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# Quality Control in Mediterranean Fresh Food Export Products

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**Abstract:** The paper analyses food safety and quality control in Mediterranean fresh food export products to EU. We focus the analysis on Spain, as one of the leader export countries in fresh agricultural produces, identifying some of the main activities in the supply chain. A comparative analysis was conducted with Tunisia and Turkey, where fieldwork was carried out the citrus and tomato sectors, showing the main results. The study focuses attention on the identification of key non-compliance areas in food safety and quality, through benchmarking and traceability.

**Keywords:** Fresh products, traceability, quality control, benchmarking.

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## 1. Introduction

The negotiations in the new Millennium Round (Round of Development) have on the agenda the liberalization of agricultural markets with special attention to intensifying agricultural exports from Less Developed Countries (LDC) towards industrial areas such as the EU.

On the other hand, the Mediterranean sea is a strategic region very important to the EU. Therefore it is important to intensify the economic relations of the Mediterranean countries in order to provide an incentive for socio-economic development. A key issue for this is commercial trade focused on agricultural products where LDC have comparative advantages.

However, the duel is how to organize the new situation. In the economic scenario, the Mediterranean exports to the EU will compete directly with the Southern European agriculture, one of the less developed areas in the EU. Therefore, some compensatory measures should be developed.

Secondly, not all the LDC are able to provide products and services adequate for the high standards required by the European consumers. Therefore, we describe some significant items related with the situation in Tunisia and Turkey compared with Spain.

## 2. Quality export policy in international trade

Quality export policy should accomplish the requirements of the destination countries. Therefore enterprises and the administration of exporters should know the market regulations, commercial barriers, marketing channel structures and consumer behaviour of their customers.

One specific item is the relation of quality with food safety demands. In exporting countries with established and organised supply lines, the co-ordination of safety and quality through

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private retailer supply relationships or through a centralised organisation is possible. However traceability systems for food safety may represent a technological barrier to exporting firms in less developed countries. The process is much more problematic where there are fragmented supply chains, less direct multi-producer relationships with exporters, and less vertical integration in the supply chain. Food systems in developing countries are not always as well organised and developed as in the industrialised world, and moreover, knowledge of standards is often lacking.

Food safety is more likely to be a concern in fresh food products destined for international trade than in other types of agricultural trade (Unnevehr, 2000). First, since fresh products are transported and consumed in fresh form, handling throughout the entire supply chain can influence food safety and quality (Zepp *et al.*, 1998). Above all it is the relatively short durability, (it becomes perishable very quickly), of fresh produce and the susceptibility to damage and pre- and post-harvest disease that impose high requirement levels for quality assurance. Secondly, standards in developed countries tend to be significantly higher than those in developing countries; hence compliance with those standards may require greater initial investment in quality control and sanitation in developing countries. Thirdly, fresh commodities are subject to increasing scrutiny and regulation in developed countries where food safety hazards are better understood and more often traced to their sources.

The long-term solution for developing countries to sustain an international demand for their products lies in building up the trust and confidence of importers in the quality and safety of their food supply systems. This requires improvements within national food control systems and within the industry's food quality and safety programmes (FAO, 1999). 'Farm to table' process control to manage both quality and safety is increasingly in demand in developed countries, and new institutions are evolving to certify production practices (Unnevehr and Jensen, 1999). Hence, there are market incentives for developing countries' exporters to adapt these management practices, and to co-ordinate safety and quality management more closely with importers.

A key to product quality and safety management throughout the fresh produce supply chain is **traceability**, enabling product tracking and accountability at each stage. Nowadays, the facility to trace fresh produce production and handling practices is required by the importer/retailer complex, and all major operations, from planting to export, must be documented. This approach ensures a better understanding of the steps and conditions to which fresh produce have been subject (Ait-Oubahou and El-Otmani, 2000) Traceability requires the identification of all physical entities (locations) from where fresh produce originates, is packed and stored. Due to the globalisation of the fresh produce supply chain and because of the diversity of international produce supply chain practices, the fresh produce sector in March 2001 agreed upon *Fresh Produce Traceability Guidelines* (FPT guidelines)<sup>2</sup> to provide a common approach to tracking and tracing fresh produce by means of an internationally accepted numbering and bar-coding system – the EAN•UCC system (EAN International, 2001). The adoption of the guidelines is voluntary and the degree to which companies will implement them may vary because of differences in commercial operations. However, the use of common identification and communication standards will significantly improve the accuracy and speed of access to information about the provenance of fresh produce. Therefore, it is likely that this traceability model will be a requirement for fresh produce exporters in the near future.

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<sup>2</sup> The FPT Guidelines were developed together with the EuroHandelsinstitute (EHI), the European Association of Fresh Produce Importers (CIMO), the Euro Retailer Produce Working Group (EUREP), the European Union of the Fruit and Vegetable Wholesale, Import and Export Trade (EUCOFEL) and the Southern Hemisphere Association of Fresh Fruit Exporters (SHAFFE).

As a final word in this section, it must not be assumed that there is an easier commercial option in domestic markets for firms who do not wish to meet the challenges of more sophisticated export markets. There are many reasons besides the ethical and moral imperatives why firms must strive to achieve high levels of performance with respect to safety and quality. Two will be cited here: first, social and economic losses due to poor food safety and quality are probably as serious, if not more serious in developing economies where standards and systems are lower, than are losses in advanced economies (Poole *et al.*, 2002). Improvements in the health and safety of poor people are fundamental to international efforts to achieve the Millennium Development Goals for poverty reduction, as is the development of vibrant food systems where the sector is, or has the potential to be, a major source of employment, export earnings and other macro-multiplier effects.

### 3. How to improve safety and quality policies in the export supply chain

An export supply chain showing 'best practice' for fresh produce safety and quality involves many inspections and certifications. Some of these controls will be carried out by government authorities, both for exporting and importing countries, based on public standards and regulations, while others will be undertaken by private organisations (i.e., third party certification) on behalf of importers/retailers and based on private specifications.

In exporting countries with more established and organised supply lines, the co-ordination of safety and quality through private retailer supply relationships, or through a centralised organisation is made possible. The process is much more problematic in developing countries when there are fragmented supply chains, more indirect multi-producer relationships with exporters, and less vertical integration in the supply chain.

At this stage a number of quality and safety checks will be carried out:

- Produce quality, weight and labels checked for conformance with specifications
- Produce inspected for physical contaminants and mechanical damage, including chill damage
- Need for ripening assessed
- Produce sampling for quality testing specific to product (e.g., sugar content in citrus)
- Produce sampling for phytosanitary purposes
- Produce sampling for pesticide residue checks

Due to the globalisation of the fresh produce supply chain and because of the diversity of international produce supply chain practices, the fresh produce sector in March 2001 agreed upon Fresh Produce Traceability Guidelines (FPT guidelines)<sup>3</sup> to provide a common approach to the tracking and tracing of fresh produce by means of an internationally accepted numbering and bar coding system – the EAN•UCC system (EAN, 2001)

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#### 4. Benchmarking analysis in the export supply chain focused on food safety and quality

Carrying out a benchmarking exercise will enable the comparison of the level of implementation of food safety and quality practices, across countries, sectors and different sizes and ages of firms, with the identification of key non-compliance areas for exporting companies in the countries under study. The process involves working with those operators considered to be examples of 'best practice' in the industry and those firms with less market share.

In the UK industry, a study by the Food and Drink National Training Organisation (FDNTO, 1998) also used a scoring system in a benchmarking process for the food and drink manufacturing industry. The objectives of this research were to set a benchmark for UK food and drink manufacturing companies to identify and promote world class manufacturing activities, to establish a set of benchmarking criteria founded on international best practice for UK companies to measure themselves against and identify areas for continuous improvement and to produce an industry action plan. The key areas looked at were:

- i) business measures,
- ii) personnel and training measures (statistical data),
- iii) skills profiles.

The benchmarking process involved a questionnaire on Business Measures and Personnel and Training Techniques, explored by a senior management team during a visit to the company, after which the personnel skills were assessed on visits to manufacturing operations.

Some of the key strengths of the benchmarking process in previous studies have been the bringing together of participants from companies in various sectors and of various sizes, providing a forum for exchanging information and experiences to help resolve problems (e.g. Andersen *et al*, 1999). In this study, the objective of using benchmarking was to increase the knowledge about the supply chain management process, to identify best practices in the industry and to enable the industrial project partners to learn from the best practice. Studies such as the one made by Prado (2001) focus on the face-to-face interaction and teamwork between participants in the benchmarking process, highlighting the importance of information sharing or the dissemination stage of benchmarking. The benchmarking process usually results in the development of a series of actions within each company involved in the exercise.

Thus, benchmarking involves:

- identification and examination of specific key areas or performance areas in the process under study,
- identification of firms with best practice in the area,
- exchange of information and experiences,
- production of an action plan,

A benchmarking framework is given by Shah & Singh (2001):

- Stage 1: Selection of performance measures, depending on the firm's competitive focus, market niche and strategy.
- Stage 2: Benchmarking exercise on the firms in the industry, using the selected performance measures. This enables the identification of firms with "best performance" in terms of the selected measures.
- Stage 3: Information about specific strategies of the "best performance" firms to be obtained from sources in the public domain. This information can be related to the specific performance measures of the firms.
- Stage 4: Leveraging this knowledge to find what bearing the firms' performance measures have on their specific practices and policies.

For this study, specific performance measures were identified for application across the sectors. By carrying out case studies of exporting firms, the relationship between producers and exporters was examined and a comparison with existing best practice in infrastructure and management practices was also carried out. In this benchmarking exercise, a qualitative rather than quantitative approach is used to explore each KPI. This is due to the difficulty of assigning quantitative measures to the supply chain characteristic indicators which are being examined here.

Benchmarking is a tool for improving performance by learning from best practice and understanding the process by which they are achieved. This project in particular focuses on 'process benchmarking' by comparing operations, work practices and business processes in the fresh produce exporting industry in Morocco and Turkey, with those in Spain. The benchmarking framework used in the study is shown in Figure 1.

Specific performance measures (Key Performance Indicators – KPI) were identified for application across industries. The indicators were decided upon through an examination of the supply chains for each target sector and a study of the areas and levels in which safety and quality systems could be controlled through the supply chain. Some indicators were also based on EUREPGAP (2001) and Güngör & Güngör (2000).

Each KPI was explored using questions, which made up a questionnaire for use as a discussion guide during visits and interviews with exporters. A qualitative rather than quantitative approach was initially used to compute each KPI due to the difficulty of assigning quantitative measures to the supply chain characteristic indicators examined in the study. Qualitative data was then classified into three levels. The different elements within each of the three levels in the framework aim to characterise that level, indicating the firm's policies and practices in this aspect, rather than specifying certain criteria, which they must meet. Some points of the framework depended upon a combination of answers in the questionnaire.

The benchmarking project considers several areas for the analysis of food safety and quality management (Table 1). For each area, a number of KPIs were developed to be used as a comparison in the benchmarking process.

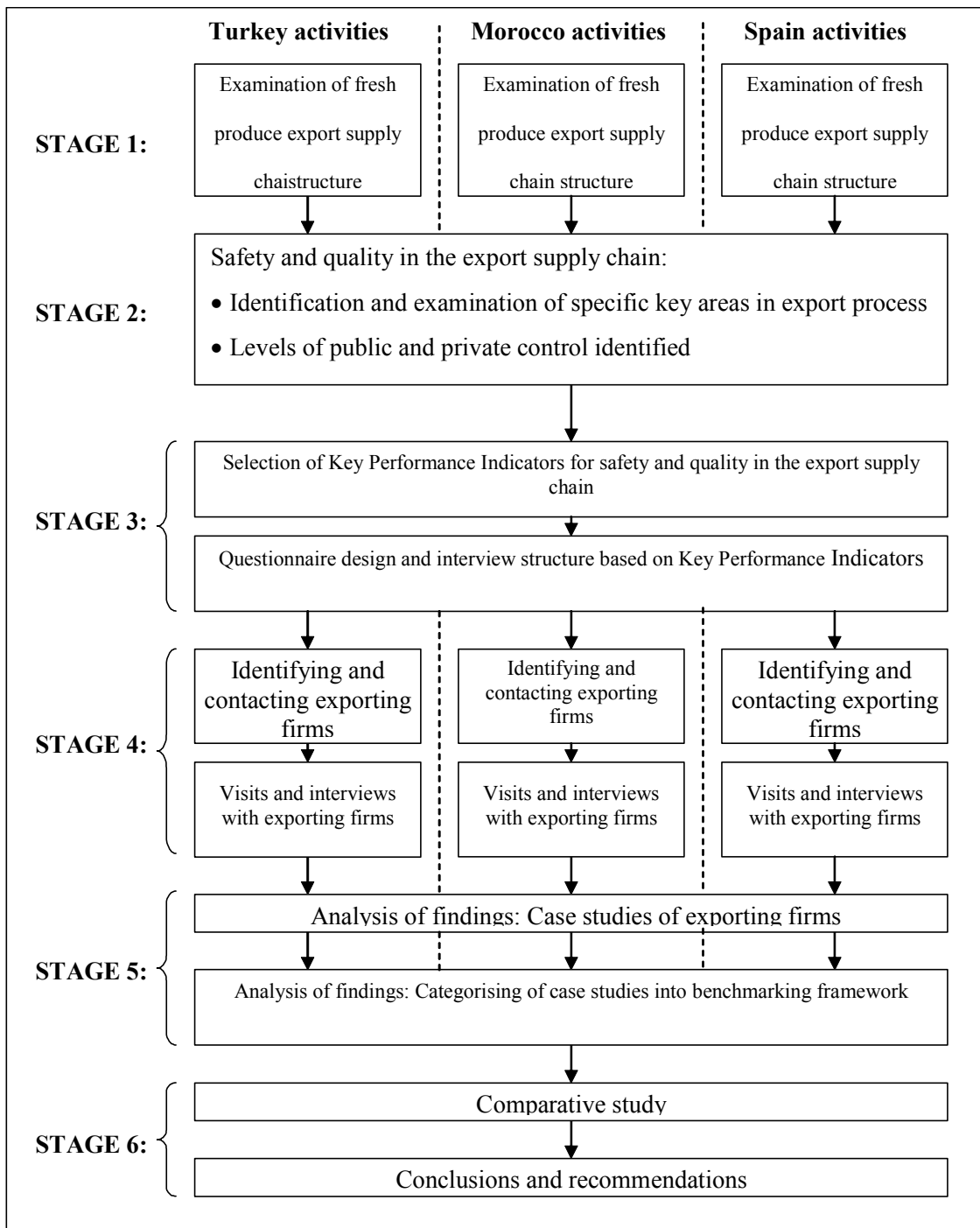


Figure 1. Stages in benchmarking fresh produce export sectors: Turkey, Morocco and Spain

**Table 1.** Key Performance Indicators

<b>Areas of Analysis</b>	<b>KPI for comparison in benchmarking framework</b>
1. Supply base	1.1. Degree of specialisation 1.2. Export volume 1.3. Number of producers and fragmentation of supply 1.4. Varieties 1.5. Forecasting systems 1.6. Production flexibility
2. Supply chain management	2.1. Producer-exporter relationship (type of producer-exporter relationship, e.g. co-operative, private firm) 2.2. Vertical integration 2.3. Degree of co-ordination of operations 2.4. IT infrastructure and integration for supply chain management 2.5. Customers: countries exported to 2.6. Customer contracts 2.7. Customer visits
3. Traceability and tracking	3.1. Traceability systems 3.2. Segregation
4. Crop protection	4.1. Producer practices 4.2. Exporter communication
5. Harvesting	5.1. Harvest hygiene 5.2. Harvest quality (Product homogeneity, effect of climate, consistency in production)
6. Processing and packaging	6.1. P&P technology 6.2. P&P quality 6.3. Labelling
7. Storage & Transport	7.1. Exporter storage knowledge 7.2. Storage capacity 7.3. Storage quality 7.4. Transport quality
8. Export Quality Control (QC) process	8.1. Quality Certification 8.2. QC staff 8.3. Worker knowledge 8.4. Product sampling for QC 8.5. Laboratory access
9. Packhouse worker health, safety and welfare	9.1. Training 9.2. Worker welfare, health and safety
10. Environmental management	10.1. Environmental management

For Dimensions 1 and 2, a qualitative rather than quantitative approach was initially used to compute each KPI due to the difficulty of assigning quantitative measures to the indicators examined in the study. Qualitative data was then classified into three levels, as follows:

**Level 1:** Firm shows little or no capacity in achieving 'best practice';



- Level 2:** Firm shows some capacity in achieving 'best practice';
- Level 3:** Firm shows 'best practice' in this area (i.e., consistent performance, clear and demonstrable systems in place, certification)

The different elements within each of the three levels in the framework aim to characterise that level, indicating the firm's policies and practices in this aspect, rather than specifying certain criteria, which they must meet. Hence, this method allows for the identification of areas in which the companies have room for improvement.

For Dimension 3, firms indicated in the questionnaire whether they carried out a particular control measure and if they carried out additional control measures at each stage.

## 5. Empirical analysis

### 5.1 Data Collection

To implement the benchmarking framework, fresh produce (citrus and tomato) exporters were identified and contacted in Morocco, Turkey and Spain. Firms were approached on the basis of their supplying citrus or tomatoes to a range of customers. Four firms were visited in Morocco (four citrus exporters), seven firms were visited in Turkey (five citrus exporters and two tomato exporters) and five firms were visited in Spain (two citrus exporters and three tomato exporters).

In comparing the practices of Moroccan and Turkish fresh produce exporters with those of Spanish exporters, we are taking the practices of the Spanish exporters as 'best practice'. These are the practices which have often been assigned to 'level 3' in the benchmarking analysis. There may, however, be areas in which further development and improvements are possible, in the sense that the comparison we undertake here is relative and not absolute. The comparison also depends on information gathered from a small number of firms, and must be viewed in light of the current public regulatory system that exists in each country and the level of customer demand for safety and quality properties which prevail in destination countries.

### 5.2 Market orientation (Varieties supplied and ability of the exporter to predict customer requirements)

In **Morocco**, all firms supply a mixture of old and new varieties. The new citrus varieties introduced in Morocco are the easy peelers. Most volumes exported concern the old varieties such as Maroc Late (Valencia). For the tomato exporter, seed companies play a role in choosing the varieties to be grown, and this can change every year depending on market requirements. Most exporter groups have developed their own information network. Visiting trade fairs, getting advice from EACCE and following trends are the main means used in Morocco to predict the future requirements of the market for tomatoes. Prediction of the weather in Europe is also closely monitored. In the case of an expected severe winter the Moroccan growers will plant significantly more to meet the expected high demand in the winter. Concerning citrus, as renewing trees require time, the prediction system is less developed. The Ministry of Agriculture and EACCE play a significant role in advising small producers on this issue.

In **Turkey**, new varieties are communicated between growers generally by word of mouth. With some producers, old varieties are quite popular and are targeted at the domestic market, which can be a problem for exporter. For the largest exporter, there is a system of variety review

and renewal. For the tomato exporter, seed companies determine which varieties are grown, and this can change every year depending on market requirements, and also, local intermediaries who supply credit to producers, decide on the variety of seed. Some exporters are involved in collaborative work with universities, visits to European trade fairs to investigate new varieties, and personal observations and visits to customers. The largest citrus exporter carries out market research in the sector to look at trends and gather information, this information is passed on to growers. Most of the exporters have friends and contacts in their target markets and use them as an information source.

For the **Spanish** citrus exporters, customers are happy with current varieties that are supplied, though one of the exporters is switching to specialise in tangerine production, responding to the demands of the European market. The tomato exporters have direct control over varieties grown by producers through field technicians and advisors, and firms carry out their own variety trials. Firms are very well organised in terms of market research and predicting customer requirements with their own marketing departments or access to this information through marketing cooperatives. Firms also have good inter-relationships and with organisations that enable them to work together. Clients also supply information about the domestic and export market requirements.

### 5.3 Production flexibility (Ability of the exporter to meet changing customer requirements)

The **Moroccan** exporters have some degree of production flexibility, in terms of meeting different specifications and quantities required by different markets. Meeting different variety requirements is, however, difficult.

The **Turkish** exporters have some degree of production flexibility, in terms of meeting different size and grading requirements of different markets, rather than meeting different variety requirements. For the largest firm there is said to be total flexibility in the supply base, and production can easily be changed to meet the needs of customers. For the tomato exporter, the nature of the crop means that production can change from one variety to another, the exporter buys what is required on the wholesale market.

Citrus production for one **Spanish** exporter is fixed, and since this is not an important area for this firm, they are limited to certain established varieties. For the specialist citrus exporter, they are currently changing their production base in response to consumer demand. In both, citrus firms demand that analysis be limited to contacts with the commercial agents and importers. Information is quickly passed onto growers. Tomato exporters generally have more flexible production due to the nature of the product, its short season and close relationships with producers through the cooperative structure. Customer requirements can be quickly met, e.g. they are currently growing new varieties for the Spanish market which are not yet requested by the main European market and varieties are reviewed and renewed every season.

### 5.4 Customer Orientation (Number of visits from customers to advise and check on safety and quality practices through the production and export system)

For most **Moroccan** exporters, the customers undertake audits, which take place on a regular basis. Once a year is the frequency mostly used as a basis.

For most **Turkish** firms there are visits from customers, which take place frequently and on a systematic basis with some customers and occasionally with others.

Visits to **Spanish** citrus exporters take place but do depend on the individual client, with some clients being very rigorous and others performing no inspections. For the citrus exporters, the

number of inspections depends on the destination of the product. Some clients and certifiers check every order while others do not perform inspections. For the tomato exporters, there are many audits from supermarkets to check that safety requirements are being complied with. Visits take place very often, depending on the importer and it is very normal to have one visit at every campaign or every two.

#### 5.5 Traceability systems (Existence of documented traceability systems)

All the **Moroccan** firms visited have traceability systems in place. Any packing box sold in the European market carries codes and references that allow for tracing of the product to the farm of origin and treatment undergone by the product at the packhouse. Nevertheless, few traceability systems are able to show the product history at the farm level.

Four of the **Turkish** exporters have either no traceability systems in place or informal traceability systems with no product segregation. For the tomato exporter, traceability would be impossible as all supplies are bought through the wholesale market. One exporter has partial traceability as some larger producers are able to keep records of production practices, while smaller producers are unable to do so. The largest citrus exporter has had full traceability systems in place since 1998. They were implemented as a direct result of demand from customers. Records are held for 3 years.

There are full traceability systems in place for all the **Spanish** exporters interviewed, utilising bar-coding systems with grower and production information, allowing rapid tracking through the system. For one of the tomato exporters, full traceability was implemented as a result of demand by customers. Records are kept for five years and allow traceability back to each glasshouse.

#### 5.6 IT systems (Investment in IT systems and their use throughout the system for accountability and product tracing)

In **Morocco**, most exporters are investing in IT systems. These systems are used for technical management in packing house real time as well as for traceability.

For most firms interviewed in **Turkey** there is limited investment in IT systems. One firm uses computer systems for garden registers and product ordering and inventory within the packing house. One firm uses IT systems used for order placing and inventory but not for traceability. For the tomato exporter, IT systems are only used for accounting purposes and record keeping.

IT use by the **Spanish** exporters is generally high, with at least production records kept in database. Most firms have product tracking, traceability, producer information, pricing and accountability all computerised; one large cooperative provides access to all this information for growers at the packhouse, including commercial information and accounts.

#### 5.7 Quality Certification (Level of certification obtained by the firm)

In **Morocco**, all of the firms interviewed are certified to ISO 9001 or are in the process of being certified.

In **Turkey**, none of the firms interviewed are certified to any norms.

All of the **Spanish** firms have AENOR certification. Of the citrus exporters, one exporter has ISO 9002 certification and another is currently in the process of gaining this certification. Neither of the firms are EUREPGAP accredited. Tomato exporters all have ISO 9000

certification. Two of the firms have EUREPGAP certification for all or some of their production. One exporter is BRC accredited.

In three of the **Moroccan** exporting firms, informal training is based on explanation and demonstration, as most of the workers are illiterate. One exporter organises classes for his workers to learn how to read and write and to be trained on quality control basics.

In some **Turkish** packhouses, workers undergo informal training in product selection at the beginning of the season. Some firms mentioned problems about workers changing from season to season. Hence, training them can be difficult. In the largest citrus exporting firm, workers undergo regular training every season and a record of training is kept for each worker. Training manuals and systems exist.

A certain level of worker training is specified as part of the ISO 9002 certification, so that **Spanish** workers undergo regular training and a training manual is kept for each worker. Under AENOR regulations each worker must have a food manipulation license and is then trained specifically for their type of work, e.g. packing line selection, machinery operation.

#### 5.8 Environmental management (Environmental management policies and practices of the firm)

In **Moroccan** firms, there was generally little demonstration of environmental management practices, apart from one firm, which was in the process of carrying out an environmental audit, as part of the requirements of the UK importer they were working with.

In **Turkey**, there was no demonstration of environmental management policies or practices in any firms.

In **Spain**, exporters have environmental management policies in line with EUREPGAP or they are at least moving towards these. This is seen as the most pressing certification to obtain. There is no ISO 14000 certification, though exporters are interested in gaining this certification and one firm has plans to implement this when a new pack house is operational. The AENOR standard UNE 155001 also specifies environmental standards, to which one firm has 70% of production certified.

#### 5.9 Safety and quality requirements (Safety and quality specifications as part of exporter-customer contracts)

In **Morocco**, the specifications related to safety and quality are always put in the contract.

In **Turkey**, this was shown to depend to some extent on the customer, as to the importance placed on a contract. For example, for one exporter, the main customers are in Russia and the Ukraine, and for these customers, such requirements are of little concern as long as product presentation is good. Agreements are generally made verbally rather than in writing. For the largest citrus exporter, contracts are used and specific requirements are always part of the contracts.

## 6. Conclusions and recommendations

We include here the highlights of the conclusions in the research project:

- Initiatives should be developed at firm level to increase the level of coordination among actors in the supply chain: efficient markets and co-operative trading relationships signal demand changes and enhance the flows of information and incentives.

- Initiatives at government level should be developed to encourage and support horizontal cooperation among fruit and vegetable producers. Initiatives on horizontal integration of small-scale producers into second-tier co-operative businesses may require third party support in terms of provision of finance and management skills. The likely welfare impacts of supply chain rationalisation also suggest that the public sector needs to be involved, so that social objectives such as employment and income levels are taken into account. Structural innovations in the supply chain will be country- and maybe region-specific, but in most cases public sector support is posited.
- Increasing demands by international customers for 'farm to table' process controls to manage both quality and safety require that Mediterranean fresh produce exporters adopt these management practices and coordinate safety and quality more closely with importers.
- The implementation of effective and demonstrable quality control systems (i.e., HACCP-based or alternative food safety risk management systems) is recommended as the most-effective means of reducing food safety hazards.
- Initiatives should be developed at government level aimed to support firm level investments which are prerequisites to implementing effective and demonstrable quality control systems. Preferential financing arrangements or tax-credits for IT- and QC-related investment in physical infrastructure could be one such mechanism. In a wider context, the possibility of developing food safety and quality networks, local benchmarking activities, vocational training and trade fairs involving SMEs would be an important mechanism for building human capital within the industry and achieving greater social (or small enterprise) inclusion in Mediterranean countries.
- In order to overcome the diffusion of regulatory responsibility with the resulting overlaps and gaps, National food safety systems must be consolidated. Governments must move towards a centralised structure for the implementation and administration of standards for the agri-food sector comparable to those emerging in industrialised countries in order to improve the efficiency of resources and the effectiveness of control procedures.
- Public interest has increased significantly regarding the reliability and quality of test results performed by laboratories on food products. A system of certification and accreditation for laboratory testing facilities is necessary to move towards reciprocity in testing results through the elaboration of bilateral or multilateral mutual recognition agreements. However, the accreditation of laboratories in Mediterranean countries is hindered by the lack of internationally recognised certification and accreditation bodies. Accreditation granted by exclusively national bodies is usually of only limited value to exporters. As a result, laboratories have to be accredited by overseas bodies at great expense.
- Efficient systems of conformity assessment and/or enforcement are key to the efficacy of quality and safety standards in an effective mechanism for evaluating whether products/processes conform to international buyers' requirements. The wider the gap in systems of conformity assessment, the greater the compliance cost for Mediterranean producers vis-à-vis developed country suppliers to any importing country.

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