

## Traceability and food safety

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### Introduction

Food safety has been the topic of some recent policy changes and increased awareness among the public. These developments indicate that there is a need for a system that can identify hazards in food sufficiently early so that these can be tackled in time, before developing into real risks. Traceability is one of the management tools which can be developed and used to mitigate and prevent food safety hazards in a major way. There is an increasing demand for detailed information on the nature and origin of food products. Thus traceability is becoming a legal and commercial necessity.

There are several definitions for traceability. European Union (EU) defines traceability as the 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 (Regulation EC No. 178/2002). ISO definition of traceability (ISO/DIS 12875) concerns the ability to trace the history, and for products this can include the origin of materials and parts, the processing history and the distribution and location of the product after delivery. Traceability includes not only the principal requirement to be able to physically trace the products through distribution chain, from origin to destination and vice versa, but also to be able to provide information on what they are made of and what has happened to them.

USFDA defines traceability as the efficient and rapid tracking of physical product and traits from and to critical points of origin or destination in the food chain necessary to achieve specific food safety and, or, assurance goals. Additionally, labeling and traceability of genetically modified food (GMF) are important issues that are considered in trade and regulation, particularly by EU legislation (Regulation EC No. 1829 & 1839/2003). HACCP and Track & Trace (traceability) are closely connected aspects of Food Safety. While HACCP is usually seen as an internal matter in food companies, traceability - especially whole chain traceability - obviously spans the whole flow of the food supply chain and its components from "farm to fork".

HACCP aims at preventing food from doing harm to consumers and assuring that it lives up to a consistent level of quality. Traceability aims at identifying and containing the damage, once food safety has been breached. However, in a more positive sense, traceability across the food chain can also play an important role in certifying the authenticity of a product and thus reduce the risk of counterfeiting and old meat being relabeled with new sell-by dates. Traceability is of absolute importance in proving any credence to claims for organic origin, etc. The same is the case with ISO 22005:2007, where it is mandatory for every food chain to develop and implement procedure for traceability as per Codex Alimentarius system. The system requires that any food producing industry should :

- Sets out the “general principles and basic requirements for system design and implementation” of traceability system
- Uses Codex definition of traceability
- Requires food/feed business to:
  - Set food safety, quality & other objectives
  - Design a system that meets regulatory & customer requirements
  - Specify the information to be obtained from its suppliers, collected within itself & provided to its customers
  - Establish procedures, documentation, etc
  - Implement the system (training, etc)
  - Monitor the system
  - Review it regularly & Update

The main objective of a traceability system is to record the history of a product. It has to take in account the history and safety of the raw materials used in the production and follows the process through the distribution to the consumer. Therefore, traceability system basically benefits to both producer and consumer. Traceability system enables fewer products to be recalled and brings important cost savings where the aim is to provide consumers with the high quality and safety products which are produced in a cost efficient way . Furthermore, benefits of an efficient traceability system provide feedback on product quality to the supply chain and improve consumer confidence. Currently, traceability systems can be incorporated into information systems where consumers can get information on any product such as via electronic data interchange/EDI.

The implementation of traceability has generated a significant amount of interest as there is no single system accepted globally. Therefore, it is important to distinguish between legal requirements and technologies required for providing a track and trace capability. The traceability system should enable efficient food safety management, but it is the responsibility of individual companies and supply chains to voluntarily take advantage of the capabilities it provides.

Basically any food traceability system should address the following criteria:

- What do products/ingredients/components consist of?
- Where did they come from?
- Where did they go?

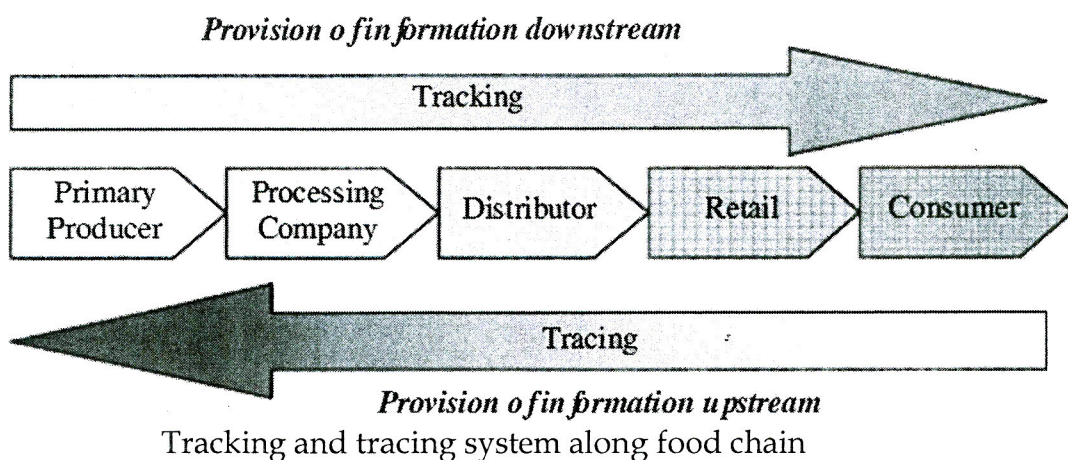
- ☐☐Traceability of risks and actions based on HACCP principles:
- What risks and processing were the products/ingredients/components subjected to?
- Did general conditions live up to the requirements during processing?
- Could different products have affected (contaminated) each other?
- Were there any deviations from established procedures?
- What actions were taken to remedy every problem reported and discovered?
- What actions were taken to limit damage?
- What actions were taken to avoid future problems?

To deal with food safety in an optimum way, both aspects of traceability are essential and should be combined. Product traceability alone cannot identify a cause of a food incident, but it can help find out where to look, because it shows where components and ingredients came from. Traceability of risks will be able to identify the cause precisely and at the same time reveal whether other lots have been contaminated. And then, in turn, product traceability can locate these batches.

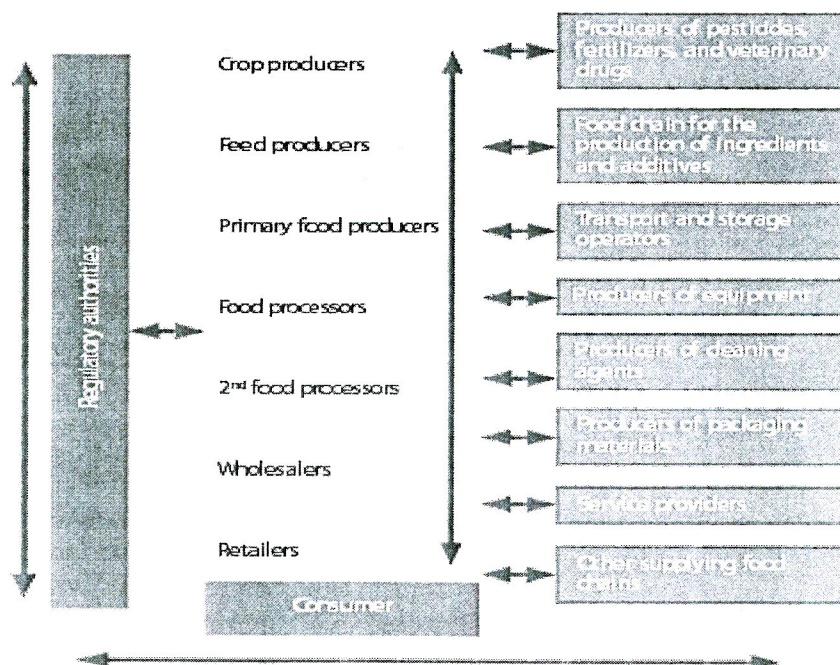
### **The implementation of food traceability**

The EU's General Food Law entered into force in 2002 and makes traceability compulsory for all food and feed businesses. It requires that all food and feed operators implement special traceability systems. They must be able to identify where their products have come from and where they are going and to rapidly provide this information to the competent authorities. It is mandatory that all food and feed business operators to establish traceability systems, even when their customers do not require it. Traceability is also mandatory for beef in Japan, while exported beef in Australia, Argentina and Brazil is obliged to be traceable. Conversely, up to date traceability is voluntary in the U.S. In order to be able to trace products and retrieve related information, producers have to provide information and keep track of products during all stages of production, including primary production, processing, distribution, retailing, and consumer. Furthermore, traceability requires a verifiable method to identify growers, fields and produce in all its packaging and transport/storage activities at all stages of the supply chain.

Basically, there are two important aspects regarding the implementation of traceability, which are tracking and tracing system. Product tracking is the capability to follow the path of a specified unit of a product through the supply chain, whereas product tracing is the capability to identify the origin of a particular unit and/or batch of product located within the supply chain by reference to records held upstream in the supply chain. The implementation and maintenance of the traceability regulations require an effective and efficient system to track and trace back the products. Consequently, methodologies for the analyses of the food materials combined with information technology systems are essential to establish a working tracking and tracing system .



By the new EU regulation of traceability, the food processor is obliged to ensure that the food products meet the requirements of food law in which previously it was sufficient for a processor to be able to identify the source of an ingredient. This implies that the source of all materials involved can be traced and a processor must therefore be able to prove that his suppliers can provide full traceability. If any problem is suspected, tracking must go as far as the consumer. Traceability covers everything that happens to the products before, during and after the manufacturing, packaging, and distribution.



## Tracking application for traceability

A product traceability system requires the identification of all the physical properties from which the product originates, including the location where it is originated, processed, packaged, and stocked. In order to keep track of items within a food supply chain it is crucial to identify items in each step of the chain. This application is done by data loggers as mark or tag that follows the item and can be read further down the supply chain. Data loggers / carriers carry an identifier which is a character based or alphanumeric code. There are 2 types of information are comprised within data carrier, i.e. primary and secondary information regarding the identification. Primary identification is used to determine the identification of a unit, by recognizing a set of features that can be considered characteristically unique for the concerned unit. The identification method can be DNA or other molecular based analytical methods. Secondary identification is an identifier to a unit, in a form that can be attached to a unit through or partly through the supply chain. The identifier can be thought of as a code, often as a number or an alpha-numeric string.

GS1 (formerly EAN/UCC) is universally accepted as an identification and communication system. The system consists of three components: (1) Identification numbers; used to identify a product (Global Trade Item Number-GTIN), location (Global Location Number-GLN), logistic unit (Serial Shipping Container Number-SSCC), service or asset (Global Returnable Asset Identifier-GRAI); (2) Data carriers; the barcodes or radio frequency tags used to represent these numbers. The data carriers vary according to the level of information required or the space available; and (3) Electronic messages; the means of connecting the physical flow of goods with the electronic flow of information. These technologies have been used in meat traceability, providing a robust tracking system for most elements of the meat chain.

## Considerations on implementing traceability system

An efficient and effective system of traceability can significantly reduce operating costs as well as increase productivity. At the same time, such a system provides product safety elements and thus makes consumers safer. In order to establish product traceability system, particularly on food traceability system, there are 4 fundamental concepts must be taken in account. Accordingly, those aspects are product identification, data to trace, product routing, and traceability tools. The implementation of traceability system, thereby, should consider to the concerned product properties.

In practice, different technical approaches can be used for tracking system. The data accuracy and reliability required can guide the selection of the traceability tool. Accordingly, cost is a relevant factor and so must also be taken into account. Final choice must consider the degree of compatibility with the product and the production process, the degree of automation supported by the supply chain analyzed, and in general knowledge along the supply-production chain. Traceability system has to describe extensively to which the origin of all the raw materials used and the distribution of the finished products can be defined precisely and thereby could be identified unambiguously. Additionally, traceability system has to be able to identify which hazards are focused in the system as well as the specific time of the tracking-tracing practices (online, hours, days or weeks). Therefore,

accuracy, speed, completeness, reliability, validation and verification of the systems are important considerations in implementing traceability system

Bar codes are currently widespread used in tracking system as they offer several significant advantages. With an integrated system, the process of entering information into retailers' systems is automated so when new information is logged into the system by the producer, it is added in real time to all systems across a network. With such systems, anyone along the chain can track inputs, production, and inventory by an array of characteristics. However, RFID technology is known as the promising technology due to the higher accuracy and efficiency in identifying items compared to barcodes. By the time of reducing cost of production, RFID technology will be eventually replacing bar codes technology.

## 6. Conclusion

With increasing emphasis on traceability, exporting countries must earn consumer confidence in its products in order to enter the market. Lack of public confidence in the product of any country will lead to exclusion of that country from the international market and, at the same time, the country's own internal market may experience demand from affluent consumers as well as the tourist industry for food imported from countries that generate public confidence and consumer trust. Therefore, it is essential that each country "brand" itself as a trustworthy, safe producer and supplier that meets ethical and environmental concerns with focus on sustainability. The benefits of traceability system on food production and distribution will be achieved only if implemented comprehensively within all steps of food supply chain. As a whole we should understand that accuracy, speed, completeness, reliability, validation and verification of the systems are important considerations in implementing traceability system

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