



# Traceability as a strategic tool to improve inventory management: A case study in the food industry

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## ABSTRACT

Our aim in this research is to show that traceability can become much more than just a way to guarantee food safety. To illustrate this idea, we have developed a longitudinal case study of one firm in the Spanish vegetable industry. We show the reasons why this firm decided to implement a computerised traceability system, and we describe how the use of its traceability system has provided them with many qualitative and quantitative advantages along the different stages of their supply chain, their manufacturing operations and their inventory and logistics activities.

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## 1. Introduction

Traceability is defined by the American Production and Inventory Control Society (APICS) as “the registering and tracking of parts, processes, and materials used in production, by lot or serial number”. This definition is quite broad, although in the food industry is a concept that has been basically related to as a mechanism to assure food safety. In fact, in the ISO 9000/BS 5750 traceability is defined as a quality procedure referred to as the ability to retrace steps and verify that certain events have taken place. Traceability is nowadays a requisite in the food industry. In fact, as of January 2005, the European Union requires that all food firms must trace their products, in all stages, beginning with suppliers until the arrival of the end products to the final consumers.

Our aim in this paper is to show that traceability may become much more than just a mechanism to assure food safety. In order to do this, we have developed a longitudinal case study of one firm in the vegetable industry. We have analysed the impact of their computerised traceability system on inventory management, and on

the rest of the organisation. We have found among other outcomes that the firm has improved the management of their inventories through a better use of warehousing space; reduced handling costs; decreased inventory level; and minimised errors related to the whole production and logistics processes.

This paper consists of six more sections: first, a review of literature related to traceability (Section 2); then, we describe the firm (Section 3), and then the methodology (Section 4) we have used; in Section 5, we study the reasons why and the way in which the firm implemented their computerised traceability system; then, in Section 6, we show the qualitative and quantitative benefits obtained; and finally, we summarise conclusions and present some venues for future research (Section 7).

## 2. Traceability in the literature

With the purpose of finding how traceability has been studied in the academic literature, we have made an examination of published articles related to this concept. We have identified three main areas: firstly, the one that describes traceability as a mechanism for food safety; secondly, the set of articles that deals basically with the problems organisations must cope with when implementing traceability; and finally, the area in the literature that portrays traceability as a source for firm differentiation.

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With regards to the first viewpoint, *traceability as a guarantee of food safety*, traceability is a concept whose relevance for media and consumers is given by its relationship to food safety. In this sense, many firms use their traceability systems as a promotional device in order to show the reliability of their food safety procedures. Gellynck et al. (2006) focus on the effect of information about meat safety procedures on consumer trust using data collected in Belgium. A similar study was carried out in France by Latouche et al. (1998). They find that consumers demand a greater transparency on food safety and that they are willing to pay for it. In the UK, Northern (2001) shows empirical evidence that supports the hypothesis that industry-led farm assurance schemes, such as traceability systems, are indeed used by large multiple food retailers as a credible signal of food safety. Dimara and Skuras (2003) define traceability as an extrinsic quality evidence. The authors demonstrate that traceability and the use of certificates of origin influence consumer evaluation.

Regarding the second issue, *mechanisms to implement a traceability system*, Cheng and Simmons (1994) analyse traceability in manufacturing systems. They conclude that a good traceability design sets out to provide the right amount and form of information for the appropriate level at an acceptable cost. Tracing functions include detecting and measuring, two key activities in any manufacturing system. In this sense, Jansen-Vullers et al. (2003) propose an approach to the design of information systems for traceability based on graph modelling. Using traceability of products cultivated by farmers as an example, Dióspatonyi et al. (2000) stress that one of the problems associated with an accurate traceability of raw materials is the recollection of exact documentation. To solve this problem, they design a number of simple tools and create several test applications running on different database systems. Sohal (1997) carry out a case study in which he describes a number of factors critical to the development and implementation of a traceability system in an automotive parts manufacturer. Those are, basically, the need of top managers to have a clear understanding of Computer Integrated Manufacturing (CIM); a multidisciplinary team approach to problems; a smooth relationship between software vendors and users; and the appropriate training of the personnel-related implementing and running such a system. Finally, we have also found papers, such as the one written by Pinto et al. (2006), which analyses the use of specific TIC's as mechanisms for traceability in the food industry.

Concerning *traceability as a tool for differentiation*, Fisk and Chandran (1975), for example, give five reasons why a company can use traceability as a source of competitive advantages: firstly, as a mechanism to solve possible product safety problems, something that can be used to demonstrate that quality control systems work to protect customers before and after products are sold; secondly, as a way to provide a good-faith legal defence in many product liability cases for a company; thirdly, traceability may improve manufacture's understanding of its distribution systems; fourthly, a traceability system can enable the manufacturer to keep in touch with their consumers;

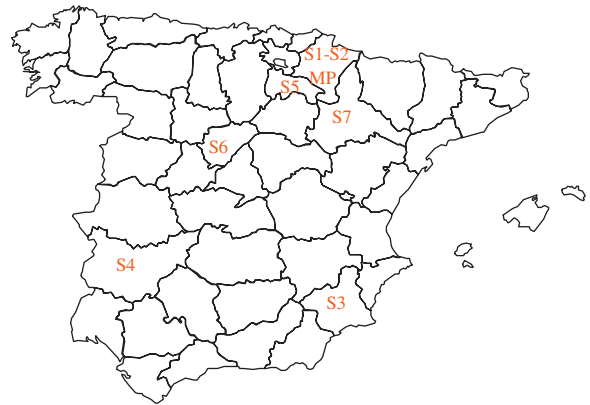


Fig. 1. Supply plants (S) and main plant (MP) of FF.

and, finally, the traceability systems may supplement quality controls made in laboratories because the findings of test programs, in conjunction with field usage studies, can be valuable in developing better products in the long run. For the authors, undoubtedly, there are costs involved in establishing and maintaining a traceability system, but those ones can be a bargain compared with the overhead of, for example, bringing back default products previously distributed in the market. In a recent article, Rábade and Alfaro (2006) analyse buyer–supplier relationship's influence on traceability implementation in the vegetable industry, and show the way traceability helps to reinforce the degree of coordination in the supply chain.

After this review, two obvious questions arise: where does our research fit and what does our paper add to the existing literature on traceability? Answering both questions, we must say, first, that our paper builds on those articles aimed to show the way traceability can be used as a source of competitive advantages; and, second, that we analyse an industry, vegetable products, and a country, Spain, which, to the best of our knowledge, have not been studied before in the traceability literature.

### 3. Description of the firm

FF<sup>1</sup> began its activities in 1984 as a small family firm dedicated to the production of canned vegetables. Presently, the company's business includes the manufacturing, packaging and commercialisation of products consisting of a wide assortment of frozen vegetables. The variety of finished products is extremely extensive, as well as the packaging, which varies from 50 grams plastic bags to containers of more than 1000 kg, depending on customer specifications. The most important raw materials used by the company are green beans, peas, peppers, broccoli, potatoes and carrots. The volume of sales rose from 18 million Euros in 1995, to 151.25 million Euros in 2006, year in which the firm processed 180,000 tons of vegetables, and employed 326 people.

<sup>1</sup> FF is not the true name. The firm whose activities we describe has asked us to remain anonymous.

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