Safety food in olive oil supply chain

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Abstract
The agro-food sector has been hit by scandals and frauds in the last few years. This has resulted in a growing interest in notions including quality, food safety and foodstuff origin on the part of consumers.
In order to guarantee the safety of food products all the elements of the food production chain should be considered as one only process from primary production down to sale or supply of food products to end consumers in view of the impact that each element of this chain is likely to have on food safety. Traceability and food safety are therefore becoming key concepts to increase produce competitiveness as well as consumer acceptance. A completely different approach to the problem, as highlighted by the above examples, suggests to utilize, for the time being, the definition given by the Italian "Academy of Georgofili: "Chain traceability means identifying all the businesses contributing to the production of a food product. Such identification relies on monitoring the flows of materials 'from farm to fork", i.e. from the producer of the raw material to the end consumer" (Georgofili, 2000).
The present work is focused on the analysis and on the use of systems of traceability in the olive growing/olive oil production and supply chain of an Italian Region: Calabria.

Keywords: safety, tracking, tracing, olive tree, dynamic lot.

Introduction

For guaranteeing the safety of all food products all the aspects of the channel of food production should be considered as a one only process which starts from primary production and ends to either sale or supply of food products to the consumer passing through a number of processing steps which may all have a role in terms of food safety (Hernández, 2003).

Food traceability and safety are becoming notions crucial to those who work in this sector as they are likely to increase produce competitiveness and appreciation on the part of consumers.

The study carried out has been intended to detect any mismatches, i.e. errors of manipulation or of registration likely to compromise the identification of the product traced in a view to suppressing any sources of risk in compliance with the requirements of EC Reg. 178/2002.

The work, therefore, is focused on the analysis and the use of both tracking and tracing systems of olive and olive oil products. The present study has been based on an in-depth analysis of the area under consideration in a view to identifying some farms typical of the territory in question. The different steps of olive processing have been analyzed, from olive harvesting to olive processing at the oil mill.

Materials and methods

To implement the 'better practice' traceability model in a single company, or even in a single chain, is not too difficult, but it is a much bigger challenge to influence a whole chain, or even an entire industry.

For the food industry as a whole, the distance between the 'actual' state and the 'desired' state is huge, especially considering the diversity of the products, chains and actors.

Unique batch identification in the real sense of the word is not widespread, advanced use of barcodes (for identification, not data carrying in general) is neither widespread nor standardised, and radio-frequency tags are certainly not common. Adapting the technical innovations is one thing, but the organisational challenges are much greater.

The good manufacturing practices is widely adopted in the food industry, but unfortunately not a good traceability practices. It is common to carefully take care of and check the raw material or ingredient that you receive, but rare to do similar with the information pertaining to it.

Numerous studies have shown that the information loss from one link in the chain to the next is huge, in some industries documented to be 80-95% (Storoy, Foras, & Elsen, 2007).

In the current situation, the buyers of food products normally specify the structure and content of the information that is transmitted, often through lengthy forms to be filled out by the supplier. The supplier then has a wide variety of forms to fill out, with conflicting names and measurements.

By using a standard, information becomes re-usable and unambiguous, and workload is minimized. Suppliers can deliver information in one format and buyers can receive information the same format.

A language for standardized electronic communication has been developed especially.

A detailed analysis of the productive processes has been carried out relying on the so-called "dynamic lot", defined as the unit of product processed (either directly or indirectly) in a unit of time (usually one day), as a function of the specific features of the farms in question (orographic features, level of mechanization, etc.).

The study has been initially focused on the study of the most widespread olive cultivars in the area under consideration.

The survey conducted has highlighted that olive growing accounts for the move important sector (in terms of production) of the farming economy of the Region Calabria.

The commonest cultivars of Calabria, object of this work, are: *Ottobratica*, *Sinopolese*, *Carolea*. Such varieties (figures 1,2,3) account for 76% of the regional olive growing heritage (Sciarrone, Abenavoli, 2006).

Figure 1. Olive trees cv *Ottobratica*

Figure 2. Olive trees cv *Sinopolese*

Figure 3. Olive trees cv *Carolea*

On the basis of the above remarks, the present study has focused on the definition of a logistic unit (the lot) as an initial unit of reference for all infield cropping operations, harvest included. On the grounds of the results of a three-year a research effort a correlation model (which is being finalized) has been defined which is intended to determine on a quantitative basis (surface) the lot containing the most important data that accompany the production process, from the olive grove to the oil mill.

Given the heterogeneous nature of the olive growing sector under study, the determination of the *dynamic lot* (L_d) can depend on the following variables:

$$L_d = f(i, t_i, s, c, M_a, O_l)$$

where:
i = soil slope;
t_i = planting typology;
s = shape and layout of the groves;
c = plant size;
M_a = level of mechanization;
O_l = level of organization of the work site.

The parameters contained in the equation spell out the peculiarities of the olive grove under consideration. As a result, also the size of the lot will necessarily vary and its dimensions will be determined case by case.

Results and conclusions

The primary objective of the present study has been the detection of any mismatches, i.e. handling or registration errors likely to impair the tracking of the product in question. When these errors occur the portion or the lot of product in question must be excluded not

only from the traceability line, but also from the food chain to suppress any sources of risk in compliance with EC Reg. 178/2002 articles 3, 6, 7, 8 (Reg. 178, 2002).

Documentability has been obtained by means of a precise description of the productive process and of the control systems together with the indication of the procedures which define the operational procedures of the production process under consideration.

The reliability of the mathematical model used for the determination of the lot described in the previous sections has been tested on the basis of the data collected during the three-year period 2004-2006 at the olive growing farms under study. More specifically, the data collected during the above period concerned harvest operations which are considered to be crucial to the transit of information (in terms of both data implementation and transmission) from the olive growers and the oil mill.

The surfaces obtained by the mathematical model (dynamic lots) are in Figure 4.

Figure 4. Graphic representation of dynamic lot

The different areas of land (see figure 4) are function, primarily, from the heterogeneous nature of the olive tree and from the land slope.

It's possible, therefore, by the mathematical model, to determine the origin of olives harvested and to trace the entire route, thus ensuring greater food security.

In conclusion, as already mentioned, the study carried out has been intended to detect any mismatches, i.e. errors of manipulation or of registration, by the dynamic lot, likely to compromise the identification of the product traced in a view to suppressing any sources of risk in compliance with the requirements of EC Reg. 178/2002.

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