN-13, GTIN-12 and GTIN-8. Selection of a numbering system depends on the type of product and the application.

Sample use of GTIN-13:

***5412345**: GS1 company prefix (in this example, assigned by GS1 Belgium & Luxembourg)*

***00001**: item number assigned by the company*

***3**: control key*

There are now **GTIN+** codes (that is, the GTIN code + the lot number or the expiration date – BBD, Best Before Date – or the production date – PD, Production Date – and a **SGTIN** code – GTIN with the serial number of the item).

3.3.3. SSCC (Serial Shipping Container Code)

The SSCC is an 18-digit GS1 number that unequivocally identifies the logistics unit on which it is placed. It is used in logistics **to number packages** (e.g.: pallets). For example, three identical items sent in three different packages will have the same EAN-13 item number but different SSCC codes. Every SSCC number is different around the world.

Open	Country	Manufacturer code	Sequential number	Control key
1 digit	1 digit	5 to 8 digits	7 to 10 digits	1 digit

In combination with the EDI despatch advice, the SSCC ensures quick and correct reception of merchandise. In addition, all of the data tied to the logistics unit, that is, the approval number, the GTIN(s), the packaging date, etc. can be exchanged via EDI using the SSCC as a reference. The SSCC is a pure traceability tool.

The SSCC is marked on the logistics unit using UCC/EAN-128 symbols.

***00**: Application Identifier (AI) introducing the SSCC*
***1**: serial number extension (between 0 and 9)*
***54123456**: company prefix (if using an 8-digit prefix)*
***00001234**: serial number*
***5**: Control digit*

3.3.4. Barcodes

Barcodes carry information. Their purpose is to code relevant data about a product or service at every step of the supply chain.

Logical identification (location, products, packages) is most often printed and read using a barcode. The use of barcodes is always subject to physical characteristics (size and shape of the media, background color etc.)

Several standards co-exist depending on these characteristics and the number of digits used:

- **EAN-8** and **EAN-13**: 8 or 13 digits (written in plain text under the bars) - used essentially for consumer products;
- **ITF 14:** 14 digits: this data is larger and more clearly legible. It is primarily used in logistics on packaging (boxes, pallets, etc.);
- **UCC/EAN 128**: a new standard enabling representation of a variable length chain of alpha-numeric characters.

When additional information about a product is needed in the fruits and vegetables chain, for example, the lot number, the weight or the packaging date, **UCC/EAN-128** symbology

can be used to encode the data in addition to the product identification (GTIN). This may be the date the product was palletized, the operator's national authorization number and the net weight.

GS1 Application Identifiers (AI) must be included in UCC/EAN-128 barcodes. They define the data structure of the data in the elements they introduce.

Application Identifier (AI) (01) is the GTIN
Application Identifier (AI) (13) is the packaging date, in this case, 7 October 2002
Application Identifier (AI) (7030) is the producer's national authorization number

3.3.5. The QR code (Quick Response Code)

The **QR code** is a two-dimensional barcode (**matrix code**) consisting of black modules arranged on a square white background.

The name QR is the acronym for 'Quick Response', because its data content can be decoded quickly. Intended for use with a QR code reader, a mobile telephone, or a smart phone, it has the advantage of being able to store more information than a regular bar code.

QRs can store up to 7,089 numeric characters or 4,296 alphanumeric characters which is far above the capacity of barcodes.

They are found on many different media: they simply have to be scanned using the photo mode of a mobile telephone and sent in order to receive information (composition, origin, lot number, manufacturing date, etc.). Despite its cost, applications are being rolled for certain food products (e.g.: olive oils in Italy).

3.3.6. RFID and the EPC (Electronic Product Code)

Initiated by several players, including EAN and UCC, the EPC (*Electronic Product Code*) is a RFID microchip-based identification system consisting primarily of:

- a product identifier (based on the same structure as the GTIN code);
- an individual item identifier via the addition of a sequential number.

Barcode and RFID technologies are often spoken of as if the first will eventually replace the latter. It now seems that the technologies will be used in a complementary way by combining the advantages of both. One-dimensional barcodes are cheap and electronic

labels can store information. RFID is a solution whenever dynamic information is required and the price of labels is considered at the operational level (multiple use). One example of this kind of use is industrial laundry. Every hanger has an electronic label for tracking through the process and each piece of clothing is identified with a barcode for tracking from drop-off to pick-up.

6.7. GS1 labelling recommendations

The overall goal of GS1 is to enable every operator in a chain to label the products they make and sell using information supplied by the preceding operator. In order to be able to transmit the information required to the next steps, GS1 gives recommendations on the **minimum data** to be forwarded to the next operator. These data can be put on the rack sheet, on adhesive labels, etc.

Data to be written on the card or label:

- Producer/grower number (authorisation number);
- Product name, variety or commercial type;
- Class/category (not valid for potatoes);
- Size/calibre;
- Country of origin;
- Net weight (if compulsory or agreed to);
- Batch number (see below);
- Harvest date (optional);
- Plot number (optional);
- Date.

Growers may assign a batch number on their products. If they do, the combination of batch number and grower identification will ensure traceability. If they do not assign a batch number, the auctioneer/packer/importer must put one on at a later time. The harvest date may be useful in helping producers obtain more information on a product's best-by date or in the event of a recall. The plot number provides additional information on the origin of the product.

Conclusions

All stakeholders in the food chain must meet regulatory requirements along the various steps of the food chain, particularly through a traceability system to track the origin of the raw materials used (upstream traceability) and to locate products in the subsequent steps of distribution and marketing (downstream traceability). Traceability requirements are described in European and international legislation, in addition to international food safety standards (notably the ISO 22000 family).

Therefore, all stakeholders wishing to send their food products to the European Union market must meet these requirements to protect the safety of final consumers. Warning systems are in place to help remove hazardous products from the shelves and precautionary measures are sometimes implemented in all Member States to prevent a food contamination outbreak.

Labelling and packaging play a key role in identifying food products and there are strict requirements for identifying food products and possibly recalling them in the event of risk.

In addition to facilitating identification and traceability, packaging is also used to inform consumers. The strategies that agri-food companies put in place must consider its commercial impact in a highly dynamic way, particularly with regards to cultural differences.

European legislation applies to goods exported or re-exported from the EU before being put on the market of a third country, unless the importing country decides otherwise.

The European Food Safety Authority (**EFSA**) is crucial for protecting and informing consumers. It also provides scientific and technical views and assistance in all areas with an impact on food safety. It is an independent source of information and ensures that the general public remains informed about risks.

Jointly with the Commission, the EFSA operates warning and crisis management systems for sharing information quickly in case of problems and for taking all measures necessary to protect the general public in case of food risks.

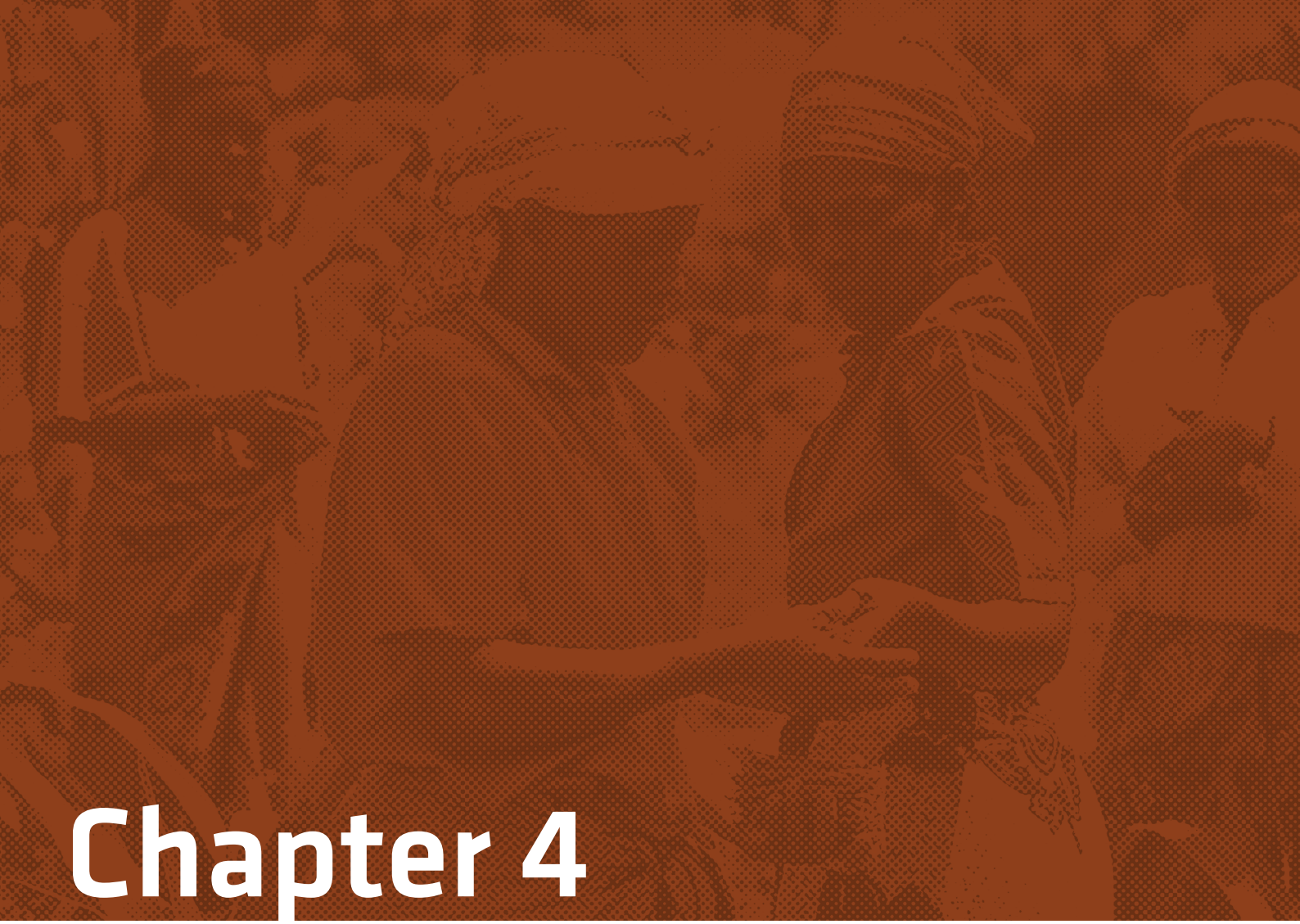
Therefore, measures may be taken to suspend the placement of dangerous products on the market, whether produced in the EU or imported into EU territory. Compliance with EU regulations and international standards is therefore a strategic issue for any country wishing to market their food products in the European territory.

Appendices

A.1. Some definitions

Batch	A definitive quantity of a commodity produced essentially under the same conditions.
Container	Any packaging of food for delivery as a single item, whether by completely or partially enclosing the food. Wrappers are included in this definition. A container may enclose several units or types of packaging when such is offered to the consumer.
Date of minimum durability (best-by date, best before date, optimal shelf life)	The date which signifies the end of the period under any stated storage conditions during which the product will remain fully marketable and will retain any specific qualities for which tacit or express claims have been made. However, beyond the date the food may still be perfectly satisfactory. 'Best before [date]'
Expiration date (use-by date, recommended last consumption date, shelf life)	The date which signifies the end of the estimated period under any stated storage conditions, after which the product probably will not have the quality attributes normally expected by consumers. After this date, the food should not be regarded as marketable.
Food additive	Any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result (directly or indirectly), in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods. The term does not include contaminants or substances added to food for maintaining or improving nutritional qualities.
Food (foodstuff)	Any substance, whether processed, semi-processed or raw, which is intended for human consumption, and includes drinks, chewing gum and any substance which has been used in the manufacture, preparation or treatment of 'food' but does not include cosmetics or tobacco or substances used only as drugs.
GMPs – Good Manufacturing Practices	Good Manufacturing Practices (GMPs) are the processes used to maintain food safety by applying best practices, documentation and continuous improvement. Required by EU regulations for materials coming into contact with food, they are close to the ISO 9001 and ISO 22000 approach.
Ingredients	Any substance, including a food additive, used in the manufacture or preparation of a food and present in the final product although possibly in a modified form.
Labelling	Any written or printed text or any graphic representation that appears on the label, accompanies the product or is displayed near it, including for the purpose of promoting its sale. It

	provides information about and helps to identify the food product.
Migration	In the particular context of materials in contact with food, migration means that substances, monomers and/or additives contained in the material in contact with the food (at a high concentration) tend to flux into the food in contact with this material (at a low concentration).
Packaging	The act of wrapping or enclosing a product in material before presenting it to consumers. Primary packaging is in direct contact with the product. Packaging also means all material elements that, without being separated from the product itself, are sold with it in order to facilitate its protection, transport, storage, display on shelves, identification and use by consumers. • Primary packaging: container in direct contact with the product (e.g. a bottle). • Secondary packaging: contains an already packaged product (e.g. a cardboard box containing the bottle). • Tertiary packaging: packaging for handling products during transport until the point of sale (e.g. pallet).
Packaging recovery	Reuse, recycling or any other action aimed at obtaining recyclable materials or energy. This is to avoid useless waste. Two types of recovery are possible: • material recovery, which reuses elements from waste to reintegrate them into the economy; • energy recovery, which uses the calories contained in waste.
Package recycling	Direct reintroduction of waste into the production cycle from which it came to replace a new raw material thereby acting as a type of material recovery.
Pre-packaged food	Food product packaged or made up in advance in a container, ready for offer to the consumer, or for catering purposes. Unit of sale consisting of a foodstuff and the packaging into which it was placed prior to being offered for sale, whether such packaging covers it fully or partially, but in such a way that the contents cannot be altered without the package being opened or modified.
Sell-by date	The last date of offer for sale to the consumer after which there remains a reasonable storage period in the home.
Traceability	The ability to follow a product through the different stages of production, from processing to marketing, particularly in the food sector. It is divided into upstream and downstream traceability.



Chapter 4

Packaging, labelling and marking food products

4.1. Packaging materials

4.1.1. Introduction and definitions

The advent of large-scale distribution has revolutionized global food trade. The need to move from the bulk sale of industrial products to the sale of packaged and processed food has given the food packaging sector an essential and multifaceted role.

Food risks are becoming more frequent and it is important to inform consumers on the contents of the food they consume. Food labelling therefore takes a leading role in this issue.

The purposes of packaging and labelling are very different, as are the relevant regulations and standards. Both aspects, therefore, are covered separately in this technical handbook.

Regulation (EC) No. 178/2002 of the European Parliament and the Council of 28 January 2002 is part of the 'Hygiene Package': European regulations establishing the requirements related to food safety. The European Union's objective is to guarantee food safety for consumers 'from the farm to the fork'.

Thus, the EU's strategy in the field of food safety endeavors to:

- address food safety, the health and wellbeing of animals and the health of plants;
- ensure the traceability of foodstuffs from the producer to the consumer and beyond the internal borders of the EU in order to remove trade barriers and offer consumers a wide variety of choices;
- implement strict standards for food produced in or imported into the European Union.

Therefore, all actors wishing to export their products to the European Union must **comply with the regulatory requirements** in force to guarantee the quality and safety of food on the domestic market.

Food laws also protect consumers against fraudulent business practices. They cover consumer safety, the health and wellbeing of animals and the health of plants and the environment.

This chapter specifically addresses the requirements related to packaging, labelling and the consequences of their use, particularly during transport and handling. It also deals with the implementation of traceability systems.

❑ Some definitions

The definition of the word **packaging** given in *Mercator*,[1] an influential French book on marketing, is: *"All material elements that,* without *being separated from the product itself, are sold with it in order to facilitate its protection, transport, storage, display on shelves, identification and use by consumers".*

- Primary packaging: container in direct contact with the product (e.g. a bottle).
- Secondary packaging: contains an already packaged product (e.g. a cardboard box containing the bottle).
- Tertiary packaging: packaging for handling products during transport until the point of sale (e.g. pallet).

The role of each type of packaging (primary, secondary or tertiary) is different, as defined above.

Labelling plays a role in identifying the food product and providing information about it.

Packaging involves wrapping or enclosing a product in material before presenting it to consumers. Primary packaging is in direct contact with the product (Larousse).

The concept of mere wrapping is different from that of packaging. The former refers to conserving and protecting the product to make it easier to handle, transport and store, while the latter also serves to inform and notify consumers while taking into account aspects linked to environmental protection.

Packaging therefore serves several purposes:

- **Protecting the product**: a role in protecting the food product and maintaining its integrity in terms of taste and food safety until the final point of sale. As a result, the packaging must allow the product to maintain its organoleptic, nutritional and health properties. Compatibilities between the container and its contents must also be taken into consideration, as well as the inertia of the materials, meaning the non-migration of the packaging elements towards the product.

- **Transport:** the packaging must facilitate the handling and transport of the product from the factory to the distribution centers. Damage caused to products is often related to the quality of the packaging and to poor handling and delivery practices. Thus, packaging and its properties are crucial for professionals to avoid occasionally substantial financial losses.

- **Information:** an informative role with the data appearing on the label, in order to meet regulatory requirements and inform consumers about conservation and preparation methods. Therefore, labelling provides information on the nature of the contents, the ingredients in a product, the manufacturer and its contact information. In most countries, this information is strictly regulated.

- **Communication:** a role in marketing the product, for consumers are in direct visual contact with the products they decide to purchase (self-service) without

[1] J. Lendrevie and J. Lévy, 2012, *Mercator : Théories et nouvelles pratiques du marketing*, p. 209.

intermediaries, as occurred in traditional or petty trade. As a result, packaging performs a persuasive function in trade by encouraging consumers to buy a particular product.

- **Storage:** the role of packaging is important in storage for easy handling when storing in distribution centres and in logistics platforms and during transport.

- **Protecting the environment:** this new role of packaging relates to its impact on the environment. In fact, the production of packaging has a real impact on the environment, and the biodegradability of packaging is a key factor in managing waste and recycling material. The packaging industry must continuously adapt to these new constraints.

These purposes will be discussed in the chapters of this technical handbook with a presentation of the different applicable legal texts, particularly in the European Union, to facilitate the entry of food products into the trading area and meet its various demands.

The Annexes include references to sources of information and the texts of the applicable laws.

It is essential for producers to consider implementing a specific 'packaging and labelling' strategy to meet the following needs:

- **to standardise packaging**: to facilitate economies of scale and reduce costs, as well as to reduce the cost of handling and shipping the product and to optimise storage space at all levels of distribution;
- **to adapt packaging**: necessary for marketing to foreign countries, and especially for adapting to particular cultural and linguistic characteristics, special climates and the economic level of the target market.

Thus, in terms of **specific cultural characteristics**, we notice the importance of colour codes (different from one country to another), local consumer habits, preferences in terms of materials and sizing, specific conditions of use and, obviously, adherence to specific regulatory requirements.

In particular, this technical handbook discusses **European regulations that** facilitate access to the European Union market, with its 27 countries. It also takes international legislation into account, notably the *Codex Alimentarius*.

4.1.2. Packaging materials

Packaging materials serve several purposes. They are adapted to the food product they enclose and to how it is processed to ensure it stays safe and suitable until the point of sale.

In order of importance, the main packaging materials are:

- paper and board;
- plastic;
- metal;
- glass;

- wood;
- composite;
- textile.

Technical and regulatory aspects will differ according to the material used, especially if the type of food processing, and therefore the conservation properties provided by the packaging, are taken into account. Another aspect is **the effects linked to the migration of the materials to the food product itself** (food grade).

❑ Paper and board

The main types of packaging using paper and board are cardboard boxes, bags of different sizes, folding boxes, board crates and packing paper. They are used to package different types of food products, such as granules or powder, industrial products, fresh fruit and vegetables, etc.

Paper and board are made from fibrous materials and come from multiple sources:

- wood (softwoods such as the *Amabilis* fir, maritime pine and leafy trees, such as black poplar, *Eucalyptus saligna*);
- vegetal (bamboo, straw);
- fibre recovered from waste paper;
- other integrated materials: chemical products, water.

Thus, the final quality of the paper or board produced depends on the quality of the cellulosic fibres used (size, diameter and wall thickness). The level of quality is assessed according to the qualities of the final product in terms of resistance, tensile strength, bursting, folding, etc. The best products are those made from long fibres.

The advantages of these types of packaging include their ease of processing and their biodegradability. After-use is also easy. Thus, considering the environmental challenges we face today, paper and board still have a bright future with good potential for development.

❑ Plastic

The use of plastic packaging has grown significantly in recent decades, with a wide and varied range of plastic containers. The most common are pouches, sacks, bottles, jars, vials, packaging film, etc. Plastic is a main competition to packaging in glass, paper and textiles.

Plastics are synthetic products obtained from petroleum, coal and natural gas. Thus, the use of plastic does not help to protect the environment due to its weak biodegradability and damage to the environment in general.

The main plastic materials used to manufacture food packaging include:

- polyethylene (PE);
- copolymer of ethylene-vinyl acetate (EVA);
- polypropylene (PP);
- expandable polystyrene;
- polyvinyl chloride (PVC);

- polyamides (PA);
- copolymer of polystyrene (ABS).

The different chemical properties of these materials are not described here as they can be found in specialised literature on the subject. However, we will review the regulations and standards related to their food grade and in their use in food packaging.

The level of quality is evaluated from the qualities of the final product in terms of density, tensile strength, signs of breakage and water absorption.

❑ Metal

Metal is mainly used in food packaging for products packed in tins or cans, especially for fruit and vegetables. Its important role, which continues despite the development of new types of packaging, stems from its mechanical properties and its aptitude for sterilisation. Therefore, it is used in industrial processes where heat and mechanical stress are required.

The main metals used are **iron and aluminium**. However, costs remain high.

Recent developments have modernised this type of packaging, especially by lightening the material, innovating electric soldering techniques (replacing lead soldering, which is harmful to health) and adding easy openings to make cans more convenient to use.

❑ Glass

Glass has been used to package food since ancient times, especially in bottles and jars. Traditionally, all liquid food products such as water, milk, oil, lemonade, etc., were packaged in glass bottles under a deposit-return system.

Glass is obtained from silica, soda, lime and refining agents (to eliminate gas bubbles in the glass), as well as dyes, decolourants and reducers.

The main forms of glass packaging include bottles, cups, jars, vials and ampoules for medicine.

Despite its great qualities, notably inertia with respect to food products (no transfer to the packaged product) and its advantages in terms of physical and mechanical characteristics, glass packaging is gradually being replaced by plastic.

This change is mainly for economic reasons (plastic packaging is cheaper and the deposit-return system is disappearing because of concerns about handling, commercial use and food contamination risks). Furthermore, innovation in plastic materials is constantly improving to tackle the various aforementioned challenges. In particular, PET (polyethylene terephthalate) has presented glass packaging with stiff competition because it is similar in terms of transparency and rigidity. Problems of movement in plastic materials have also been greatly improved.

In addition, glass poses a major threat to food safety (contamination of products due to glass shards). The use of glass in a food factory is strongly discouraged.

❑ **Wood**

Because of its abundance in nature and the different ways that humans have used it since ancient times, wood is the oldest packaging material in use. For example, wooden barrels have been used to hold liquid food and agricultural products in brine since ancient times (e.g. olives and peppers).

Today, wood is mainly used in upstream agricultural activities, such as vegetable and fruit crops: wooden crates and boxes, pallets, cases, barrels, baskets and particle board packaging.

Wood packaging is divided into two categories:

- softwood: conifers (or resinous);
- hardwood: broad-leaved.

The criteria applied to the quality of wood packaging are density or unit weight, resistance to bending, compressive strength, the ability to hold nails and resistance to cracking and the ease of work and decomposition.

Restrictions have recently begun to appear on the use of wood as food packaging. The first limitations were of an economic nature, then new regulations and standards for using wood appeared in the agri-food sector, with wood processing requirements. Therefore, plastic crates are gradually replacing wooden ones. The same goes for pallets in sectors where food safety is very strict, such as dairy and meat.

❑ **Textiles**

Different textile fibres were traditionally used as food packaging, such as jute, cotton, hemp and linen. However, use has decreased significantly due to the introduction and development of plastic packaging and the risks of food contamination for the packaged product.

4.1.3. European packaging coding system

Below is the European Union's packaging identification and codification system:

Materials	Abbreviations used	Numbered
Plastics: Polyethylene terephthalate High-density polyethylene Polyvinyl chloride Low-density polyethylene Polypropylene Polystyrene	PET, HDPE, PVC, LDPE, PP, PS	1 to 19
Paper, board	PAP	20 to 39
Wood, cork	FOR	50 to 59

Metal	FE, ALU	40 to 49
Cotton, jute	TEX	60 to 69
Glass	GL	70 to 79
Composite materials	C + abbreviation of the dominant material	80 to 99

This dual identification system allows manufacturers to use either the numbers or the abbreviations. For example, polypropylene is identified by the abbreviation PP or the number 5.

The system is voluntary for producers, but once they choose to use it, they must continue to adhere to it. The system could be made compulsory in the future.

For **imports** to one of the countries of the European Union, the responsibility for complying with regulations rests on the importer or the representative designated to ensure compliance with regulatory requirements.

4.2. European regulations on packaging

4.2.1. Aims of European regulations

The purpose of European Union regulations on packaging is to **protect and inform consumers** while facilitating the **free circulation of goods** amongst European Union countries.

Many regulations related to food packaging and labelling have been published since the European Union was created, but here, only the main texts are examined, and especially recent amendments to make them easier to understand and to help people comply with European regulations.

This chapter covers regulations related to packaging, packaging waste and food labelling by focusing primarily on regulations in the European Union.

4.2.2. Regulations on food packaging

European regulations regarding the safety of materials and articles in contact with foodstuffs are taken from the European Commission's **DG-SANCO** (Directorate-General for Health and Consumers).

❑ **Regulation on food contact**

The fitness of materials to be in contact with food is governed by **Regulation (EC) No. 1935/2004**. This regulation replaced Directive 89/109/EEC and Directive 80/590/EEC effectively from 3 December 2004. It applies to materials and articles which, in their finished product state, according to their purpose, are in contact, or intended to be, with foodstuffs or with water intended for human consumption. It does not apply to fixed public or private facilities used for water distribution or to antiques.

Regulation (EC) No. 1935/2004 establishes the **principle of inertia** (Article 3):
"Materials and articles shall be manufactured compliance with good manufacturing practice so that, under normal or foreseeable conditions of use, they do not transfer their constituents to food in quantities that could:

a) Endanger human health;
b) Bring about an unacceptable change in the composition of the food;
c) Bring about a deterioration in its organoleptic properties".

The regulation lists the **criteria of inertia** that could apply to a category of materials and that will be detailed in specific directives or regulations (positive lists of authorised ingredients, purity criteria applicable to some of these ingredients, particular conditions of use, specific transfer limits, overall transfer limits, measures concerning oral contact), as well as sampling arrangements and methods of analysis.

The groups of materials and objects subject to specific guidelines include:

- plastic materials, including varnishes and coatings;
- regenerated cellulose;
- elastomers and rubber;
- paper and board;
- ceramics;
- glass;
- metals and alloys;
- wood, including cork;
- textiles;
- paraffin wax and microcrystalline wax;
- active materials and articles;
- adhesives;
- cork;
- ion-exchange resins;
- printing inks;
- silicone;
- varnishes and coatings.

The regulation also establishes rules on the authorisation of substances in the manufacture of materials, methods of control and inspection, the labelling of materials and objects and especially a symbol, written declarations of compliance, traceability and safeguard measures.

The materials and articles concerned include:

- packaging;
- cooking recipients and utensils;
- materials, machines and substances used in the production, storage or transport of foodstuffs;
- teats and soothers.

The foodstuffs concerned are food and beverages:

- either products in the finished state or intermediate products;
- intended for human consumption.

The following are not covered:

- coating materials;
- fixed drinking water distribution facilities.

The specific regulations or directives contain inertia criteria that depend on the nature of the materials. For certain materials (e.g. plastic), there is a list of substances authorised in Europe (positive lists) that are complemented by national authorised substance lists (see the references to national lists).

These substances are the only ones authorised in the manufacturing of the materials. Substances are authorised by the DG-SANCO with the backing of the Standing Committee on the Food Chain and Animal Health, following a favourable opinion by

scientific bodies such as the **European Food Safety Authority (EFSA)** and, in the past, the Scientific Committee on Food. These notices are published on the Internet. When there is no specific requirement for a given material, the principle of inertia laid down in the regulation still applies. The manufacturer is responsible for demonstrating compliance with these principles.

Altogether, Regulation (EC) No. 1935/2004, along with specific regulations and specific directives, form European legislation on materials and articles intended to enter into contact with food. Specific directives have been transposed into national law as decrees on materials. In lieu of specific regulations or specific directives for a given material, the current national provisions apply.

The provisions on hygiene for materials and packaging are covered by legislation on food products. Regulation (EC) No. 852/2004 of the Food Hygiene Package defines the requirements for hygiene of foodstuffs. This regulation includes specific provisions applicable to the packaging of foodstuffs.

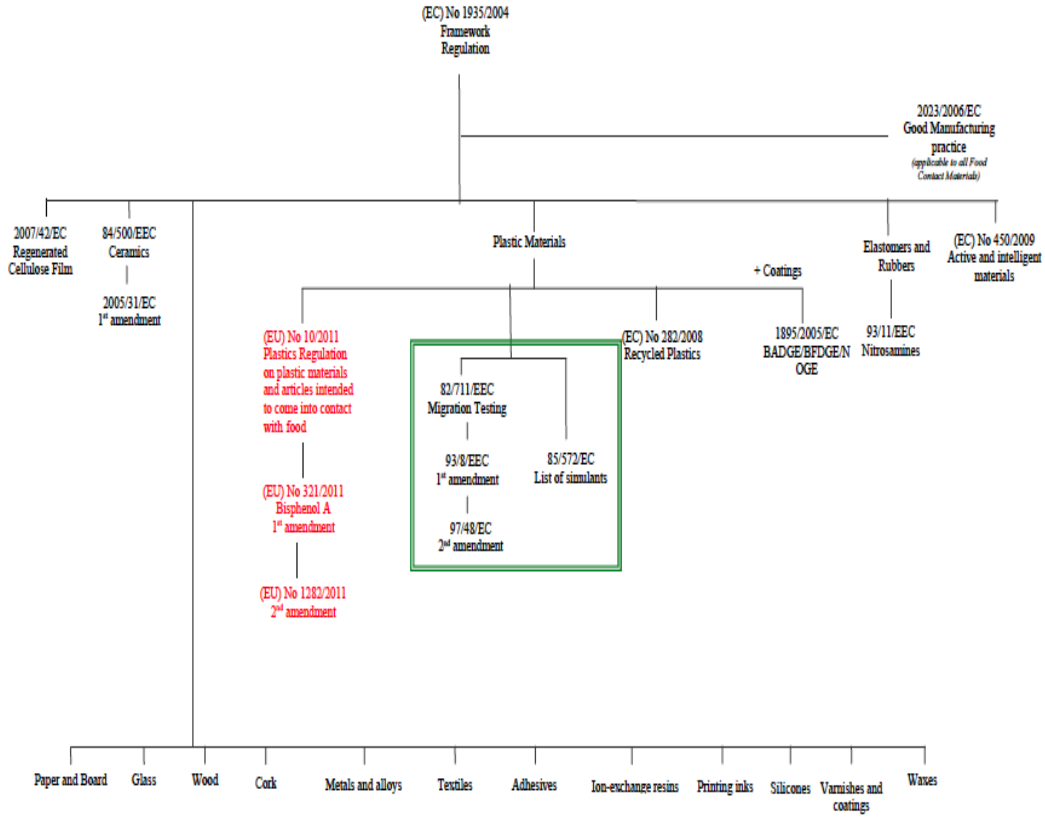
Numerous specific regulations for different packaging materials exist. In addition to European legislation, reference must be made to the national regulations of the country where the food product will be marketed (see list of contacts by country in the Annex and the CETIM's downloadable guide):

- **Principles of inertia and symbol:** Regulation (EC) No. 1935/2004 of the European Parliament and of the Council of 27 October 2004, concerning materials and articles intended to come into contact with food (Article 3);
- **Plastics:**
  - Regulation (EU) No. 10/2011 of the Commission of 14 January 2011, covering plastic materials and articles intended to come into contact with food (amended by Commission Implementing regulation (EU) No. 321/2011 of 1 April 2011);
  - Regulation (EU) No. 282/2008 of the Commission of 27 March 2008, on recycled plastic materials and articles intended to come into contact with foods, amending Regulation (EC) No. 2023/2006;
  - Regulation (EU) No. 284/2011 of the Commission of 22 March 2011, laying down specific conditions and detailed procedures for the import of polyamide and melamine plastic kitchenware originating in or consigned from the People's Republic of China and Hong Kong Special Administrative Region, China;
- **Material control:**
  - Directive 82/711/EEC of 18 October 1982, laying down the basic rules necessary for testing migration of the constituents of plastic materials and articles intended to come into contact with foodstuffs;
  - Directive 85/572/EEC of the Council of 19 December 1985, laying down the list of stimulants to be used for testing migration of constituents of plastic materials and articles intended to come into contact with foodstuffs;
- **Epoxy compounds**: Regulation (EC) No. 1895/2005 of 18 November 2005, on the restriction of use of certain epoxy derivatives in materials and articles intended to come into contact with foodstuffs;

- **Ceramics**: Directive 84/500/EEC of 15 October 1984, on the approximation of the laws of the Member States relating to ceramic articles intended to come into contact with foodstuffs (amended by Directive 2005/31/EC of 29 April 2005);
- **Regenerated cellulose film**: Directive 93/10/EEC of the Commission of 15 March 1993, relating to materials and articles made of regenerated cellulose film intended to come into contact with foodstuffs (amendment: Directive 2007/42/EC of 29 June 2007);
- **Rubber**: Directive 93/11/EEC of the Commission of 15 March 1993, concerning the release of the N-nitrosamines and N-nitrosatable substances from elastomer or rubber teats and soothers;
- **Active and intelligent materials and articles**: Regulation (EC) No. 450/2009 of 29 May 2009, on active and intelligent materials and articles intended to come into contact with foodstuffs.

The following diagram illustrates the European regulations applicable to tests on the migration of materials.

Diagram of European regulations applicable to tests on the migration of materials



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❑ Specific regulations for plastic materials

Regulation (EU) No. 1282/2011 of the Commission of 28 November 2011, amending and correcting Regulation (EU) No. 10/2011 on **plastic materials and articles** intended to come into contact with foodstuffs. It updates the positive list by modifying the restrictions and/or specifications concerning them and already established in the European Union. In particular, the SML of 2,4,6-triamino-1,3,5-triazine (melamine) drops to 2.5 mg/kg of food, taking into account the TDI established 0.2 mg/kg of body weight per day (EFSA recommendation of 13/104/2010) and exposure from other sources.

❑ Impact of packaging on the taste of food

The impact of the contact between food packaging and food products also has consequences for the taste of food. International standards on sensory analysis allow the evaluation of this impact.

Standard ISO 13302:2003 (Sensory analysis – Methods for assessing modifications to the flavour of foodstuffs due to packaging) describes the methods for evaluating changes in the sensory attributes of food products or their simulants caused by packaging.

The methodology may be used as an initial screening to assess a suitable packaging material or as a subsequent means of determining the acceptability of individual batches/the production cycle.

ISO 13302:2003 applies to all materials used for food product packaging (for example, paper, cardboard, plastic, foils and wood). In addition, the scope of application may be extended to all articles intended to come into contact with foodstuffs (e.g. cooking utensils, coatings, brochures or pieces of equipment, such as joints or piping) to control food compatibility from a sensorial point of view, in accordance with legislation in force.

4.2.3. Regulations on food packaging and packaging waste

As environmental concerns have grown, programmes to prevent and recover packaging waste have been set up in various European countries, governed by European Union regulations.

Directive 94/62/EC on packaging and packaging waste serves a two-fold objective:

- to encourage all Member States to make progress in terms of preventing and recovering packaging waste;
- to regulate and harmonise initiatives in order to avoid trade barriers and distortion of competition within the European Community.

Thus, this directive sets specific objectives for recovering and recycling packaging:

- **Recovery:** reuse, recycling or any other action aimed at obtaining recyclable materials or energy. This is to avoid useless waste. Two types of recovery are possible:
  - Material recovery, which reuses elements from waste and reintegrates them into the economy;
  - Energy recovery, which uses the calories contained in waste.
- **Recycling:** direct reintroduction of waste into the production cycle from which it came to replace a new raw material, thereby acting as a type of material recovery.

With regards to **prevention**, the directive defines the essential requirements that packaging must meet for placement on the market. In particular, these requirements include source reduction of the weight and volume of packaging to the necessary minimum and lowering the content of heavy metals and other hazardous substances.

Regarding **recovery**, which includes material recycling, organic recycling and energy recovery, the directive stipulates the objectives to achieve for all Member States.

Stemming from this regulation (referenced in the Annex and fully available for viewing on the website cited), here are some of the **waste recycling** requirements and measures gradually adopted by EU Member States until late 2008:

- between 55% minimum and 80% maximum by weight of the packaging waste will be recycled;

- the minimum following recycling aims for materials contained in packaging waste will be attained:
  - 60% by weight for glass;
  - 60% by weight for paper and board;
  - 50% by weight for metals;
  - 22.5% by weight for plastics, exclusively counting materials recycled into plastic form;
  - 15% by weight for wood.

In order to implement these measures, consumers are required to sort their waste in their households, while selective sorting and pickup provides support. Some countries undertake this sorting and pickup differently depending on their level of economic development and geographic conditions (mountains, difficult access, etc.).

Member States also encourage **energy recovery** when it is preferred to recycling for environmental reasons and has a favourable cost-benefit ratio. This could be done by leaving a sufficient gap between domestic recycling and recovery goals.

In addition and when appropriate, Member States shall encourage **the use of material from recycled packaging waste** to produce packaging and other products by improving market conditions for these materials and reviewing regulations in place that prevent their use.

This regulation has a clear impact on food **packaging and labelling** because the proper marking must be affixed either to the packaging itself or the label. It must be clearly visible and easy to read. The marking must have an appropriate life cycle, including when the packaging is open.

Il faut noter que les emballages et les déchets d'emballage ne sont **pas soumis au marquage CE.**

It should be noted that packaging and packaging waste are **not subject to CE marking**.

In addition to European regulations, each country may adapt and develop its own suitable domestic regulations.

In terms of recycling, manufacturers must take the following criteria into consideration:

- methods for measuring and verifying the presence of heavy metals and other hazardous substances in packaging and their release into the environment through packaging and packaging waste;
- criteria for a minimum content of packaging from recycled material for appropriate types of packaging materials;
- criteria for recycling methods;
- criteria for composting methods and the compost produced;
- criteria for the marking of packaging.

With regards to heavy metals, concentrations of lead, cadmium, mercury and hexavalent chromium present in packaging or packaging components must not exceed 100 ppm.

Annex II of the EU regulation lays down the following requirements for manufacturing packaging and their recycling characteristics:

1) Requirements specific to **the manufacturing and composition** of packaging:
   a) Packaging shall be manufactured that the packaging volume and weight is limited to the minimum adequate amount to maintain the necessary level of safety, hygiene and acceptance for the packed product and for the consumer.
   b) Packaging shall be designed, produced and commercialised in such a way as to permit its reuse or recovery, including recycling, and to minimise its impact on the environment when packaging waste or residues from packaging waste management operations are disposed of.
   c) Packaging shall be manufactured so that the presence of noxious and other hazardous substances and materials as constituents of the packaging material or of any of the packaging components is minimised with regards to their presence in emissions, ash or leachate when packaging or residues from management operations or packaging waste are incinerated or landfilled.
2) Requirements specific to the **reusable nature** of packaging:
   a) Its physical properties and characteristics shall enable a number of trips or rotations in normally predictable conditions of use.
   b) It is possible to process the used packaging in order to meet the health and safety requirements for the workforce.
   c) The requirements specific to recoverable packaging when the packaging is no longer reused and thus becomes waste are fulfilled.
3) Requirements specific to the **recoverable nature** of packaging:
   a) Packaging recoverable in the form of material recycling. Packaging must be manufactured in such a way as to enable the recycling of a certain percentage by weight of the materials used into the manufacture of marketable products, in compliance with current standards in the Community. The establishment of this percentage may vary, depending on the type of material of which the packaging is composed.
   b) Packaging recoverable in the form of energy recovery. Packaging waste processed for the purpose of energy recovery shall have a minimum inferior calorific value to allow optimisation of energy recovery.
   c) Packaging recoverable in the form of composting. Packaging waste processed for the purpose of composting shall be of such a biodegradable nature that it should not hinder the separate collection and the composting process or activity into which it is introduced.
   d) Biodegradable packaging. Biodegradable packaging waste shall be of such a nature that it is capable of undergoing physical, chemical, thermal or

biological decomposition such that most of the finished compost ultimately decomposes into carbon dioxide, biomass and water.

4.2.4. Signs to identify quality and origin

Consumers today increasingly demand healthy food with quality guarantees. Many brands and labels have emerged to bear proof.

For example, we can cite some labels developed in France:

- AOC: Appellation of Controlled Origin;
- *Label Rouge* ('Red Label');
- *AB* ('Organic Agriculture');
- *Montagne* ('Mountain');
- *Produits fermiers* ('Farm Products');
- *Produits pays* (for food and agricultural products completely produced in a French overseas department).

Labels have also been created in **Europe**, especially the PDO (Protected Designation of Origin), which will replace the French AOC. This label is proof that the product was created in a given location with recognised and certified expertise.

Other labels are currently being created in Europe:

- PGI (Protected Geographical Indication): this label means that at least one stage of the manufacturing process is performed in a specific territory. Examples include honey from Galicia and rice from Camargue;
- TSG (Traditional Speciality Guaranteed): this label emphasises a traditional method of production.

Penalties on labelling are governed by national regulations on consumer codes. Thus, a labelling defect or mislabeling may lead to criminal penalties for the endangerment of others or even manslaughter. For example, the technique of repackaging to mislead consumers about the expiration date is deception and could cause serious illness or death in vulnerable people.

4.3. Regulations on food labelling

Food labelling is the primary means of communication between the producer and the food vendor on one hand, and the between the purchaser and consumer on the other.

Since 1 January 2005, regulation has required EU countries to implement **procedures to label** or **identify products** marketed by the operator, producer or first importer into the EU to enable and facilitate traceability when they are placed on the market. Its main purpose is to enable a **procedure to withdraw and/or recall products in the event of a food crisis.** The quality of the traceability allows for targeted and accurate withdrawals, **limitations on the extent of recalls** and raising the seizure of batches not covered.

Several international and European standards lay down practices for identifying products.

4.3.1. International standards

❑ ***Codex Alimentarius* standards**

The standards and directives of the *Codex Alimentarius* on food labelling are **included in standards on the commercial quality of food.** Indeed, for each food, they specify **the indications that must appear when marking or labelling (Chapter 4)** products intended for consumption.

International regulations on labelling can be found in ***Codex Alimentarius* Codex STAN 1-1985: Labelling of foods**. This regulation details the indications required to appear on the label, such as the names of the categories of ingredients to use, identification for traceability, the date of durability, declaration of food additives and food processing aids, date marking and storage instructions.

The *Codex* standard's chapter on labelling includes the following criteria.

1. Emballages destinés au consommateur final

1.1. Nature of the food
Each package shall be labelled as to the name of the food and type (bitter) and may be labelled as to the name of the variety, if applicable.

1.2. Preparation instructions
For example, a statement indicating that cassava should be peeled and fully cooked before being consumed is required.

2. Non-retail containers

Each package must bear the following details in letters grouped on the same side, legibly and indelibly marked, and visible from the outside, or in the shipping documents.

2.1. Identification
Name and address of exporter, packer and/or dispatcher. Identification code (optional).

2.2. Nature of the food
Name of food and type (bitter) if the contents are not visible from the outside. Name of variety (optional).

2.3. Origin of the food
Country of origin and, optionally, district where grown or national, regional or local place name.

2.4. Commercial identification
Class
Size (size code or minimum and maximum diameter in centimetres)
Net weight (optional)
Number of units (optional)
Preparation instructions

2.5. Official inspection mark (optional)
There is also a **general Codex** standard for labelling of pre-packaged foods. This is **Codex STAN 1-1985 (Rev. 2-1999**), which applies to all **pre-packaged foods** available as such to consumers or intended for catering, as well as some aspects related to their presentation.

The declaration of ingredients present in food is compulsory when it is packaged hermetically before purchase. However, exceptions are provided for:

- aerated water;
- fresh and unprocessed fruit and vegetables;
- fermented butter, cheese, milk and cream;
- products consisting of a single ingredient whose name appears on the packaging;
- products whose packaging covers a surface of less than 10 cm^2.

Similarly, handmade products created by small businesses, such as pastries, meat or cheese packaged shortly before purchase, are exempt from this legislation.

❑ Date marking

With regards to date marking, an indication of the **date of minimum durability shall not be required** for:

- fresh fruit and vegetables, including potatoes which have not been peeled, cut or similarly treated;
- wines, liqueur wines, sparkling wines, aromatised wines, fruit wines and sparkling fruit wines;
- beverages containing 10% or more by volume of alcohol;
- bakery or pastry products which, given the nature of their content, are normally consumed within 24 hours of their manufacture;
- vinegar;

- food-grade salt;
- solid sugars;
- confectionery products consisting of flavoured and/or coloured sugars;
- chewing gum.

However, it is mandatory to declare content of the following **allergens**:

- cereals containing gluten; i.e., wheat, rye, barley, oats, spelt or their hybridised strains and products thereof;
- crustaceans and products thereof;
- eggs and egg products;
- fish and fish products;
- peanuts, soybeans and products thereof;
- milk and milk products (lactose included);
- tree nuts and nut products;
- sulphite in concentrations of 10 mg/kg or more.

Furthermore, **irradiated products** must carry a written statement to that effect. This statement may also be accompanied by the following symbol:

4.3.2. European regulations and standards

Food labelling is intended to ensure that consumers are **fully informed** about the content and composition of these products so they can protect their health and interests. Additional information can focus on a particular quality of a product, such as its origin or method of production. Some foods are also subject to specific regulations, such as genetically modified organisms, allergenic foods, foods for infants and various beverages.

Labelling of some non-food products must also contain specific information to ensure they are safe to use and so consumers can make real choices. Moreover, the packaging of food products must comply with manufacturing standards to prevent it from contaminating the products.

European legislation is mainly based on three texts:

- Directive 2000/13/EC of the European Parliament and of the Council of 20/03/2000 on the approximation of the laws of the Member States relating to the labelling, presentation and advertising of foodstuffs. It was amended by Directives 2001/101/EC (changing the definition of meat in Annex I of Directive 200/13) and 2003/89/EC (which concerns the indication of ingredients present in food).
- Regulation (EC) No. 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods.

- Regulation (EC) No. 1221/2008 of the Commission of 5 December 2008, amending Regulation (EC) No. 1580/2007 laying down implementing rules on Regulations (EC) No. 2200/96, (EC) No. 2201/96 and (EC) No. 1182/2007 of the Council in the fruit and vegetables sector as regards to marketing standards.

❑ **Directive 2000/13/EC, amended by Directives 2001/101/EC and 2003/89/EC**

This applies to **foodstuffs intended to be delivered as such to the final consumer or to restaurants, hospitals or other similar groups ('mass caterers')**. It does not apply to products intended for export outside the European Community.

It establishes a list of details that **absolutely must** appear on the label, two of which are only mandatory when necessary (instructions for use) or in case of confusion (designation of origin):

- the **name under which the product is sold,** which notifies consumers of the nature of the product. This is accompanied by an indication of the physical condition of the food (in the event of any possible confusion);
- the list of ingredients (barring exceptions) preceded by the word 'Ingredients'. These must be listed in descending order of weight. Ingredient means any substance, including additives, that is used in the manufacture or preparation of a food and is still present in the finished product, even if in a modified form;
- the net quantity;
- the date of minimum durability or, in the case of foodstuffs which, from the microbiological point of view, are highly perishable, the 'use by' date;
- any special storage conditions or conditions of use, such as, for example, 'store in refrigerator', 'store in a cool and dry place', etc.;
- the name or business name and address of the manufacturer or packager, or of a seller;
- the place of origin or provenance (in the event of any possible confusion);
- instructions for use (if necessary);
- with respect to beverages containing more than 1.2% by volume of alcohol, the actual alcoholic strength by volume.

Additives that belong to one of the categories listed below must be included in the list of ingredients by **the name of this category** followed by its **specific name** or its **EC number**. These may include colour, preservative, antioxidant, emulsifier, thickener, gelling agent, stabiliser, flavour enhancer, acid, acidity regulator, anti-caking agent, modified starch, sweetener, raising agent, anti-forming agent, glazing agent, emulsifying salts (for processed cheese), flour treatment agent, firming agent, humectant, bulking agent and propellant.

Directive 2003/89/EC deals with food allergens. The aim of this directive is to provide consumers with fuller information about the composition of products through more comprehensive labelling, particularly for those with food allergies or intolerances.

This directive amends the 25% rule by the 2% rule: with the exception of additives, listing compound ingredients constituting less than 2% of the finished product is not required.

This directive establishes a list of the 14 main food allergens (ALBA list), which must appear on labelling for food products:

- cereals containing **gluten** (wheat, rye, barley, oats, spelt, kamut or their hybridised strains) and products thereof;
- **crustaceans** and products thereof;
- **eggs** and products thereof;
- **fish** and products thereof;
- **soybeans** and products thereof;
- **milk** and products thereof (including lactose);
- **nuts:** almonds, hazelnuts, walnuts, cashews, pecan nuts, Brazil nuts, pistachio nuts, Macadamia nuts, Queensland nuts and products thereof;
- **celery** and products thereof;
- **mustard** and products thereof;
- **sesame** seed and products thereof;
- **sulphur dioxide and sulphites** at concentrations of more than 10 mg/kg or 10 mg/litre expressed as SO_2;
- **peanuts** and products thereof;
- **molluscs** and products thereof;
- **lupine.**

❑ **Regulation (EC) No. 1924/2006 of the European Parliament and of the Council of 20 December 2006**

This regulation **addresses nutrition and health claims** made on foods.

By **'nutrition claim'**, the regulation means any claim that states, suggests or implies that a food has particular beneficial nutritional properties due to:

a) the energy (caloric value) that it:
   i) provides;
   ii) provides at a reduced or increased rate;
   iii) does not provide and/or;
b) the nutrients or other substances that it:
   i) contains;
   ii) contains in reduced or increased proportions, or;
   iii) does not contain.

A **'health claim'** is defined as any claim that states, suggests or implies that a relationship exists between a food or one of its constituents and health.

This regulation sets the legal framework and criteria authorising such claims on the packaging of foodstuffs intended for human consumption. The annex of the regulation lists the nutrition claims permitted. For example, the statements 'high fibre' or 'with no added sugar' constitute nutrition claims. However, the statement 'Omega 3 reduces cardiovascular risks' is a health claim.

It is helpful to distinguish:

- health claims related to reducing the risk of disease and to child development and health;
- health claims other than those referring to reducing the risk of disease and to child development and health, also called general function health claims.

Health claims related to reducing the risk of disease and to child development and health are subject to mandatory pre-control. Requests for permission to use a claim shall be investigated by the European Food Safety Authority (EFSA) upon referral by the competent national authority. EFSA examines requests and issues opinions from which the Commission develops a positive list of health claims related to reducing the risk of disease and child development and health[2].

However, **general function health claims** may be applied without prior control *"if they are based on generally accepted scientific data and are well understood by the average consumer".*

A list of these claims[3] has also been established by EFSA, but it follows a simplified procedure (the Member States send the Commission suggestions for the list and the Commission consults with EFSA, which then gives its opinion).

❑ Regulation (EC) No. 1221/2008 of the European Parliament and of the Council of 20 December 2006

This regulation relates to the quality and marketing standards for fresh fruit and vegetables in the EU. It reduces the number of specific marketing standards from 36 to 10 (apples, citrus fruit, kiwifruit, peaches/nectarines, pears, strawberries, sweet peppers, table grapes, tomatoes, lettuces/curled-leaved and broad-leaved endives). For all other fruits and vegetables, a general marketing standard is compulsory (see Annex I of Regulation (EC) No. 1580/2007)[4]. This standard establishes that fruit and vegetables intended to be sold fresh to consumers may be marketed if they are of sound, fair and marketable quality, and if the full name of the country of origin is indicated (in a language understandable to the consumers of the destination country).

❑ Other applicable regulations

In addition to these three flagship European laws on labelling and packaging, over the course of the last decade the European Union has endorsed various standards aimed at ensuring the traceability of other products involved in the food chain. *In fine*, these standards are intended to provide a high level of protection for human health:

- **Regulation (EC) No. 1830/2003** of the European Parliament and of the Council concerning the traceability and labelling of genetically modified

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2 To learn about this control procedure in detail, see Articles 15 to 19 of Regulation (EC) No. 1924/2006, eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1924:EN:HTML.

3 www.efsa.europa.eu/en/press/news/110728.htm.

4 eur-lex.europa.eu/legal-content/EN/TXT/?qid=1402299529023&uri=CELEX:32007R1580.

organisms and the traceability of food and feed products produced from genetically modified organisms. This regulation amends Directive 2001/18/EC;

- **Regulation (EC) No. 1935/2004** of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC;
- **Regulation (EC) No. 907/2004** of the Commission, amending the marketing standards applicable for fresh fruit and vegetables with regards to presentation and labelling.

❑ **Special regulations**

➢ ***Cocoa and chocolate***

The European Union defines a certain number of common rules for cocoa and chocolate products intended for human consumption. These rules are stipulated by Directive 2000/36/EC[5] of the European Parliament and of the Council of 23 June 2000, which repeals Directive 73/241, thus putting an end to the 27-year "chocolate war"[6].

Directive 2000/36/EC applies to cocoa and chocolate products intended for human consumption that are specified in Annex I. It stipulates common rules for their **composition**, the **name under which they are sold, their labelling** and **presentation** and establishes definitions for these products in order to give consumers informed choices. This directive applies without prejudice to the general provisions related to food labelling.

The directive settles the composition of cocoa and chocolate products. For certain products in particular, it determines the minimum percentage of cocoa butter as well as the possibility of using an amount of vegetable fat other than cocoa butter, not exceeding 5% of the finished product.

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5 eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0036.

6 The 'chocolate war' grew out of a disagreement amongst EU Member States which, at the time, could not settle on the composition of 'chocolate'. Some countries accepted that chocolate could include vegetable fats other than cocoa butter, others refused this possibility. In the absence of an agreement, the 1973 Directive national standards on this matter remained in force. See www.eurogersinfo.com/actu5.htm (in French).

The vegetable fats that may be used (other than cocoa butter) are listed in Annex II of the directive: palm oil, karité (shea butter), coconut oil, etc.

The directive requires a legible statement regarding the presence of vegetable fat on product packaging to attract consumer attention. Consumers must also be notified through labelling solely reserved for a certain number of names of products that comply with the directive (see Annex I of the directive):

- cocoa butter;
- cocoa powder, cocoa;
- fat-reduced cocoa powder, fat-reduced cocoa;
- powdered chocolate;
- powdered drinking chocolate, sweetened cocoa, sweetened cocoa powder (possibly supplemented by the term 'fat-reduced');
- chocolate (possibly supplemented by the terms 'vermicelli', or 'flakes', 'couverture' and 'gianduja');
- milk, cream or skimmed milk chocolate (possibly supplemented by the terms 'vermicelli', or 'flakes', 'couverture' and 'gianduja');
- family milk chocolate;
- white chocolate;
- filled chocolate;
- *chocolate a la taza;*
- *chocolate familiar a la taza;*
- chocolates or pralines.

In exceptional cases, these names can be used for other products that cannot be mistaken in the country of sale for those covered by the directive.

Labelling of cocoa and chocolate may include **other statements**. For example, the labelling of chocolate products containing vegetable fats other than cocoa butter must include the statement 'contains vegetable fats in addition to cocoa butter' in the same field of vision as the list of ingredients, but clearly separated. Labels for chocolate powder, sweetened cocoa, chocolate, milk chocolate, family milk chocolate, *chocolate a la taza* and *chocolate familiar a la taza* must indicate the total dry matter content of cocoa. Furthermore, cocoa and powdered, thin or fat-reduced chocolate must indicate the amount of cocoa butter.

➢ ***GMOs***

The European Union (EU) guarantees the traceability and labelling of genetically modified organisms (GMOs) and products derived from these organisms throughout the food chain.[7]

The traceability of GMOs helps us to control and verify the information appearing on labels, monitor environmental effects and remove products

[7] See Regulation (EC) No. 1830/2003 of the European Parliament and of the Council, of 22 September 2003, concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms and amending Directive 2001/18/EC.

from the shelves when new scientific information might demonstrate that the GMOs used in the product are hazardous for health or the environment.

All products intended for human or animal consumption, including those directly intended for processing, are subject to a **labelling requirement** when they consist of, contain or are produced from GMOs. Only traces of GMOs may be exempted from this requirement if they do not exceed a **threshold of 0.9%** and their presence is technically unavoidable and unintentional.

The products covered include food, ingredients and animal feed provided as they are to final consumers or groups, whether pre-packaged or not, at all stages of their placement on the market.

This information must appear in the following wording:

- 'Genetically modified' or 'contains genetically modified [name of organism]' when the product contains or consists of GMOs (e.g. sweet corn);
- 'Produced from genetically modified [name of organism]' or 'contains [name of ingredient] produced from genetically modified [name of organism]' when the product contains GMO by-products (e.g. corn flour).

In food composed of multiple ingredients including corn flour and soy lecithin, information regarding the presence of GMOs or GMO by-products must be provided for all ingredients concerned. It is necessary to clarify when a product contains "wheat produced from genetically modified corn' and 'lecithin produced from genetically modified soy".

These statements must appear either in the list of ingredients or below it. They must appear in an identical font.

If there is no ingredient list, the statements given above must clearly appear on the label. The use of category names established in Directive 2000/13/EC is still applicable as long as information related to the transgenic nature of the ingredient is provided on the label, including compound ingredients constituting less than 2% of the finished product.

According to the Commission, this means that an **organic product** might not be created intentionally with GMOs, but could still contain traces of up to 0.9% (from contamination in the field, for example). The same is true for organic animal feed.

As such, products coming from the organic farming sector cannot be described as 'GMO-free' solely because of their mode of production. Therefore, operators wishing to claim the absence of GMOs must ensure that their products from the organic sector do not actually contain GMOs at the detection threshold in accordance with the requirements for the use of negative claims stated in the French government's Information Note No. 2004-113 of 16 August 2004.

In the latter case, operators must be able to demonstrate that they have taken the measures necessary to avoid using GMOs or their by-products. These provisions

should not be construed as requiring operators that have implemented the necessary measures to label any presence lower than 0.9%, demonstrated through self-assessment by their suppliers or by themselves.

Member States shall ensure the implementation of measures to control and inspect products, including sampling inspection and quantitative and qualitative analysis of food. These measures mean that Member States may withdraw a product from the market that does not meet the conditions of this regulation.

➢ ***Identification and labelling of beef***

After the 'mad cow disease' (bovine spongiform encephalopathy) crisis, the European Union adopted new provisions on identifying bovine animals (cattle) and labelling meat. The new provisions enhance traceability and food safety throughout the supply chain, thereby boosting trust amongst European consumers and creating more favourable conditions for raising cattle intended for meat production.

Regulation (EC) No. 1760/2000 of the European Parliament and of the Council of 17 July 2000 establishes a system for the identification and registration of bovine animals and concerns labelling of beef and beef products (repealing Council Regulation (EC) No. 820/97 of the Council amended by Regulation (EC) No. 1791/2006).

The regulation stipulates:

- a system for the identification and registration of cattle (Title I);
- a compulsory beef labelling system (Title II, Section I) and a voluntary beef labelling system (Title II, Section II).

4.3.3. Identification and registration of cattle

Each Member State must establish a system for identifying and registering cattle. This system must include the following elements:

- ear tags to identify each animal individually;
- computerized databases;
- passports for animals;
- individual registers kept at each holding.

❑ **Ear tag**

➢ ***Cattle coming from European Union***

All animals on a holding born after 31 December 1997 or intended after this date for intra-European exchanges are identified by a label affixed to each ear within 20 days of their birth and in any case before leaving the farm where they were born. Both ear tags bear

the same unique identification code used to identify each animal individually and the farm where it was born. In the case of cattle used for cultural or sporting events, the ear tags may be substituted with an identification system offering equivalent guarantees and authorised by the Commission.

➢ ***Cattel coming from third countries***

All imported cattle that have passed through the veterinary controls established by Directive 91/496/EEC must be identified by an ear tag affixed within 20 days after the veterinary controls and always before they leave the farm. This obligation is not applicable when the destination holding is a slaughterhouse located in the State where the controls are conducted or when the animal is slaughtered within 20 days of undergoing the controls.

➢ ***Provisions concerning all cattle***

Every animal coming from another Member State retains its original ear tag. No ear tag may be removed or replaced without the permission of the competent national authority. The European Parliament and the Council must decide on the possibility of using electronic identification arrangements by 31 December 2001.

❑ **Computerized databases**

In accordance with Directive 64/432/EEC on animal health problems affecting intra-Community trade in bovine and swine within the EU, since 31 December 1999 Member States have operated a computerised database that records cattle identities, the holdings of their territory and cattle movements.

❑ **Individual passport**

➢ ***Issue of the passport***

Since 1 January 1998, the competent national authority has issued a passport for all cattle within 14 days of notification of their birth or, in the case of imported cattle, within 14 days of notification of their re-identification by the Member State concerned.

The authority may also issue a passport for animals from other Member States. In this case, the passport accompanying the animal must be surrendered to the Member State that issued it.

➢ ***Holding and surrender of the passport***

The passport accompanies the animal throughout all movements. It is returned to the competent authority:

- upon the death of the animal. The passport is surrendered by the keeper no later than seven days after the animal's death, or by the slaughterhouse operator if the animal was sent to slaughter;
- when the animal is exported to a third country. The passport is surrendered by the last keeper to the competent authority in the place where the animal is exported.

➢ ***Exceptions***

Member States with a computerised database may decide not to issue passports to cattle that are to remain in their country. Animals are accompanied by a passport only when they are being moved to another Member State.

❑ **Individual holding register**

All animal keepers, with the exception of hauliers, must maintain a computerised or manual register of animals at the holding.

Information on the origin, identification and destination of the animals is available upon request to the competent authority for a period of at least three years.

The Commission may establish special rules applicable to cattle movements in mountain areas.

❑ **Comitology**

By means of the management procedure, the European Commission, assisted by the Committee for the European Agricultural Guidance and Guarantee Fund, draws up the arrangements for implementing the cattle identification and registration system (e.g. ear markings, passport, register, controls, penalties, transitional provisions, etc.).

4.3.4. Labelling of beef and derived products

❑ **Compulsory labelling system**

Operators or organisations that market European or imported beef are required to label meat at all stages of the marketing process. When the product is not pre-packaged, they must provide consumers with the relevant information visibly and in written form at the point of sale.

The labelling must bear the following information:

- a reference number or code ensuring the link between the meat and the animal (or group of animals) from which the meat comes;
- 'slaughtered in' (country of slaughter and approval number of the slaughterhouse;
- 'cutting in' (country of cutting and approval number of the cutting hall).

Moreover, since 1 January 2002, operators must also indicate:

- the country where the animals were born;
- the country where the animals were fattened/bred;
- the country where the animals were slaughtered.

When the beef comes from an animal born, fattened/bred and slaughtered in the same country, this information may be grouped under the 'Origin' heading followed by the name of the country in question.

By way of derogation, imported meat for which not all compulsory information is available must be labelled with the words 'Origin: non-EC' followed by the name of the third country in which it was slaughtered.

The labelling of **minced meat** must include:

- a reference number or code ensuring the link between the meat and the animal (or group of animals) from which the meat comes;
- the indication "Produced in" (followed by the name of the country of production) and the indication 'Origin' when the State or States concerned are not the same as the country of production;
- the country of slaughter.

Operators may supplement the above with information on the place (establishment) of slaughter, the place of cutting (establishment and country), the date of mincing, the country of birth and the country or countries of breeding.

❑ Voluntary labelling system

Operators or organisations marketing beef may wish to include information beyond what is required in their labelling. To do so, they must apply specifically for authorisation from the competent authority of the Member State in which the beef in question is produced or sold. The application must include:

- the information to be displayed on the label;
- the measures to be taken to guarantee that the information is accurate;
- the controls applicable at all points of production and sale, including those to be carried out by independent bodies recognised by the competent authority;
- the penalties to be applied, in the case of organisations, to members who fail to comply with the specifications.

Applications that do not prove a link between identification of the product and the animal or that propose labels containing misleading or insufficiently clear information will be declined.

The European Commission, assisted by a Management Committee, will lay down the period after which an application that has been neither authorised nor rejected by the competent authority will be considered to have been approved. It may also establish an accelerated approval procedure for certain types of meat.

In the case of voluntary labelling of imported beef, the application must be authorised in advance by the competent authority in the third country where the meat is produced. This country subsequently notifies the Commission of the authority responsible for authorisation, the criteria and procedures followed in examining the application and the list of operators involved. However, approval will be valid within the Community only if the criteria applied by the third country are judged to be equivalent to those laid down in Community regulations.

Member States notify the Commission of the voluntary labels they authorise so that it may inform the other Member States through the Management Committee for Beef and Veal.

Where an operator or organisation fails to comply with the application, the Member State may withdraw authorisation or impose additional conditions.

❑ **Provisions relating to both labelling systems**

By means of the management procedure, the European Commission, assisted by the Management Committee for Beef and Veal, draws up the implementing arrangements for beef labelling (e.g. definition of minced beef, definition of specific information which may be shown on labels, transitional measures, etc.).

4.3.5. Enforcement and control of the identification, registration and labelling systems

Experts from the Commission, in conjunction with the competent authorities, carry out on-the-spot inspections to ensure that the controls are conducted in compliance with regulations. The findings of the inspections are discussed with the competent authority and set out in a report. On the basis of this report, the Commission may decide to review the situation within the Standing Veterinary Committee and to adopt the necessary decisions in accordance with the regulations procedure.

❑ **New regulations on consumer information**

The **draft Regulation on food information for consumers** was adopted by the European Parliament on 6 July 2011.

This new regulation aims to **optimise consumer information** through a simple, legible and understandable labelling system that is not misleading. It supplements current legislation based on Directives 2000/13 **(see Annex V)** on the labelling and presentation of foodstuffs, and 90/146 **(see Annex VI)** on nutrition labelling.

Thus, the text specifies the information to be displayed on labels of pre-packaged foods, including the list of ingredients, the words 'use by' and the specific conditions of use. Specifically:

- the energy value and quantity of fats, saturated fatty acids, carbohydrates, sugars, proteins and salt must appear in the same field of vision and at least be expressed per 100 g or 100 ml;
- the presence of allergens must be reported separately in the product's list of ingredients;
- all required information must appear in a minimal font size set at 1.2 mm and 0.9 mm when the packaging does not exceed 80 cm^2;
- a product's indication of origin shall be limited to fresh meat and to cases where its omission could mislead the consumer. It may be extended voluntarily to other goods, provided that it does not encroach on the space reserved for required information.

Finally, the text instructs the European Commission to **conduct impact studies** on the most controversial issues.

Information about trans fatty acids, the indication of origin of food other than fresh meat, information about conditions of slaughter, alcoholic beverages and alcopops (flavoured alcoholic drinks) are not yet regulated, but they could become so at a later time, according to the results of studies conducted by the Commission.

These new provisions, which have yet to be formally endorsed by the Council, **enter into force in 2014**. Rules concerning the nutrition statement will undergo a transitional period of two additional years, five years in total, to allow food sector businesses to adapt.

4.3.6. Requirements for transport and distribution

Regulation (EC) No. 852/2004 of the European Parliament and of the Council of 29 April 2004, which forms part of the "Food Safety Package" (European standards laying down the requirements for food safety), establishes the general principles regarding food **transport and distribution**.

It is important to remember that operators must apply food laws at every step of the food chain and particularly during transport and distribution.

The requirements of this regulation are as follows:

1. Vehicle storage compartments and/or containers used for transporting food must be clean and in good condition in order to protect the food from any contamination. They must be designed to be conveniently cleaned and/or disinfected, if necessary.
2. Vehicle storage compartments and/or containers must be reserved for transporting food if they are likely to be contaminated by cargo of another nature.
3. When vehicle storage compartments and/or containers are used to transport other products in addition to food or to transport different food products at the same time, the products must be separated effectively.
4. Bulk foodstuffs in liquid, granular or powder form must be transported in storage compartments and or containers/tankers reserved for food transport. Such containers must be marked clearly, visibly and indelibly regarding their use for carrying food or with the words 'For food only' in one or more languages of the European Community.
5. When vehicle storage compartments and/or containers are used to transport products other than food or to transport different foodstuffs, they must be cleaned effectively between loads to prevent the risk of contamination.
6. Food loaded into vehicle storage compartments and/or containers must be placed and protected in order to lower the risk of contamination to the utmost.
7. If necessary, vehicle storage compartments and/or containers used to transport foodstuffs must be capable of maintaining food at the appropriate temperatures and permit the control of these temperatures.

Therefore, the rules for identifying packaging during transport are clear. This technical handbook does not cover requirements for the temperature chain, but they are mentioned in the references.

Most used abbreviations and acronyms

Most used abbreviations and acronyms

AB	*Agriculture biologique* (Organic agriculture)
ABS	Acrylonitrile butadiene styrene
ACP	African, Caribbean and Pacific Group of States
AI	Application Identifier
Al	Aluminum
AOC	*Appellation d'origine contrôlée*
AOC	*Appellation d'origine protégée*
BBD	Best Before Date
BRC	British Retail Consortium
CB	Certification body
CETIM	*Centre technique des industries mécaniques* (Technical Center for the Mechanical Industries)
CIP	Presentation Identifier Code
CREDOC	*Centre de recherche pour l'étude et l'observation des conditions de vie* (Research Center for the Study and Observation of Living Conditions)
DT_{50}	Half-Life (e.g. time for the concentration of an active ingredient in the soil to be reduced by 50%) or $T_{1/2}$

EAN	European Article Number
EDI	Electronic exchange
EEC	European Economic Community
EFSA	European Food Safety Authority
EPC	Electronic Product Code
EU	European Union
EVA	Ethylene-vinyl acetate
FAO	Food and Agriculture Organization
Fe	Chemical symbol for iron
FLO	Fairtrade Labelling Organizations International
FOR	Wood, cork
FSMS	Food Safety Management Systems
GAP	Good Agricultural Practice
GCI	Global Commerce Initiative
GFSI	Global Food Safety Initiative
GGN	Global Gap Number

GL	Glass
GLN	Global Location Number
GLP	Good Laboratory Practice
GMO	Genetically modified organisms
GPP	Good Phytosanitary Practices
GSMP	Global Standard Maintenance Process
GTIN	Global Trade Item Number
HACCP	Hazard Analytical Critical Control Point
HDPE	High-density polyethylene
ID	Identifier login
IS	Information system
ISO	International Standard Organization
LD_{50}	Lethal Dose 50 (in mg/kg bw)
LPDE	Low-density polyethylene
NOAEL	No Observable Effect Level or NOEL (No Effect Level)
OJEC	*Official Journal of the European Community*

OJEU	*Official Journal of the European Union*
PA	Polyamides
PAP	Paper, board
PD	Production Date
PDCA	Plan, Do, Check, Act
PE	Polyethylene
PET	Polyethylene terephtalate
PGI	Protected Geographical Indication
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl chloride
QRC	Quick Response Code
RASFF	Rapid Alert System for Feed and Food
RFID	Radio Frequency Identification
SGTIN	GTIN with a serial number for identifying an object
SO_2	Sulfur dioxide

SSCC	Serial Shipping Container Code
TDI	Tolerable Daily Intake
TEX	Textiles (cotton, jute…)
TSG	Traditional Specialty Guaranteed
TTH	Time to harvest
UCC	Uniform Code Council
UNO	United Nations Organization
WHO	World Health Organization
WTO	World Trade Organization

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Useful Websites

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Actualité européenne: www.eurogersinfo.com

ADEME (Agency for the Environment and Energy Management, France): www.ademe.fr

ANSES (National Agency for Food Safety, Environment and Labor, France) : www.anses.fr

AZAQUAR (Food Science and Technology): www.azaquar.com

BRC : www.brc.org.uk

CNIL (National Commission on Informatics and Civil Liberties): www.cnil.fr

Codex Alimentarius: www.fao.org/fao-who-codexalimentarius/codex-home/en

COLEACP: www.coleacp.org

CTA: www.cta.int

EFSA: www.efsa.europa.eu

EUR-LEX (Website of European Union law): eur-lex.europa.eu/homepage.html?locale=en

Fair Trade: www.fairtrade.net

FAO: www.fao.org/home/en

FASFC: www.afsca.be/home-en

Food Trace: thefoodtrace.com

Freshfel Europe: www.freshfel.org

GFSI: www.mygfsi.com

GLOGALG.A.P: www.globalgap.org

GS1-France: www.gs1.fr

TRACEHABIL: www.tracehabil.com

European Union: europa.eu

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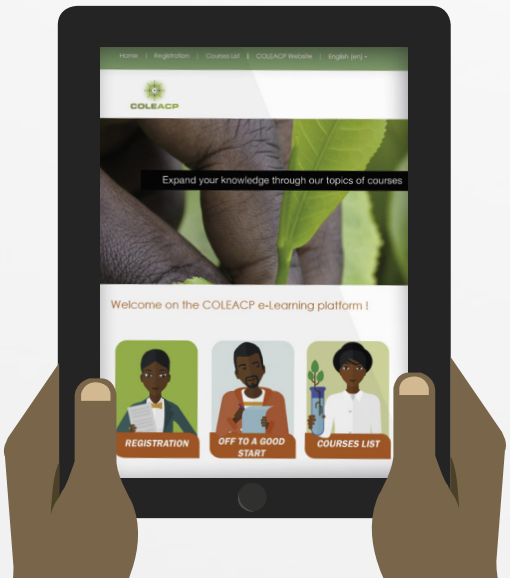

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