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AN ECONOMIC ANALYSIS OF FOOD SAFETY STANDARDS AND ITS IMPLICATION ON AGRICULTURAL TRADE IN THE CONTEXT OF EU-MED PARTNERSHIP: THE CASE OF *SPS* STANDARDS AND *EUREPGAP* REQUIREMENTS

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1. Executive summary

As in the case of previous research projects funded jointly by the EU and the Royal Scientific Society, this research project was also carried out on the basis of a contract between FEMISE and the RSS situated in Jordan in order to conduct an economic analysis of food safety standards and to test the impact of imposing these standards on agricultural trade between the EU and southern Mediterranean countries: Jordan, Syria and Egypt.

This research project aims at examining policy, technical, and institutional trade disputes that may arise between the EU and MP countries due to food safety measures represented in SPS and EUREPGAP. This research has identified what does it take to comply with these measures in terms of appropriate policies, technical and trade procedures while at the same time acknowledging the genuine concerns of all parties about safety and quality of agricultural and food products. The specific objectives of the study are as follows:

- To identify the technical, institutional, and policy constraints faced by governments and exporters (private sector) in the selected countries in meeting the requirements of SPS and EUREPGAP;
- To determine the expected trade impact of complying with these standards on the competitiveness of agricultural and food exports;
- To develop a strategy to meet the food safety requirement through identifying the most appropriate technical and economical means that the EU can best assist the MP countries in, to improve domestic technical capacity in this area;
- To analyze the complexity of certain tariff and non-tariff barriers, within the framework of food safety measures, which hinders the trade of agricultural products in several MPs with the EU; and
- To assess the existing SPS standards, the EUREPGAP regulations and the actually applied standards in the studied MP countries and compare them with international standards. This assessment should lead to recommendations on ways and means of harmonizing and simplifying these standards and how to develop a euro-Mediterranean bio-ethic agriculture.

The objectives of this research were translated into ten research questions that were answered though applying two quantitative methodologies and utilizing primary and secondary data sets.

- Are food safety standards and inter-country differences considered major impediments of horticultural exports from MP countries to the EU region?
- Is there an economically 'recoverable' gap between current and potential performance of the horticultural export sector? If this gap exists, then what are the major factors influencing it?
- Are exporters in MP countries able to comply with SPS standards and EUREPGAP requirements? What would be the additional costs to producers and consumers in order to meet the standards and requirements?
- What are the critical factors that affect the compliance with SPS standards and EUREPGAP regulations?
- Do the SPS and EUREPGAP regulations create a bias in favor of large-scale farmers against small and medium scale farmers in the MPCs?
- What kind of motivations and incentive measures would attract foreign firms (multinational enterprises from the EU) to invest in the export-oriented agricultural sectors in the MPCs? Would such an involvement be an effective way to overcome some SPS and EUREPGAP related impediments to agricultural trade?
- What is the magnitude of protectionism involved in applying food safety standards? In other words, how would the food safety standards impact the level of protection of the selected crops in the three countries?
- Would horticultural exports still be competitive if producers/exporters have to invest in new equipments and arrangements to meet the food safety standards and requirements?
- What is the expected role of government policies in MP countries in bridging the gap between current and "what should be" to shorten the time involved in the transformation process? and;

- How would the EU agricultural policy, in terms of reciprocal liberalization and structural tools such as a "Feoga Orientation" would help and impact the modernization of the agricultural sector in southern MPCs?

The interviewed exporters and producers, concluded that the key impediments related to SPS include: 1) Serious lack of knowledge about SPS requirements and regulations; 2) high cost of infrastructure needed to meet SPS conditions; 3) absence of inspection mechanism to monitor production areas at domestic producers; and 4) non-existence of local legal bodies responsible for the implementation and monitoring of SPS and other agreements regulations.

The business community identified several technical and commercial constraints that are currently facing the horticultural industry and impacting the food sanitary regulations. The identified technical impediments are: 1) lack of highly qualified laborers; 2) absence of modern and efficient packing and grading facilities; 3) the inferior quality of the local produce in the three countries; 4) the tough requirements imposed by the EU; 5) limited capacity of air cargo especially to East Europe; and 6) absence of quality control laboratories in the region especially for testing chemical residues. While the identified commercial impediments include:1) high cost of exported products from the original sources; 2) difficulties in shipping and forwarding procedures to EU markets; 3) lack of commitment of local producers in terms of dates of delivery and product quality; 4) difficulties in issuance of needed certificates and other routine procedures (bureaucracy); 5) national rules and regulations; 6) high shipping costs; and 7) unorganized horticultural export industry.

This study has also concluded that any additional food safety standards imposed by the EU will definitely increase the level of protectionism in favour of EU producers unless these regulations are also imposed on locally produced products in the EU zone, which is not currently the case since SPS and EUREPGAP are usually imposed on imported horticultural products from outside the EU region. The imposed regulations will improve the competitiveness of the EU products through raising the protection level of these products as a result of the increased costs of imported similar products from outside the EU region by an average of 17 percent.

The analysis of competitiveness showed that much of the horticultural exports from the south MPC will continue to be competitive despite the burden of the newly added costs on MPC exporters as a result of complying with sanitary regulations. The comparative advantage indicator that was used to test the newly added cost in terms of new equipments and handling procedures showed that the selected horticultural products exported from the three countries to the EU will continue to enjoy a comparative advantage as well as positive economic profits.

The interviewed private sector players in the horticultural export industry concluded that the type of needed technical assistance from the EU may take the following forms: 1) intensive training on SPS and other quality related regulations; 2) support in establishing a proper shipping fleet to EU markets; 3) elimination of all commercial barriers; 4) modern infrastructure in terms of advanced grading and packing facilities needed to improve product quality; 5) awareness programs on SPS and other EU regulations tailored to producers and exporters; 6) support in establishing a certification and accreditation authority for SPS and EUREPGAP regulations and protocols in the different countries in the region; 7) financial and technical support to small farmers; and 8) providing specialized marketing information about EU markets and regulations and importing partners.

The researchers of this study were able to identify the following strategic options that could be used to formulate a comprehensive strategy to help the MPCs to comply with SPS, EUREPGAP and HACCP:

- Establishing awareness programs in the MP countries for explaining the importance of compliance with sanitary regulations on future food exports to the EU and other potential markets.
- Accelerating the process of adapting the SPS regulation into the sanitary system of the MP countries as requested by the WTO. The SPS agreement also calls for establishing offices and contact points in signatory countries.
- Creating a qualified and certified staff in SPS and Technical barriers to trade (TBT) for training, inspection, and implementation (i.e. training of trainers).
- Training producers, importers, exporters etc. in the technical aspects of the SPS and TBT.

- Involving official, academic, and research institutions in the process at the national level.
- Establishing better communication channels with the international institutions dealing with SPS and TBT.
- Providing financial support in the form of loans etc. for producers who are willing to establish the international systems in their facilities.
- Organizing mutual tours with international producers and importers.
- Issuing publications and newsletters dealing with the most recent updates on SPS and TBT.
- Reviewing the existing establishments in the country and advertising them as success stories.

2. Introduction

Agriculture is considered the cornerstone of many economies worldwide, especially in developing countries. Agricultural production and processing are activities which give many poor countries the opportunity to trade their way out of poverty. However, one fundamental requirement is that agricultural products are safe, and do not pose risks to human, animal and plant health. Recent trends in global food production, processing, distribution and preparation are creating an increasing demand for food safety research in order to ensure a safer global food supply.

Sanitary and Phytosanitary (SPS) Agreement is one of the principal agreements that form the World Trade Organization (WTO) Treaty. The agreement was designed to ensure the safety of imported food items which is always raised by many of the developed countries. The main focus of the agreement is on how governments can apply food safety and animal and plant health measures (sanitary and phytosanitary measures) including, but limited to, calling for products to come from disease-free areas, strict inspection of products, particular treatment or processing of products, determining allowable maximum levels of pesticide residues or permitted use of only certain additives in food.

To ensure food safety, and to protect against the entry, establishment, and spread of diseases and pests through trade, countries impose regulations to protect human and animal health "Sanitary " which are measures taken to protect human or animal life or health, and plant health "phytosanitary" which are measures taken to protect plant health.

The Fifty-third World Health Assembly (May, 2000) adopted a resolution calling upon the World Health Organization (WHO) and its Member States to recognize food safety as an essential public health function. The resolution also called on the WHO to develop a Global Strategy for reducing the burden of food borne disease.

Additionally, other systems ensuring food safety are the EUREPGAP and HACCP (Hazard Analysis Critical Control Points). The EUREPGAP started in 1997 as an initiative of retailers belonging to the Euro-Retailer Produce Working Group (EUREP). It has subsequently evolved into an equal partnership of agricultural producers and their retail customers. Their mission is to develop widely accepted standards and procedures for the global certification of Good Agricultural Practices (GAP). The newly formulated protection measures known as EUREPGAP will be in effect soon although the HACCP system was put in effect few years ago by other countries. The EUREPGAP Protocol for Fresh Fruit and Vegetables was developed by a group of well-know large retail chain stores across Europe to ensure human food safety by what is know by (Europe Good Agricultural Practices). As in the case of SPS, the EUREPGAP emerged as a result of rising consumer concerns, global sourcing, and the EU regulatory system. This protocol forces exporters of fresh produce to the EU to take into consideration the new requirements that will surpass food safety issues into new areas of concerns, such as social aspects of worker welfare and environmental principles.

The final act of the Uruguay Round of Multilateral Trade Negotiations, signed in Marrakech on the 15th of April 1994 that established the World Trade Organization (WTO) includes, among many other agreement, the Sanitary and Phytosanitary Measures or what is known as the "SPS Agreement". The SPS Agreement is part of the treaty that established the World Trade Organization (WTO).

The main concern of the SPS Agreement is the application of food safety and animal and plant health regulations. The SPS measures became functional with the establishment of the World Trade Organization on the 1st of January 1995. The agreement was designed to tackle the “always raised problem” by many food importing countries, especially developed countries, of how to ensure that

consumers are being supplied with food that is safe to eat. Simultaneously, how can a country ensure that strict health and safety regulations are not being used as an excuse for protecting domestic producers? The agreement mainly focuses on how governments can apply food safety and animal and plant health measures (sanitary and phytosanitary or SPS measures) and sets out the basic rules in the WTO.

The secretariat of the WTO encourages member countries to adopt international standards, guidelines, and recommendations where they exist. However, the use of higher measures must not be arbitrary but justified on scientific grounds. Some of the most popular sanitary and phytosanitary measures adopted by many countries include: call for products to come from disease-free areas, strict inspection of products, particular treatment or processing of products, determining allowable maximum levels of pesticide residues or permitted use of only certain additives in food. These measures should be applied to domestically produced food or local animal and plant diseases, as well as to products coming from other countries.

Away from the SPS measures, another form of protection measures which are mainly concerned with human food safety is what is known as EUREPGAP (Europe Good Agricultural Practices). A EUREPGAP Protocol for Fresh Fruit and Vegetables was developed by a group of well-known large retail chain stores across Europe which include Sainsbury's, Safeway, Somerfield, Tesco, Ahold, and many others. The EUREPGAP emerged as a result of rising consumer concerns, global sourcing, and the EU regulatory system. International exporters to the EU should take into consideration the new requirements that will surpass food safety issues into new areas of concerns, such as social aspects of worker welfare and environmental principles.

The European Protocol on farm Good Agricultural Practice (GAP) defines essential elements for the development of best-practice for the global production of horticultural products (e.g. fruits, vegetables, potatoes, salads, cut flowers and nursery stock). Although, the Protocol defines the minimum standards acceptable to the major retail groups in Europe, yet standards for some individual retailers and those adopted by some growers may exceed those included in the protocol. EUREPGAP supports the principles and encourages the use of HACCP.

EUREPGAP consists of a long checklist that contains REQUIRED and ENCOURAGED actions by the producers. Farmers must be able to demonstrate that they follow the Required and Encouraged actions included in the checklist such as product traceability, record-keeping, varieties and rootstocks used, pest and disease resistance varieties, seed treatments and dressings, genetically modified organisms, site management, irrigation methods and requirement, crop protection, choice of chemicals, post-harvest treatments, waste and pollution management, recycling and re-use, worker health, safety and welfare, environmental issues, and internal auditing procedures.

Food safety and security issues are gaining more attention worldwide as a result of new emerging apprehensions by the majority of consumers, especially in Europe. These newly emerging concerns include: 1) the use of biotechnology in food production to improve crop production and 2) the very recent emergence of Mad Cow Disease in the United States, a disease the spread a few years ago in Great Britain causing huge financial losses to meat and livestock producers and harming the meat supply industry as a result of lost consumer confidence.

Obviously, these measures included in the SPS agreement and the EUREPGAP may result in additional restrictions on trade in agricultural and food products. Although governments in the EU and Mediterranean Partner countries (MP) do agree that some trade restrictions may be essential to guarantee food safety and animal and plant health protection, nevertheless, these restrictions may go beyond what is needed for health protection and may be used as protective measures to shield domestic producers from international economic competition. The level of enforcing these measures is expected to escalate as other trade barriers are reduced as a result of bilateral and unilateral free trade agreements. This research provides an evidence on that abiding by sanitary, phytosanitary, and EUREPGAP measures will result in additional cost that will be incurred by exporting countries in terms of new inspection and testing facilities and laboratories, certification of inputs and outputs, losses, and delays in shipping products to their final destinations. The increase in additional cost is expected to hinder exports to the EU region and may negatively impact employment in the agricultural and export sectors in MP countries.

3. Objectives of the project

Apparently, the new safety standards may result in additional restrictions on the trade of agricultural and food products even though governments in the EU and Mediterranean Partner countries (MP) do agree that some trade restrictions may be essential to guarantee food safety and animal and plant health protection. Consequently, this research project aims at examining policy, technical, and institutional trade disputes that may arise between the EU and MP countries due to food safety measures represented in SPS and EUREPGAP. The main focus of this project is on exports of horticultural products from three countries in the Mashrek region: Egypt, Syria and Jordan. This research identifies what does it take to comply with these measures in terms of appropriate policies, and technical and trade procedures while at the same time acknowledging the genuine concerns of all parties about the safety and quality of agricultural and food products.

To achieve the objectives of this research, three methodologies have been employed including: Descriptive analysis; Econometric analysis (Multiple Regression analysis); and The Policy Analysis Matrix (PAM). Two sources of data will be used here: Primary and secondary data. The primary data was collected through a structured questionnaire from producers/exporters. Additional primary data was collected from interviews with people in public institutions related to food and agriculture trade and safety.

Several researchers from Egypt, Jordan and Syria participated in this study. A junior economist from Spain also participated in all stages of the study. The research project lasted for about 15 months after signing the agreement with FEMISE.

The results of this project are of great interest to decision makers in the Mediterranean Partner countries (MPs) and the EU region, especially those who are involved in issues of food safety and food trade negotiations. In addition, this research has provided detailed information about food safety regulations that might be useful to exporters and producers of horticultural products and other researchers in MPs and the EU region.

The main focus of this research was on exports of horticultural products from three countries in the Mashrek region: Egypt, Syria and Jordan. A recent document prepared by FEMISE and submitted at the meeting of the EU ministers of agricultural that was held in Italy at the end of 2003 concluded that EU countries were in a comparative disadvantaged situation in terms of fruits and vegetables (FEMISE, 2003). The document recommended that if only economic rationality was followed, the optimal solution for trade exchange between the EU and MP countries would certainly be a liberalized agricultural exchange translated by reciprocal flux (fruits and vegetables incoming from MP against cereals, meat and milk from the EU or other sources). The study also concluded that MP countries are facing many constraints that include among many others, the lack of equipment and inadequate technological skill in terms of appropriate varieties, quality, and sanitary control.

This research project aims at examining policy, technical, and institutional trade disputes that may arise between the EU and MP countries due to food safety measures represented in SPS and EUREPGAP. This research has identified what it takes to comply with these measures in terms of appropriate policies, and technical and trade procedures, while at the same time acknowledging the genuine concerns of all parties about the safety and quality of agricultural and food products. The specific objectives of the study are as follows:

- To identify the technical, institutional and policy constraints faced by governments and exporters (private sector) in the selected countries in meeting the requirements of SPS and EUREPGAP;
- To determine the expected trade impact of complying with these standards on the competitiveness of agricultural and food exports;
- To develop a strategy to meet the food safety requirements through identifying the most appropriate technical and economical means through which the EU can best assist the MP countries to improve domestic technical capacity in this area;
- To analyze the complexity of certain tariff and non-tariff barriers, within the framework of food safety measures, which hinder the trade of agricultural products in several MPs with the EU; and

- To assess the existing SPS standards, the EUREPGAP regulations, and the actually applied standards in the studied MP countries and compare them with international standards. This assessment should lead to recommendations on ways and means of harmonizing and simplifying these standards and how to develop a euro-Mediterranean bio-ethic agriculture.

4. Literature review

Limited research is available on the issue of SPS agreement and its conflict with trade. Few researchers have examined this issue worldwide. A recent project funded by the Australian Centre for International Agricultural Research (ACIAR) tackled this issue in depth (Mehta and George, 2003, and Chandra and Jayasuriya, 2003). The research project aimed at examining trade conflicts relating to food safety standards; the role of the Sanitary and Phytosanitary (SPS) agreement, and the related WTO dispute settlement procedures in resolving these disputes. The analysis was conducted through an in-depth comparative study of the export-oriented processed food industries in India and Thailand. In their study, the researchers established a quantitative and qualitative database to obtain a detailed national level overview of the nature and extent of the problems, and the constraints relating to meeting SPS standards. The study focused on selected products in the two countries including: Shrimp (both countries), Tuna (both countries), Poultry (both countries), Pig meat (Thailand), Mangoes (India), Pineapples (Thailand), and Mushrooms (India). The trade impact of food safety standards was analyzed using the Policy Analysis Matrix (Monke and Pearson, 1989) as a main tool. The analysis was based on estimating the 'export tax' equivalent of SPS compliance cost (TE) using detailed cost-structure data. TE estimates were then combined with other aspects of the incentive structure with an impact on export production at successive stages to estimate the nominal rate of protection (NRP) and the effective rate of protection (ERP). The aim was to measure the extent to which costs are raised by the need to comply with food safety standards.

Another approach to modelling technical trade barriers was developed by Calvin and Krissoff, (1998) through which they examined the tariff and technical trade barriers facing US apples in the markets of Japan, Korea, and Mexico. They calculated the tariff-equivalent (TE) of the technical (phytosanitary) measures that constrain US exports to the three markets. These estimates were then used to calculate how much trade was impeded by the phytosanitary measures in addition to the standard trade barriers. The model they used was a static partial equilibrium analysis.

Roberts and Krissoff (2004), concluded that sanitary and phytosanitary measures implemented by many countries to safeguard human and plant health can influence trade of horticultural products through increasing the costs of imports or prohibiting them completely. Multilateral negotiations are rules that were used as a vehicle to minimize the use of these measure as a tool by protectionists to protect domestic producers from international competition. The authors argue that these rules have lowered many unnecessary barriers to horticultural trade by agreeing on establishing transparent and science-based regulations. However, the researchers insisted that to quantify the benefits of continued regulatory reform, further research is needed to assess the trade and welfare effects of sanitary and phytosanitary measures on horticulture markets.

Among the many analytical tools that were suggested by Leonardo Iacovone (2003) to analysis the impact of sanitary and phytosanitary measures is the partial equilibrium model. The proposed partial equilibrium model by Iacovone can be tailored to measure the impact of different types of SPS measures; however it needs detailed information and knowledge on the specific measure to be analyzed. According to Iacovone, the model can be designed to capture several components including the protectionist component ("tariff like"), supply shift component ("addressing production externalities"), and demand shift component (addressing consumption externalities). He recommended that once the data is collected, the researcher needs to be very careful in the fine tuning of the model. The fine tuning of the model should emphasize on quantifying or measuring the economic value of the consequences of the implicit technical barriers imposed by the SPS measures in terms of increased production and marketing costs in the form of the additional processing required to meet standards (washing fruit, removing impurities, testing and inspection costs).

5. Conceptual framework

Agricultural exports play a crucial role in providing hard currencies to many southern Mediterranean countries. The horticultural export sub-sector is an important part of the economic development process in the three selected countries involved in this study. Egypt, Syria and Jordan have been attempting to build up an agricultural infrastructure capable of meeting growing domestic demand for agricultural commodities, as well as that of the highly absorptive markets of the Gulf States and sophisticated markets in the EU countries. The three countries represent a major portion of the Mashrek region. Joining the Euro-Mediterranean Partnership and the World Trade Organization (WTO) is expected to have a significant impact on the agricultural sectors in these countries. However, joining these two important organizations also implies commitments and requirements to be met, such as the SPS agreement. Hence, this research will focus on analyzing the horticultural sub-sector of the three countries in a regional perspective. To achieve the objectives of this research, three methodologies will be employed here:

- Descriptive analysis;
- Econometric analysis (Multiple Regression analysis); and
- The Policy Analysis Matrix (PAM);

The descriptive analysis will focus on the national as well as on the industry level issues. At the national level, the analysis will cover all aspects related to horticultural exports in the three countries including the volume of exports, impediments to penetrate potential markets, main partners, the development of horticultural export industry, and analytical descriptions to issues related to joining WTO, EU-MED and any other bilateral agreements. The collected data that was developed for this project contains the national level overview of the nature and extent of the problems and the constraints related to meeting SPS standards and EUREPGAP requirements. This database also includes the main public-sector and private organizations involved in the promotion and monitoring of processed horticultural products and food trade. The information in the database was collected through utilizing available secondary data from official sources and country profiles in addition to interviews with key government advisers involved in trade policy making and negotiations, these included scientists in the area of food quality, public agencies responsible for administration of export quality control, and focus groups involving major private sector players such as producers, traders/exporters and associations.

The descriptive analysis will also include a detailed supply-chain investigation of the selected crops, which will also involve a firm-level survey based on a structured questionnaire. This questionnaire was completed through field visits and interviews with producers and traders/exporters. It covered areas of production, post-harvest handling, food safety issues, transport, storage, and export.

The Econometric analysis (multiple regression analysis) will be used here to test the causality relationship between the performance variables and firm-characteristics. In other words, the analysis here is used to determine the impact of a firm's specific criteria on the incidence of rejection as a result of not abiding with SPS and/or EUREPGAP regulations. The dependent variable in this multiple regression was the hindrance of exports due to incidences of rejection for not complying with SPS or EUREPGAP regulations and the additional cost to meet these regulations. The set of independent variables included the firm's specific variables including the firm's size, ownership, age of firm, education level of the owner, invested capital, links with importing firms in destination markets, participation in workshops and international fairs, technical capacity available to meet standards, quality control methods, and source of inputs to the production and marketing process (Equation 1).

$$V = f(S, O, G, E, K, L, W, T, Q, I) \quad (1)$$

Where: V is the incidences of rejection due to SPS and/or EUREPGAP; S the firm's size; O ownership; G age of firm; E education level of the owner; K invested capital; L links with importing firms in destination markets; W participation in workshops and international fairs; T technical capacity available to meet standards; Q quality control methods, and I source of inputs to the production and marketing process is.

The impact of complying with SPS standards and EUREPGAP requirements on trade of horticultural products will be analyzed using the Policy Analysis Matrix (PAM). Person and Monke (1989) were the first to develop the Policy Analysis Matrix (PAM). The PAM approach serves both as a logical framework for thinking about the effects of changes in economic and agricultural policies, and as an empirical analytical tool for measuring the trade policy impacts. Many researchers in the region and abroad use the approach to evaluate the impacts of macroeconomic and agricultural policies. The use of this tool in the analysis draws heavily on the work conducted by ACIAR Project (2003) through estimating the 'export tax' equivalent of SPS compliance cost using detailed crop enterprise budgets to determine cost-structure for each of the selected horticultural crops. The estimate of "export tax" equivalent (TE) was then combined with other aspects of the incentive structure affecting export production at successive stages to estimate the Coefficient of Nominal Protection (NPC) and also the Effective Protection Coefficient (EPC). The purpose of this process is to measure the extent to which costs are raised by the need to comply with food safety standards. These enable marginal cost-benefit ratios to be computed so that the net gains from investments to upgrade quality to meet food safety standards in export markets can be ascertained.

This approach demonstrates whether the compliance with the SPS and EUREPGAP affects the competitiveness position of the country in producing and exporting the selected products. The major criterion of competitiveness that was used in this research is the comparative advantage which is measured by the Domestic Resource Ratio Coefficient (DRC). This coefficient shows if the studied crops are efficiently utilizing the limited resources of the three countries? In other words, do these crops enjoy a comparative advantage? A country is said to have a comparative advantage in the production of a tradable good if that country's production is efficient; if not, then it has a comparative disadvantage. The concept of comparative advantage deals with the issue of efficiency in production in the country compared with two or more trading nations, where nations with the lowest opportunity costs are relatively more efficient and have a comparative advantage. This concept is affected once the country is forced to comply with international safety regulations such as SPS and EUREPGAP, which implies additional costs in terms of equipments, materials and training (or what is called a new tax equivalent (TE).

The PAM analysis helps to illustrate how the food safety standards limit, de facto, the competition among farmers of the North, such as Spain, and the South of the Mediterranean. This in-depth analysis of the food safety factor can facilitate the integration of the agriculture in the partnership and determine how the assistance by the EU could be devised in a way to help producers in the South in penetrating the markets in the North.

Protection and comparative advantage coefficients was used to provide policy bids and recommendations. Economic profit is the cornerstone part of the Policy Analysis Matrix (PAM) analysis. Profit is defined as the difference between the value of outputs (revenues) and the costs of all inputs (costs).

Standard measures of the degree of price distortions have been estimated to compare profitability and efficiency of different crops. Several standard policy analysis ratios are estimated from values of the PAM. Ratios can be used to rank alternatives according to different policy objectives. These standard measures or ratios that will be calculated in constructed PAMs in the three countries include the Nominal Protection Coefficients (NPCs) and the Effective Protection Coefficients (EPC) for the selected crops.

The comparative advantage measure that is estimated here is the Domestic Resource Coefficient (DRC). The DRC was used to determine if the production and export of a specific crop, given that exporters/producers comply with SPS and/or EUREPGAP regulations, makes efficient use of the domestic resources. The DRC is calculated by dividing the factor costs G in Table 1 by the value added in social prices E-F. A DRC value greater than one indicates that the value of domestic resources used to produce the commodity is greater than the contribution of its value added at social prices, in other words comparative disadvantage exists. A DRC value less than one indicates that the country has a comparative advantage in producing that commodity.

Table 1: The policy analysis matrix

	Revenues	Costs		Profits
		Tradable inputs	Domestic factors	
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Policy Effects	I	J	K	L

Source: Monke E. and Person S.R. (1989). The Policy Analysis Matrix for Agricultural Development. Cornell University Press, Ithaca. P 23.

6. Research methodology

The three methodologies described above in the conceptual framework was employed in this research to help in achieving the objectives of this research and in providing answers and explanations to the research questions contained in this part of the proposal.

As indicated above, the descriptive analysis focused on issues related to the national level and the industry level. At the national level, the analysis covered many important aspects related to horticultural exports in the three countries including volume of exports, impediments to penetrate potential markets, main partners, the development of horticultural export industry, and analytical descriptions to issues related to joining WTO, EU-MED and any other bilateral agreements. This part of the analysis provided answers to the following research questions:

- Are food safety standards and inter-country differences considered major impediments to horticultural exports from MP countries to the EU region?
- Is there an economically 'recoverable' gap between the current and potential performance by the horticultural export sector? If this gap exists, then what are the major factors influencing it?
- Are exporters in MP countries able to comply with SPS standards and ERUOPGAP requirements? What would be the additional costs to producers and consumers in order to meet the standards and requirements?

The primary data that was used in the descriptive and econometric analysis was collected through face-to-face interviews with producers, traders and exports. A purposive sample of firms was selected with the help of farmers' and exporters' associations in the three countries. The sample consisted of about 20 farmers/exports in each country, based on an appropriate purposive sample selection procedure and bearing in mind getting comprehensive data and ensuring reasonable representation of relevant firm characteristics. The collected data from the selected firms was used to comprehend and analyse the level of performance in terms of export orientation, success level in meeting SPS standards and EUREPGAP requirements, and volume and incidence of rejections by importing countries.

This collected primary data was used in the Econometric analysis to test the causality relationship between the performance variables and firm-characteristics. The questionnaire provided information on the tested variables in the econometric model such as: when the firm was established, the invested capital, number of employees, level of specialization, number of annual rejected shipments due to sanitary regulations, participation in workshops and international exhibitions, cooperation and partnership with foreign investors, technical capability to meet safety regulations and standards.

The model utilized the collected data to determine the impact of firm's specific criteria on the incidence of rejection as a result of not abiding with SPS and/or EUREPGAP regulations. The dependent variable in this multiple regression was the hindrance of export due to incidence of rejections as a result of not complying with SPS or EUREPGAP regulations and the additional cost to meet these regulations. This part of the analysis helped in answering the following research questions:

- What are the critical factors that affect the compliance with SPS standards and EUREPGAP regulations?
- Do the SPS and EUREPGAP regulations create a bias in favor of large-scale farmers against small and medium-scale farmers in the MPCs?

- What kind of motivations and incentive measures would attract foreign firms (multinational enterprises from the EU) to invest in the export-oriented agricultural sectors in the MPCs? Would such an involvement be an effective way of overcoming some SPS and EUREPGAP related impediments to agricultural trade?

The third methodology that was employed in this research is the application of the Policy Analysis Matrix (PAM). This technique was used to examine the impact of complying with SPS standards and EUREPGAP requirements on trade of horticultural products in the three selected countries. This technique was used in a previous study by Jabarin et al. (2001) which was funded by FEMISE to verify if the three countries enjoy comparative advantages in producing and exporting horticultural products. The researchers utilized the data sets that were collected in that study to construct the needed matrixes for this policy analysis. Additional data related to international prices and volume of imports to the EU markets was obtained from the latest published EUROSTAT database. This technique was recently used in a similar work conducted by ACIAR Project (2003) to estimate a proxy for the compliance cost of SPS in terms of an 'export tax' equivalent (TE). The TE on each exported kilogram of the selected horticultural crops will be added to the estimated social crop enterprise budgets. Combined with other costs, this TE is expected to affect the incentive structure of the export-oriented production in the three countries.

Two indicators for incentive structure were estimated in this part of the research, the Nominal Protection Coefficient (NPC) and the Effective Protection Coefficient (EPC). The NPC is simply a ratio that compares the observed (private or financial) commodity price with a comparable world (social or economic) price including the "TE". This ratio indicates the impact of policy (and of any market failures not corrected by efficient policy including abiding with SPS and EUROEPGAP standards) that causes a divergence between the two prices. While, the EPC is another indicator of incentives in the form of a ratio that compares the value added of the selected crop in private prices to value added in world prices. The EPC measures the degree of policy transfer from product market-output and tradable-input-policies.

In this part of the methodology, the indicator of comparative advantage was estimated using the same set of collected data. The Domestic Resource Coefficient ratio (DRC) shows if the country enjoys a comparative advantage in producing and exporting the studied commodity. Calculation of DRCs helps in comparing the efficiency among the different production systems. It is believed that imposing food safety regulations will affect the competitiveness of a country in producing and exporting as a result of the added cost that is estimated here as an "TE".

The employed policy analysis methodology was used to answer the following research questions:

- What is the magnitude of protectionism involved in applying food safety standards? In other words, how would the food safety standards impact the level of protection of the selected crops in the three countries?
- Would horticultural exports still be competitive if producers/exporters have to invest in new equipments and arrangements to meet the food safety standards and requirements?
- What is the expected role of government policies in MP countries in bridging the gap between current and "what should be" to shorten the time involved in the transformation process? and;
- How would the EU agricultural policy, in terms of reciprocal liberalization and structural tools such as a "Feoga Orientation" help and impact the modernization of the agricultural sector in southern MPCs?

The above three methodologies were collectively used to provide inputs to answer the final research question: What are the pillars of a successful strategy that can be adopted by the MPCs to promote exports to the EU region, taking into consideration supplying high quality and safe products without competing with agricultural producers in North Mediterranean countries? In other words, how could a "win-win" situation be achieved taking into consideration the expected upcoming trade constraints in the form of food safety standards?

7. Review of major sanitary measures affecting international trade of food products

International trade of food products is affected by three major measures and systems that were designed by several international organizations such as WTO and FAO, in addition to the EUREPGAP which was originally initiated in 1997 by retailers belonging to the Euro-Retailer Produce Working Group (EUREP) and developed into an equal partnership of agricultural producers and their retail. In the following section we shed the light on the major component of each of the three measures and systems that can have a vital impact on food trade in general and on horticultural products trade in particular. The reviewed measures and systems in this section include: 1) the Sanitary and phytosanitary measures (SPS); 2) the EUREPGAP, and 3) the HACCP.

7.1 Sanitary and phytosanitary (SPS) measures

The reduction of trade barriers associated with the movement of manufactured products has been subject to negotiations by many countries since the late 1940s, and was tackled by the first significant trade treaty known as the General Agreement on Tariffs and Trade (GATT). The increasing popularity of market-oriented policies, the high cost of maintaining domestic farm programs, and the growing frustration with global agricultural trade conditions by the 1980's, brought about the urgent need for agricultural trade improvement. The GATT Round, Uruguay Round (1986-1994), marked the first negotiations on agricultural trade. The result of the negotiations was the Agreement on the Application of Sanitary and Phytosanitary Measures, which is known as the SPS Agreement.

Generally, the Agreement requires governments to adopt SPS regulations, which affect trade in an open, non-discriminatory, and science-based fashion. Committees within the World Trade Organization (WTO) monitor the implementation of the SPS Agreement and administer the dispute settlement procedures.

7.1.1 SPS Agreement principles

7.1.1.1 Basic rights

The fundamental right of countries to protect the health and life of their consumers, animals, and plants against pests, diseases, and other threats to health are recognized by the SPS Agreement. However, several rules have been formulated to prevent the use of health measures in an unjustified, arbitrary, or discriminatory fashion.

SPS protection measures must be based on either a relevant international standard established by an international standards body recognized by the SPS Agreement, or a scientific risk assessment.

7.1.1 .2 Harmonization

Harmonization is intended to reduce unnecessary variances, represent the source of trade conflicts, between countries' technical standards. Therefore, the SPS Agreement supports, but does not require, countries to harmonize their SPS measures, to the greatest extent possible, by basing their health measures on relevant international standards.

The SPS Agreement recognizes three international standard setting bodies as the official entities for developing health-related standards, guidelines and recommendations: Codex Alimentarius for food safety standards, International Plant Protection Convention (IPPC) for plant health standards, and the Office of International Epizooties (OIE) for animal health standards.

When International standards are implemented, measures are considered to be unchallenged, an in such a case a risk assessment is unnecessary.

When a country prefers not to use an existing international standard, it must base its measures on a risk assessment and must be prepared to justify the deviation from the relevant international standard.

7.1.1 .3 Risk assessment

Scientific principles are emphasized by the SPS Agreement as a basis for health-related protection measures in trade. Thus, phytosanitary measures are based on a risk assessment (or some comparable

evaluation of scientific evidence). Risk assessment, includes risk assessment, risk assessment factors, and economic consequences.

Risk assessment is defined by the SPS Agreement as: "the evaluation of the likelihood of entry, establishment or spread of a pest or disease within the territory of an importing Member according to the sanitary or phytosanitary measures that might be applied, and of the associated potential biological and economic consequences; or the evaluation of the potential for adverse effects on human or animal health arising from the presence of additives, contaminants, toxins, or disease-causing organisms in food, feedstuffs and beverages"

Risk Assessment factors are the following factors identified by the SPS Agreement and which countries must take into account when conducting a risk assessment: "relevant processes and production methods, relevant inspection, sampling and testing methods; prevalence of specific diseases or pests; existence of pest- or disease-free areas; relevant ecological and environmental conditions; and quarantine or other treatments"

Economic Consequences are the following economic factors required by the SPS Agreement to be taken into account when evaluating risks to plant or animal health: “potential damage in terms of loss of production or sales in the event of the entry, establishment or spread of a pest or disease; the costs of control or eradication in the territory of the importing Member; and the relative cost-effectiveness of alternative approaches to limiting risk"

This does not preclude the consideration of other relevant consequences associated with pest introductions, including non-quantitative impacts on the environment (e.g. harm to wild flora and forests).

7.1.1 .4 Setting the appropriate level of protection

The SPS Agreement recognizes and maintains the right of countries to determine and set an "appropriate level of protection" for all pest or disease threats. While the SPS Agreement maintains countries' right to determine what is an appropriate level of protection for them, the SPS Agreement contains several disciplines to prevent countries from setting their levels of protection in an arbitrary or discriminatory fashion.

The SPS Agreement defines the term "appropriate level of protection" (ALP) as: "the level of protection deemed appropriate by the member establishing a sanitary or phytosanitary measure to protect human, animal, or plant life or health". A note is included indicating that: "many members otherwise refer to this concept as the acceptable level of risk" The SPS Agreement treats the ALP and "acceptable level of risk" as synonymous terms.

In setting the ALP the SPS Agreement requires countries to: "avoid arbitrary or unjustifiable distinctions in the levels of protection it considers to be appropriate in different situations, if such distinctions result in discrimination or a disguised restriction on international trade".

The objective is to prevent arbitrary behavior when it comes to setting the ALP in different, but comparable, risk situations. Different levels of protection may exist for different commodities for justifiable reasons. However, countries should be prepared to provide a science-based rationale for such differences.

Also, under the SPS Agreement, countries must ensure that their SPS measures are not more trade restrictive than necessary to achieve their appropriate level of protection. "A measure is considered more trade-restrictive than required when there is another reasonable measure available that provides the appropriate level of protection sought by the importing country, and which is significantly less restrictive to trade."

Countries are required to provide information regarding their risk assessment procedures (including the factors that were taken into consideration) as well as information on how and why they selected a particular level of protection. The emphasis on making regulatory decisions and actions transparent is intended to curb the ability of countries to set arbitrary and non-science based SPS measures.

To further the goal of consistency in risk management decision making, the WTO SPS Committee-- a Committee consisting of representatives from all WTO member countries--is mandated to develop

guidelines to promote consistency in the levels of protection applied for similar, identical, or comparable risks. This effort is now underway in the SPS Committee.

7.1.1 .5 Regionalization

Under the SPS Agreement, countries are committed to adapting their import requirements to the health conditions of the specific area or region where a plant or animal commodity originates. This is the concept of regionalization, or the idea of recognizing areas or regions which present a low pest or disease risk and allowing trade in animal or plant commodities from those areas. Plant quarantine officials generally do not use the term regionalization, "referring instead to the concept of "pest free areas". However, this is the same concept. Under the SPS Agreement, a region (or pest free area) may be all of a country, part of a country, or all or parts of several countries.

Regionalization presents a departure from past norms where countries tended to determine health status or disease condition on a whole country basis. The concept of regionalization recognizes that pest and disease conditions may vary across a country as a result of ecological, environmental, and quarantine differences. The concept of regionalization follows from the basic premise that regulatory measures must be based on scientific principles.

Hence, countries must be prepared to consider scientific evidence which may demonstrate the existence of a pest or disease free area within an otherwise infested country. The burden of demonstrating a pest or disease free area rests with the exporting country. The importing country's obligation is to be clear about the administrative and risk assessment procedures which would be used to evaluate free area requests.

7.1.1 .6 Equivalence

Under the SPS Agreement, countries are required to recognize another country's SPS measure as equivalent to their own when the exporting country demonstrates that its treatments or pest control procedures provide the importing country's desired level of quarantine security.

Equivalence encourages countries to recognize that different procedures (e.g., inspection, certification, testing, surveying, trapping, fumigation, and other treatments or practices) can be used to achieve the level of protection demanded by the importing country. The burden is on the exporting country to objectively demonstrate that its system or practices, while different from the importing country's measures, still achieves the importing country's plant quarantine security goals.

7.1.1.7 Transparency

Under the SPS Agreement, countries are required to make their rulemaking process transparent. This means:

- providing advance notification to WTO members of new proposed phytosanitary measures which may affect trade;
- making available the scientific basis for specific phytosanitary regulations to interested parties upon request.

However, transparency includes documentation on the appropriate level of protection selected; and providing countries with an opportunity to comment on their proposed rules before they are implemented (60-day comment period expected).An exception to this advance notification rule exists for emergency disease or pest situations.

The intended effect of the transparency provisions in the SPS Agreement is greater openness among WTO members in the rulemaking process. Like other provisions in the SPS Agreement, the transparency rule is intended to compel regulatory officials to ensure that their SPS measures are based on relevant scientific evidence and are consistent with previous risk management decisions. Advance notification of rules is intended to give affected parties, both domestic and foreign, an opportunity to provide relevant information on proposed rule changes and to anticipate and adjust to any regulatory actions which may affect trade.

7.1.1.8 Dispute settlement

At the WTO, a Dispute Settlement Body (DSB) was established to administer the dispute settlement system. Dispute settlement procedures begin with bilateral consultations. If these discussions fail to resolve the issue, a complaining party may request formation of a panel. Panels -- consisting of individuals agreed upon by the parties and drawn from an established list of recognized experts in the field and international law professionals -- may seek recommendations and advice from the relevant international standard setting organizations (i.e., OIE, Codex, IPPC, or their regional subsidiary organizations), individual experts, or appoint a board of experts to evaluate the technical aspects of a given issue.

A key question panels will ask when reviewing a phytosanitary measure that may be subject to dispute, is whether that measure is based on a relevant international standard. If not, the next test is whether the measure was based on a risk assessment. Recent panel reviews, such as the one formed to evaluate the US-EU hormone dispute, highlighted the important role international standards and risk assessment play in justifying and defending an SPS measure.

If a panel issues an opinion that a measure is in violation of the SPS Agreement, the offending government has the option of either changing the WTO-inconsistent measure or keeping it and compensating the complaining party for the value of impaired trade. If compensation is not provided, the complaining party would be permitted to suspend some trade concessions of equivalent value to lost trade.

7.2 EUREPGAP

7.2.1 Background on the EUREPGAP

The EUREPGAP was originally initiated in 1997 by retailers belonging to the Euro-Retailer Produce Working Group (EUREP) and developed into an equal partnership of agricultural producers and their retail customers. The aim was to develop widely accepted standards and procedures for the global certification of Good Agricultural Practices (GAP).

The EUREPGAP, from a technical point of view, is a set of normative documents convulsion to be legitimized into internationally recognized certification criteria such as ISO Guide 65. Collaboration among representatives from all stages of the food chain around the world formulated and developed these documents. Moreover, stakeholders outside the Industry, including consumer and environmental organizations and governments, have also been involved in preparing the protocols. This broad consultation has produced a powerful and challenging but nonetheless achievable protocol which farmers around the world can use to demonstrate compliance with Good Agricultural Practices.

It is possible for producer organizations to seek an independent and transparent recognition of equivalence with the EUREPGAP standards and procedures through a benchmarking system, thereby facilitating global trade and aiding the harmonization of technical criteria.

EUREPGAP members include retailers, producers/farmers and associate members from the input and service side of agriculture. Governance is by sector specific EUREPGAP Steering Committees, which are chaired by an independent Chairperson. Both the standard and the certification systems are approved by the Technical and Standards Committees working in each product sector. These committees have 50% retailer and 50% producer representation, creating an effective and efficient partnership in the supply chain. The work of the Committees is supported by a non-profit limited company "FoodPLUS" based in Cologne, Germany.

EUREPGAP was driven by the desire to reassure consumers after the occurrence of food safety incidences such as BSE (mad cow disease), pesticide concerns, and the rapid introduction of GM foods. Thus, consumers throughout the world are becoming worried about food production; hence, they needed re-assurance that it is both safe and sustainable. Food safety is a global issue and goes beyond international boundaries. Many EUREPGAP members are global players in the retail industry and obtain food products from around the world. For these reasons, a need has arisen for a commonly recognized and applied reference standard of Good Agricultural Practice which has at its centre a consumer focus.

These factors led to the development of EUREPGAP, sometimes known as "the triple bottom line - people, planet and profit", which recognizes the importance major corporations and multinational supply bases place on ensuring that agriculture is undertaken in a responsible way that respects food safety, the environment, workers welfare, and the welfare of animals. Good Agricultural Practices, which are understood by producers all over the world, deliver clearly defined outcomes in these areas.

By applying the good agricultural practices, producers reduce the risks in agricultural production. EUREPGAP provides the tools to objectively verify best practice in a systematic and consistent way throughout the world, which is achieved through the protocol and compliance criteria. EUREPGAP's scope is concerned with practices on the farm, after which they come under the control of other Codes of Conduct and certification schemes relevant to food packing and processing, guaranteeing the entire chain right through to the final consumer.

Another key goal is to provide a forum for continuous improvement. The technical and standards committees, consisting of producer and retail members, have a formal agenda to review emerging issues and carry-out risk assessments. This is a rigorous process, following the principles of HACCP, and involving experts in their field leading to revised versions of the protocol.

7.2.2 EUREPGAP Terms of Reference

The Aim is to respond to Consumer Concerns on Food Safety, Animal Welfare, Environmental Protection, and Worker Health, Safety and Welfare by:

- Encouraging the adoption of commercially viable Farm Assurance Schemes, which promote the minimization of agrochemical inputs within Europe and Worldwide.
- Developing a Good Agricultural Practice (GAP) Framework for benchmarking existing Assurance Schemes and Standards including traceability.
- Providing guidance for continuous improvement and the development and understanding of best practice.
- Establishing a single, recognized framework for independent verification.
- Communicating and consulting openly with consumers and key partners, including producers, exporters, and importers.

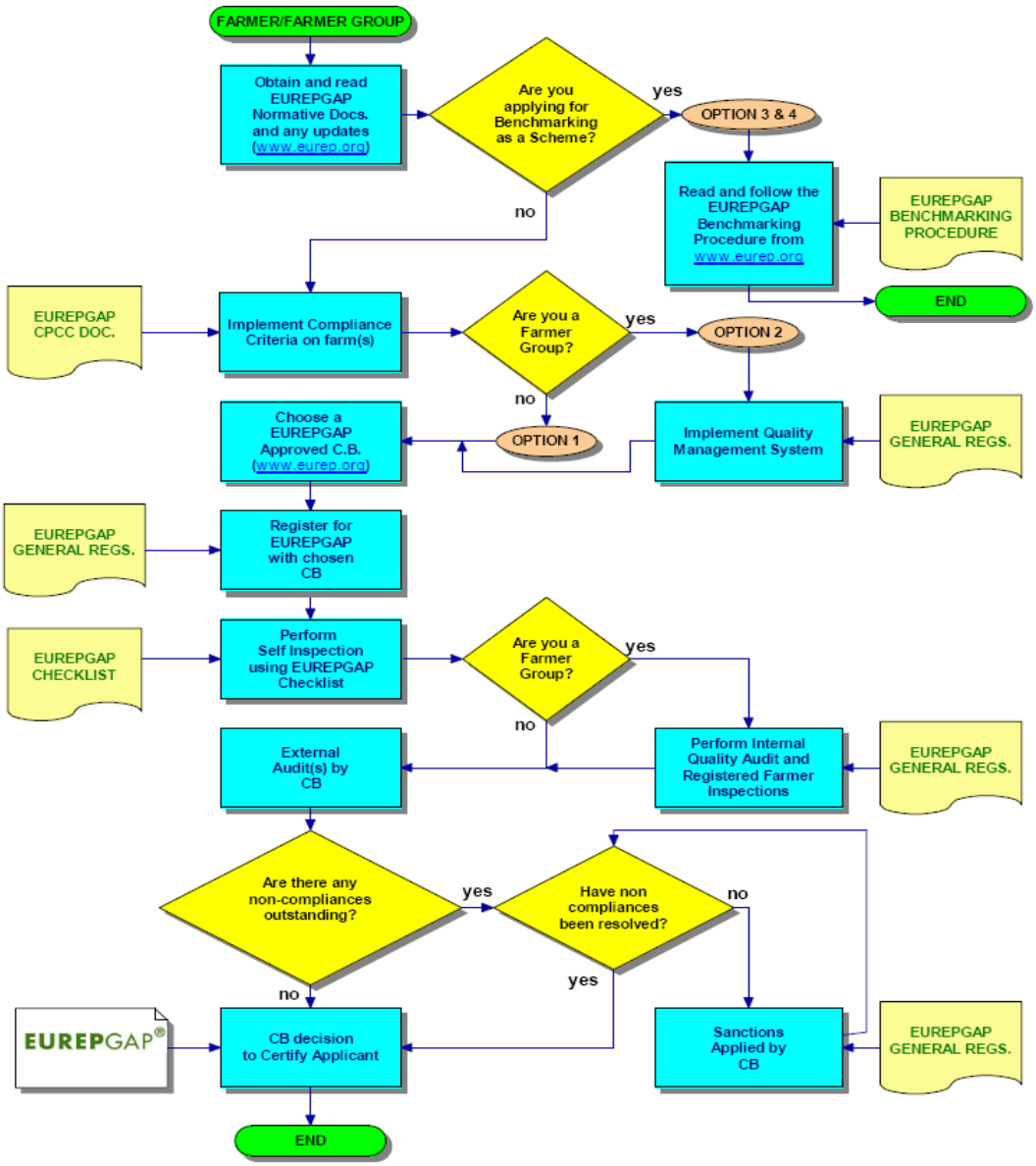
7.2.3 Objectives of the EUREPGAP

EUREPGAP scheme principles are based on the EUREPGAP Terms of Reference and specifically on the following concepts:

- Food Safety: The standard is based on Food Safety criteria, derived from the application of generic HACCP principles.
- Environment Protection: The standard consists of Environmental Protection Good Agricultural Practices, which are designed to minimize the negative impacts of Agricultural Production on the Environment.
- Occupational Health, Safety, and Welfare: The standard establishes a global level of occupational health and safety criteria on farms, as well as awareness and responsibility regarding socially related issues; however it is not a substitute for in-depth audits on Corporate Social Responsibility.
- Animal Welfare (where applicable): The standard establishes a global level of animal welfare criteria on farms.
- EUREPGAP is a global Scheme and Reference for Good Agricultural Practice, which is managed by the EUREPGAP Secretariat.
- FoodPLUS is a non-profit, industry-owned and governed organization that legally represents the EUREPGAP Secretariat located in Germany.
- The objective of this part of the document is to explain and regulate the operation of the EUREPGAP Scheme and the interaction between the Certification Bodies (from now on CBs), the Registered Farmer or Farmer Group, the schemes seeking equivalence acceptance and the EUREPGAP Secretariat.
- EUREPGAP provides the standards and framework for Independent, recognized Third Party Certification of Farm Production Processes based on (EN45011/ISO Guide 65).

- Certification of the production process - producing, growing or cropping- of these products ensures that only those that reach a certain level of compliance with established Good Agricultural Practices set out in the EUREPGAP normative documents are certified as shown in Figure 1.
- The Scheme covers the entire agricultural production process of the certified Product, from before the plant is in the ground (seed and nursery control points) to non-processed end product (Produce Handling control points).
- Participation is voluntary and based on objective criteria. EUREPGAP is non-discriminatory to Certification Bodies and/or Farmers.

Figure 1: Farmer certification process flowchart



7.3 The Hazard Analysis Critical Control Point (HACCP)

The Hazard Analysis Critical Control Point (HACCP) system is a management tool ensuring the safety of food products by systematically identifying specific hazard points and applying control measures. This concept was developed in the early 1970s and is recognized worldwide and accepted as an effective system for food safety. Even though the basic principles of this concept are not new, however, its introduction shifted the emphasis from end-product testing to preventive control of

critical aspects of the food chain from "farm to fork". It plays an important role in facilitating the international trade in food in accordance with the WTO/SPS agreement. The Hazard Analysis Critical Control Point (HACCP) concept permits a systematic approach to the identification of hazards and an assessment of the likelihood of their occurrence during the manufacture, distribution, and use of a food product, and defines measures for their control. The resulting HACCP plan can be integrated in a more general Quality and Safety assurance plan.

7.3.1 Principles of the HACCP system

HACCP consists of seven principles according to Codex Alimentarius. HACCP is a systematic approach to the identification, evaluation, and control of food safety hazards based on the following seven principles:

Principle 1: Hazard Analysis and Preventive Measures

Potential hazards associated with a food must be identified. The hazard could be biological, such as microbial; chemical, such as a toxin; or physical, such as glass or metal fragments. Control measures to prevent the occurrence of hazards must be determined accordingly.

Principle 2: Determine the Critical Control Points (CCPs)

These are points in the production of a certain food--from its raw state through processing and shipping to consumption by the consumer--at which the potential hazard can be controlled or eliminated. Examples are cooking, cooling, packaging, and metal detection.

Principle 3: Establish Critical Limits

The preventive measures with critical limits for each control point.

Principle 4: Establish Monitoring Procedures

Such monitoring procedures might include cooking time and temperature, together with who is responsible for monitoring.

Principle 5: Establish Corrective Actions

Those corrective actions are to be taken when monitoring shows that a critical limit has not been met--for example, reprocessing or disposing of food if the minimum cooking temperature is not met.

Principle 6: Establish Verification Procedures

These are procedures to verify that the system is working properly--for example, testing time-and-temperature recording devices to verify that a cooking unit is working properly.

Principle 7: Establish Record-Keeping and Documentation Procedures

This would include records of hazards and their control methods, the monitoring of safety requirements and action taken to correct potential problems.

Each of these principles must be backed by valid scientific knowledge.

7.3.2 HACCP Framework

In the HACCP framework, the term hazard refers to any agent in, or condition of, food that is unacceptable because it has the potential to cause an adverse health effect. Examples of hazards are pathogenic micro-organisms and/or their toxins, chemicals such as carcinogens and allergens, and physical objects such as stones, bones etc. that may injure the consumer. The conditions conductive to hazards may be any of the following:

- The unacceptable presence of a biological, chemical, or physical contaminant in raw materials, in semi-finished products, or in a production line environment.
- The unacceptable potential for growth or survival of micro organisms and the unacceptable potential for generation of undesirable chemicals (e.g. nitrosamines) in semi-finished products, or in a production line environment.
- The unacceptable (re)contamination of semi-finished or finished products with micro organisms, chemicals, or foreign material.

8. Results of the analysis

8.1 Results of the descriptive analysis

Different methodologies were employed in this study to answer the research questions raised to reach the reported objectives mentioned above. The descriptive analysis focused on issues related to the national level and the industry level. At the national level, the analysis covered all aspects related to horticultural exports in the three countries including volume of exports, impediments to penetrate potential markets, main partners, the development of horticultural export industry,…etc.

8.1.1 Horticultural exports of the studied countries

Egypt, Jordan and Syria are major exporters of horticultural products to other Arab countries in the region as well as to the EU markets. Table 2 shows that the total agricultural exports of the three studied countries were on a continuous increase since 1985. Compared to the year 1985, total exports of the three countries increased in the year 2003 by more than two folds.

Table 2: Total agricultural exports from studied countries (1985-2003)

Year	National Exports (1000$)			Total Exports (1000$)
	Egypt	Jordan	Syrian Arab Republic	
1985	661,567	121,737	206,261	989,565
1990	427,026	111,009	740,415	1,278,450
1995	536,117	226,985	750,577	1,513,679
2000	518,270	294,323	658,647	1,471,240
2001	620,492	316,118	652,908	1,589,518
2002	774,193	412,100	1,064,985	2,251,278
2003	938,152	440,325	597,209	1,975,686

Source: FAO, 2004

Horticultural exports in the three countries represent an important part of the total agricultural exports. As portrayed in Table 3 horticultural exports formed about 38 percent of the total agricultural exports in the year 1995. However, the importance decreased in the following years to reach 24 percent of total agricultural exports in the year 2003. Fresh fruits and vegetables exports have always been one of the major sources of foreign exchange for the three countries.

Table 3: Total fruits and vegetables exports from studied countries (1985-2003)

Year	National Exports (1000$)			Total Exports (1000$)
	Egypt	Jordan	Syrian Arab Republic	
1985	154,411	62,170	16,347	232,928
1990	127,672	70,336	210,696	408,704
1995	206,799	99,847	275,576	582,222
2000	138,342	105,544	252,497	496,383
2001	170,416	136,581	227,079	534,076
2002	180,667	154,189	220,107	554,963
2003	214,298	163,643	92,363	470,304

Source: FAO, 2004

The major exported horticultural crops vary from one country to another in the region. For instance, potatoes and citruses are the major horticultural exports of Egypt, while olives and olive oil are the major horticultural exports of Syria. While, tomatoes are the major exported crop of Jordan. As indicated in Table 4 , Egyptian exports of potatoes and oranges represented 40 percent of the total exports in 2003. While olive oil exports from Syria formed about one half of horticultural exports in the same year. Tomatoes are the major exported crop in Jordan which represented one third of Jordan's total exports of horticultural products in 2003.

Table 4: Major exported horticultural products from studied countries (1985-2003)

Year	National Exports (1000$) Total Exports (1000$)			
	Potato (Egypt)	Oranges (Egypt)	Olive oil &olives (Syria)	Tomato (Jordan)
1985	26,974	86,541	0	13,532
1990	22,426	49,103	0	33,617
1995	102,116	13,217	13,524	24,745
2000	27,390	16,558	4,009	34,262
2001	29,750	50,666	1,165	50,381
2002	42,617	26,633	10,096	59,167
2003	43,972	39,520	45,105	54,652

Source: FAO, 2004

8.1.2 Analysis of Questionnaires in the Studied Countries

The descriptive analysis also includes a detailed supply-chain investigation of the selected crops, which involved a firm-level survey based on a structured questionnaire. This questionnaire was completed through field visits and interviews with producers and traders/exporters. It covered the different areas related to production, post-harvest handling, food safety issues, transport, storage, and export. The questionnaire was used to answer the following research questions:

- Are food safety standards and inter-country differences considered major impediments to horticultural exports from MP countries to the EU region?
- Is there an economically 'recoverable' gap between the current and potential performances by the horticultural export sector? If this gap exists, then what are the major factors influencing it?
- Are exporters in MP countries able to comply with SPS standards and EUREPGAP requirements? What would be the additional costs to producers and consumers in order to meet the standards and requirements?

A total number of 56 exporters and producers in the three countries were interviewed face to face. In addition, some interviews were made with public officials and administrators in exporters' associations in Jordan and Egypt. The following is the analysis of the major issues raised in the questionnaire that was used in answering the research questions:

- Many of the interviewed exporters and producers started their horticultural exports as early as 1970. However, about one half established the export business during the nineties of the last century.The majority of the interviewed Egyptian, Syrian, and Jordanian exporters do export fresh fruits and vegetables to the EU countries as well as the rest of the regional market, especially the Arabian Gulf. However, some of the Syrian exporters export olive oil in addition to many types of fresh horticultural products.
- All of the interviewed exporters are from the private sector, of which one fourth are individual exporters while the rest are private companies of limited liability owned by groups from the private sector in the three countries.
- The invested capital of those who answered the related question ranged from US$ 10,000 to US$5,000,000. The average invested capital for the 28 companies who replied to this question was US$ 100,171.
- About 95% of exporters always deal with the same importers and traders in the importing countries.
- Eight out of the 56 interviewed exporters stated that some of the shipments to the EU markets were rejected in the last year, of which six exporters concluded that the rejection was due to non-compliances with the health (sanitary and phytosanitary) regulations.
- The total volume of the rejected shipments in 2003 ranged from 9 tons to 600 tons. The rejected products were tomatoes, Clementines, potatoes, okras and other mixed vegetables.
- The shipments were rejected upon arrival to destinations in Germany, England, and Romania.
- 23 percent of the exporters know that there are international agreements called SPS and EUREPGAP. While, about 32 percent knows about the EUREPGAP and the HACCP, however

the remaining exporters have no idea about any of the three food sanitary regulations and protocols.

- The 55 percent of the interviewed exporters, who knew about sanitary regulations, stated that they invested in new equipments to comply with these regulations. The new investments were in the form of post-harvest handling equipments such as pre-cooling and cold storage facilities, grading machines, in addition to measurements tools and laboratories for quality control testing.
- The total value of invested capital in the new equipments, by the 20 exporters who responded to this question, to meet the sanitary regulations amounted to about US$ 7.23 million. This means that on average, each exporter invested about US$ 375 thousand.
- The estimated annual operational cost of the newly installed equipments amounted to US$ 1.3 million (an average of US$ 68 thousand per exporter).
- More than one half of the interviewed exporters assured that complying with the sanitary regulations of the SPS, EUREPGAP, and HACCP will increase the total cost of exported products by an average of 17 percent. However, some of them estimated the additional cost by approximately 50 percent of the current costs.
- Only thirteen exporters stated that they do not have qualified technical staff who are able to apply SPS, EUREPGAP and HACCP regulations on their facilities.
- 67 percent of the interviewed exporters believe that complying with SPS and EUREPGAP regulation will increase their competitiveness in the export markets of horticultural products. They stated that their competitive situation in these market will improve through: 1) obtaining higher prices for their higher quality products; 2) pre-contracting with importers in the EU and other export markets; 3) improving the efficiency of the marketing systems in the three countries; and 4) exploring new export markets and niches.
- The biggest impediments facing the export sector of horticultural products are: 1) technical and 2) commercial.
- The technical impediments are those related to: 1) the lack of highly qualified laborers; 2) the absence of modern and efficient packing and grading facilities; 3) the low quality of the local produce in the three countries; 4) the tough requirements imposed by the EU; 5) the limited capacity of air cargo especially to East Europe; and 6) the absence of quality control laboratories in the region, especially for testing chemical residues.
- The commercial impediments are: 1) the high cost of exported products from the original sources; 2) the difficulties in shipping and forwarding procedures to EU markets; 3) the lack of commitment on the part of local producers in terms of delivery dates and product quality; 4) the difficulties in issuance of needed certificates and other routine procedures (bureaucracy); 5) the national rules and regulations; 6) the high shipping costs; and 7) the unorganized horticultural export industry.
- Other commercial impediments at the international level include: 1) the lack of experience in and knowledge of international rules and regulations especially those related to the EU; 2) the lack of funding for establishing the needed infrastructure to meet international requirements; and 3) the tough competition in the export markets especially from neighbouring countries.
- Impediments related to SPS include: 1) the serious lack of knowledge about SPS requirements and regulations; 2) the high cost of the infrastructure needed to meet SPS conditions; 3) the absence of an inspection mechanism to monitor production areas at domestic producers; and 4) the non-existence of local legal bodies responsible for the implementation and monitoring of SPS and other agreements' regulations.
- Type of needed technical assistance from the EU: 1) intensive training on SPS and other quality related regulations; 2) support in establishing proper shipping fleets to EU markets; 3) elimination of all commercial barriers; 4) modern infrastructure in terms of the advanced grading and packing facilities needed to improve product quality; 5) awareness programs on SPS and other EU regulations tailored to producers and exporters; 6) support in establishing a certification and accreditation authority for SPS and EUREPGAP regulations and protocols in the different countries in the region; 7) financial and technical support to small farmers; and 8) providing specialized marketing information about EU markets and regulations and importing partners.

In conclusion, the answers to the research questions raised in this part of the study which are based on the analysis of the questionnaires are as follows:

- Are food safety standards and inter-country differences considered major impediments to horticultural exports from MP countries to the EU region?

The answer to this question is "YES". Food safety standards are considered major impediments for the export of horticultural products to the EU markets. This problem is expected to become more serious in the future as the EU intends to strictly apply SPS and other hygiene related regulations on all horticultural imports from outside the EU zone.

- Is there an economically 'recoverable' gap between the current and potential performances by the horticultural export sector? If this gap exists, then what are the major factors influencing it?

Indeed there is a gap between current and potential performance of the horticultural export sector. The major factors influencing this gap, as indicated in the analysis of the questionnaire above include: 1) low quality of produced and exported products from the region which results in low economic revenues to both exporters and producers; 2) lack of needed infrastructure to meet quality and sanitary regulations in the EU region; and 3) the majority of producers, especially small-scale producers, suffer from the lack of access to proper know-how, funding, and export markets.

- Are exporters in MP countries able to comply with SPS standards and ERUOPGAP requirements? What would be the additional costs to producers and consumers in order to meet the standards and requirements?

The majority of exporters, especially small-scale ones, are not able to meet the SPS and EuropGap requirements. As indicated in the analysis of the questionnaire above, the additional costs to meet these standards which will be an additional burden on exporters is expected to amount, on average, to 17 percent of the total cost of exported products. Some of the exporters estimated the additional cost by approximately 50 percent of their current total costs.

8.1.3 Analysis of critical factors affecting compliance with SPS and other sanitary regulations

The collected data was also utilized in the proposed model to determine the impact of a firm's specific criteria on the incidence of rejection as a result of not abiding with SPS and/or EUREPGAP regulations. The dependent variable in this multiple regression will be the hindrance of export due to incidences of rejection as a result of not complying with SPS or EUREPGAP regulations and the additional cost to meet these regulations. This part of the analysis was used to answer the following research questions:

- What are the critical factors that affect the compliance with SPS standards and EUREPGAP regulations?

Only ten percent of the interviewed exporters reported rejections in the EU markets. It seems that many of exporters were not willing to report rejections in the export markets. This limited number of observations was not sufficient to conduct the proposed causality analysis using multiple regression. However, using these six observations with caution, the regression analysis was used to test if the number of rejections (as a dependent variable) is affected by the year of establishment of the firm and the availability of well-trained specialists in SPS and EuropGap (as independent variables) as indicated in equation 2 below.

$$V = f(G, T) \qquad (2)$$

Where: V is the incidence of rejections due to SPS or/and EUREPGAP; G the age of firm; and T the technical capacity available to meet standards.

The result of the regression analysis depicted in Table 5 shows that despite the relatively high value of the coefficient of determination (R^2=0.62), the statistical tests (F-test and t-Student tests) of the estimated parameters were not statistically significant. However, it is worth mentioning that the positive signs of the estimated parameters indicate that the number of rejected shipments increases as the exporting firm gets older in age (or the newly established firms have a lower rate of rejections which might be as a result of installing new and modern equipments).

Table 5: Regression Analysis Results

Regression Statistics	
Multiple R	0.788034115
R Square	0.620997766
Adjusted R Sq	0.36832961
Standard Erro	1.196572696
Observations	6

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	7.037975	3.51898734	2.45776	0.233325741
Residual	3	4.295359	1.43178622		
Total	5	11.33333			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*
Intercept	-436.380	219.623	-1.987	0.141	-1135.317
X Variable 1	0.219	0.110	1.996	0.140	-0.130
X Variable 2	3.962	1.810	2.189	0.116	-1.798

- Do the SPS and EUREPGAP regulations create a bias in favor of large-scale farmers against small and medium-scale farmers in the MPCs?

The analysis of the questionnaire clearly showed that SPS and EUREPGAP regulations create a bias in favour of large-scale farmers against small and medium-scale farmers in the three countries. This is simply because complying with these regulations requires additional fixed (investment) cost in terms of new suitable infrastructure and additional operational costs for employing new staff, procuring new materials …etc.

For instant, one of the major strawberry producers/exporters in the Jordan Valley, who has been exporting fresh strawberries to the EU markets for the last ten years, showed in figures what it takes to comply with the EUREPGAP and HACCP regulations in terms of new investment compared to the traditional production system. His farm covers an area of 180 dunums (18 hectares), while the packinghouse covers an area of 576 square meters, including 100 square meters of cold storage area. The cost of establishing the packinghouse (excluding HAACP requirement costs in Table 6) was JD 132,000 (US$ 184800). The additional costs for the application of EUREPGAP were estimated to be $ 26,471. The additional costs for the application of HACCP were estimated to be $ 9,695.4, excluding the establishment cost of the packinghouse that was estimated to be $ 184,800.

Table 6: Detailed Investment and Operational Costs Needed to Comply with EUREPGAP and HACCP Compared to Traditional Production Systems in Jordan

Items & Materials	Traditional	EUREGAP	HACCP
Farm Protection	-	12, 000	N/A
Soil Analysis	840	840	N/A
Irrigation water analysis	-	700	N/A
Maintenance of Fertilizer equipment	-	770	N/A
Maintenance of Agricultural equipment	-	840	N/A
Hygiene Facilities	-	672	980
Detergents and toilet papers	-	420	532
Mouse traps	-	N/A	28
Insect traps	-	N/A	140
Fire disguiser	-	N/A	336
Storages for fertilizers & chemicals	-	1470	N/A
Metal Pallets	-	588	N/A
Regular washing of Field bins	-	336	N/A
Shelves for Insecticides & fungicides	-	252	N/A
Hole for disposing chemicals	-	126	N/A
Special Worker's Uniforms	-	78.4	67.2
Special Guest's Uniforms	-	N/A	100.8
Hats & Gloves	-	N/A	140
Glasses & Masks	-	95.2	N/A
Scales*	-	504	504
Refractometer*	-	168	168
Farm & Packinghouse Maps	-	175	35
Farm signs	-	147	N/A
Files & Forms *	-	152	152
Stamps*	-	60	60
First Aid Kits	-	163.2	57.4
Engineers for record keeping*	-	2800	2800
Consultation Fees*	-	1365	1365
Inspectors visits*	-	1750	1750
Certificate costs	-	480	480
Total	840	26,951.8	9,695.4

N/A Not applicable
*Common use for both systems, the cost is divided between them.

The analysis of the questionnaire showed that there is a positive correlation between the size of the firm in terms of invested capital and the amount of investment in infrastructure needed to comply with SPS and EUREPGAP regulations as shown in Table 7. The table also shows that there is a positive correlation between the availability of specialized technical staff in SPS and EUREPGAP regulations, and the size of the firm. The results confirm that SPS and EUREPGAP regulations create bias in favor of large-scale exporters and producers. This calls for some intervention to empower small producers and exporters through establishing specialized associations or cooperatives.

Table 7: Correlation matrix among selected variables

	Inv. In SPS	Tech. Staff	Capital
Inv. In SPS	1.000		
Tech. Staff	0.215	1.000	
Capital	0.139	0.273	1.000

- What kind of motivations and incentive measures would attract foreign firms (multinational enterprises from the EU) to invest in the export-oriented agricultural sectors in the MPCs? Would such an involvement be an effective way of overcoming some SPS and EUREPGAP related impediments to agricultural trade?

Several studies conducted in the region (FEMISE 2002 and FEMISE 2003) concluded that there is a significant comparative advantage in producing and exporting many types of fresh horticultural products from the region to the EU markets. However, the export of horticultural products industry in the region suffers from different types of constraints including the know-how, lack of investment and the limited access to the right markets in the right time.

Many of the interviewed exporters welcomed the idea of EU producers' and exporters' participation in the horticultural sector in the region through any type of partnership. It is believed that the EU investors would significantly help in introducing and transferring the necessary technical knowledge and the needed access to the EU markets which will eventually overcome the impediments related to SPS and EUREPGAP regulations. The EU investors (proposed partners) would also synchronize the timing of exportation from the region to the EU markets without competing with the EU domestic production which can be achieved through the utilization of the comparative advantage of the early and off-season production in the southern MPCs.

8.1.4 Analysis of Compliance with SPS and Other Sanitary Regulations on the competitiveness of Exported Horticultural Products in the EU Markets

In this section of the analysis, the researchers show the results of testing the impact of compliance with SPS and other sanitary regulations on the competitiveness of exported fresh horticultural products to the EU markets using the indicator of the comparative advantage. The Domestic Resource Coefficient (DRC) indicator shows if the country enjoys a comparative advantage in producing and exporting the studied commodity. The researchers believe that imposing food safety regulations will affect the competitiveness of a country in producing and exporting as a result of the expected added cost that is estimated here as 'export tax' equivalent "TE". As indicated in the above sections, the compliance with the EU sanitary regulations would increase exporters' spending in terms of capital and operational costs by an average of 17 percent due to introducing new facilities and handling procedures to meet the sanitary regulations. The employed policy analysis methodology using the DRC in this section helped in answering the following research questions:

- What is the magnitude of protectionism involved in applying food safety standards? In other words, how would the food safety standards impact the level of protection of the selected crops in the three countries?

The answer to this question is that any additional food safety standards imposed by the EU will definitely increase the level of protectionism in favour of EU producers, unless these regulations are also imposed on locally produced products in the EU zone, which is not the case. SPS and EUROPGAP are usually imposed on imported horticultural products from outside the EU region. The imposed regulations will improve the competitiveness of EU products through raising the protection level of these products as a result of the increased costs of imported similar products from outside the EU region by an average of 17 percent.

- Would horticultural exports still be competitive if producers/exporters have to invest in new equipments and arrangements to meet the food safety standards and requirements?

The answer to this question is "YES". Much of the horticultural exports from the south MPC will continue to be competitive despite the burden of the newly added costs on MPC exporters as a result of complying with sanitary regulations. The DRC was used to test if the newly added cost in terms of new equipments and handling procedures would affect the competitiveness of selected horticultural products from Jordan, Syria, and Egypt. The selected products for testing this hypothesis were the same ones that were tested under the FEMISE funded project (FEM21-3, 2004). The FEMISE project originally tested the competitiveness of selected horticultural products produced in the three MPCs and exported to the EU markets. In this section, the DRC was recalculated for the same crops using the same set of data after incorporating the newly added costs for complying with the sanitary regulations "the 'export tax' equivalent (TE)" as reported by the interviewed exporters in the three countries.

Table 8 and Table 9 contain the major indicators of competitiveness of seven horticultural products produced and exported from Jordan. Table 8 demonstrates that the seven products enjoy a comparative advantage as well as positive economic (social) profits and value added without adding the additional costs of imposing the sanitary regulations. The economic profits to labor are the highest for roses and grapes which are considered as a high-value labor intensive products.

Table 8: Competitiveness and Efficiency Indicator for Nine Selected Crops in Jordan (without the cost of imposing SPS and EUROPGAP regulations "TE")

Jordan (US$/hect)	Green beans	Tomato	Strawberry	Sweet pepper	Roses	Carnation	Grapes
Private Profits (hect)	1405	18671	16945	8596	159342	145533	10329
Social (Economic) Profits (hect)	6363	8774	24534	11315	247302	228236	13410
Social Value Added (SVA) (hect)	9209	21819	37518	19972	311345	295704	24059
Domestic Resource Cost (DRC)	0.31	0.60	0.35	0.43	0.21	0.23	0.44
Economic profits to labor (US$/Person)	33.9	25.1	28.4	18.5	131.5	50.1	109.5
Economic profits to water (US$/CM)	4.0	0.6	4.1	2.9	3.7	5.7	0.9

Table 9 shows the same indicators mentioned in Table 8 after adding the added costs of compliance with the sanitary regulations (TE). The newly estimated indicators of competitiveness and efficiency for the same seven crops show that all the seven crops produced and exported from Jordan will continue to enjoy a comparative advantage and will also continue to be efficient in utilizing the resources of water and capital. The economic (social) profits and value added per hectare will also continue to be high especially for labor intensive horticultural products.

Table 9: Competitiveness and Efficiency Indicator for Nine Selected Crops in Jordan (with the cost of imposing SPS and EUREPGAP regulations "TE")

Jordan (US$/hect)	Green beans	Tomato	Strawberry	Sweet pepper	Roses	Carnation	Grapes
Private Profits (hect)	1194	15277	13765	6770	135366	118967	10183
Social (Economic) Profits (hect)	6097	6329	21071	115039	224171	204189	13221
Social Value Added (SVA) (hect)	8904	19191	33872	123574	287312	270706	23720
Domestic Resource Cost (DRC)	0.32	0.67	0.38	0.07	0.22	0.25	0.44
Economic profits to labor (US$/Person)	3.3	18.1	24.4	187.8	119.2	44.8	107.9
Economic profits to water (US$/CM)	3.8	0.5	3.5	29.4	3.4	5.1	0.9

The same analysis was conducted for answering the question for Syria and Egypt utilizing the same set of data collected from the FEMISE project FEM21-3 and the survey conducted as part of this project. Table 10 and Table 11 show the results of the analysis with and without the compliance with the sanitary regulations for seven horticultural products exported from Syria. The comparison presented in the two tables shows that the added costs "TE" will not significantly affect the competitiveness of Syrian horticultural products exported to the EU as well as the efficiency of utilizing the water and labor resources in Syria.

Table 10: Competitiveness and Efficiency Indicator for Nine Selected Crops in Syria (without the cost of imposing SPS and EUROPGAP regulations "TE")

Syria (US$/hect)	Green beans	Tomato	Strawberry	Sweet melon	Sweet pepper	Anise	Apple
Private Profits (hect)	1002	2602	7805	657	934	860	6650
Social (Economic) Profits (hect)	6261	5596	28792	1233	1337	275	3476
Social Value Added (SVA) (hect)	7545	7226	32925	2782	2886	823	6423
Domestic Resource Cost (DRC)	0.17	0.23	0.13	0.56	0.54	0.67	0.46
Economic profits to labor (US$/Person)	43.93	49.75	74.30	29.00	7.75	6.10	12.36
Economic profits to water (US$/CM)	1.04	0.71	2.40	0.19	0.19	0.07	0.58

Table 11: Competitiveness and Efficiency Indicator for Nine Selected Crops in Syria (with the cost of imposing SPS and EUROPGAP regulations "TE")

Syria (US$/hect)	Green beans	Tomato	Strawberry	Sweet melon	Sweet pepper	Anise	Apple
Private Profits (hect)	972	2547	7632	609	907	839	6492
Social (Economic) Profits (hect)	6186	5433	28313	1127	1249	236	3046
Social Value Added (SVA) (hect)	7470	7063	32446	2676	2798	784	5993
Domestic Resource Cost (DRC)	0.17	0.23	0.13	0.58	0.55	0.70	0.49
Economic profits to labor (US$/Person)	43.41	48.29	73.06	26.51	7.24	5.25	10.83
Economic profits to water (US$/CM)	1.03	0.69	2.36	0.17	0.17	0.06	0.51

The same conclusion regarding the consequences of complying with sanitary regulations on Egyptian exports to the EU markets can be drawn from Table 12 and Table 13. A comparison between the two tables shows also that applying the SPS and EUREPGAP regulations will not significantly affect competitiveness and the efficiency of allocating domestic resources in Egypt in the production of the selected crops portrayed in the two tables.

Table 12: Competitiveness and Efficiency Indicator for Nine Selected Crops in Egypt (without the cost of imposing SPS and EUROPGAP regulations "TE")

Egypt (US$/hect)	Spring Onion	Sugar Pea	Sweet Pepper	Strawberry	Cherry Tomato	Grapes	Dates
Private Profits (hect)	509	1374	502	2246	6714	3546	366
Social (Economic) Profits (hect)	5819	2210	10811	28561	21310	8260	2049
Social Value Added (SVA) (hect)	7466	3480	12148	32339	25318	10015	3567
Domestic Resource Cost (DRC)	0.22	0.36	0.11	0.12	0.16	0.18	0.43
Economic profits to labor (US$/Person)	1.15	0.85	5.18	10.07	4.64	5.78	4.33
Economic profits to water (US$/CM)	1.22	0.62	1.51	3.00	2.49	0.53	0.33

Table 13: Competitiveness and Efficiency Indicator for Nine Selected Crops in Egypt (with the cost of imposing SPS and EUROPGAP regulations "TE")

Egypt (US$/hect)	Spring Onion	Sugar Pea	Sweet Pepper	Strawberry	Cherry Tomato	Grapes	Dates
Private Profits (hect)	365	1264	277	1838	6305	3361	256
Social (Economic) Profits (hect)	5670	2094	10575	28133	20887	8061	1928
Social Value Added (SVA) (hect)	7318	3364	11911	31912	24895	9817	3446
Domestic Resource Cost (DRC)	0.22	0.36	0.11	0.12	0.16	0.18	0.44
Economic profits to labor (US$/Person)	1.12	0.81	5.07	9.92	4.55	5.64	4.07
Economic profits to water (US$/CM)	1.19	0.59	1.48	2.95	2.44	0.52	0.31

- What is the expected role of government policies in MP countries in bridging the gap between current and "what should be" to shorten the time involved in the transformation process?

The examined experience in this research of the three countries in exporting horticultural products demonstrates that non-traditional horticultural products that are characterized with their high value can be increased and achieve strong growth rates. However, the governments should adopt export-oriented and business-friendly policies as the export industry develops.

The three countries have been able to take advantage of the fact that their agricultural production of horticultural products is off-seasonal for their major EU markets. However, in the recent years, their exports have been subject to strict technical requirements and health and quality standards such as EUREPGAP. The three countries will soon have to face Sanitary and Phytosanitary measures (SPS) and other non-tariff measures in the EU markets. The policy response of the governments and export industries should consider setting up specialised agencies to enhance quality control and certification and raise awareness of standards amongst producers. To boost trade, the three countries pursued bilateral and regional Free Trade Agreement strategies, involving the Arab countries as well as the EU.

The governments' strategies should include, in addition to providing the necessary enabling environment, awareness programs to provide information on the SPS and TBT regulations in place in EU markets, as well as advice on traceability, residue testing, food safety risk/conformity assessments and certification techniques. The results of the questionnaire showed clearly that many of the exports lack the necessary information on Sanitary and phytosanitary measures (SPS) as well as other quality regulations.

The experience of other countries indicates that exporters can utilize these regulations to boost exports. For instance, the US, Japan, and the EU have put a ban on the use of certain antibiotics in shrimp production, which have forced the shrimp industry in Thailand to undergo costly inspections of shrimp shipments. As a result of the regular risk of trade barriers facing shrimp exports, the industry has become highly organised. The private sector represented by the major business association, the Thai Frozen Food Association, has played a crucial role in dealing with the SPS and other non-trade barriers cases through lobbying, financial assistance, and training. The experience of Thailand in tacking this issue confirms the importance of the joint efforts and collaboration between the public and private sectors.

- How would the EU agricultural policy, in terms of reciprocal liberalization and structural tools such as a "Feoga Orientation" help and impact the modernization of the agricultural sector in southern MPCs?

The three selected countries in this research have already established association agreements with the EU. Jordan has already signed and ratified the EU-Med Partnership Agreement. Many rounds on trade liberalization took place during the last few years. Trade negotiations included, among other products, food and agricultural commodities.

Agricultural exports to the EU were always among the difficult topics of trade negotiations with the EU commission. This is mainly because of the Common Agricultural Policy (CAP) implemented by the EU. The CAP is one of the major engines that made the EU into one of the major traders of food and agricultural products in the world. The EU–CAP policies were always geared toward increasing food and agricultural production to achieve self-sufficiency in the EU region, which resulted in production surpluses of many food items such as cereals.

The researchers believe that reciprocal trade liberalization will result in a tremendous increase in horticultural exports to the EU especially during the off-season period. Trade liberalization should also help in encouraging many of the EU investors in the horticultural industry to shift some of their investments to MPCs. This might also be accompanied by channelling development funds to promote this industry as was applied by the EU commission in some Eastern European countries through the "Feoga Orientation" program. FEOGA stands for "The Funds European of Orientation and Agricultural Guarantee, EAGGF-Orientation".

The EU commission agreed to spend a total of 297 billion Euros on FEOGA program over the period 2000-2006. The program is a significant financial instrument for the agricultural and rural communities of the EU. It breaks up into two sections: the "Guaranteed" section, and the section "Orientation" which is only regarded as structural funds. The program encourages the investments favorable to the rural development: promotion, labelization, and investments in favour of the products of the soil of quality; improvement of the rural infrastructures; research, and development of agricultural and vocational training of the farmers…etc. Many countries in Eastern Europe have benefited from this program to introduce the necessary structural changes needed to become part of the EU in the future.

9. Strategic Option to Facilitate Compliance with Sanitary Regulations

The above three methodologies were collectively used to provide inputs to answer an important research question: What are the pillars of a successful strategy that can be adopted by the MPCs to promote exports to the EU region, while taking into consideration supplying high quality and safe products without competing with agricultural producers in North Mediterranean countries? In other words, how could a "win-win" situation be achieved taking into consideration the expected upcoming trade constraints in the form of food safety standards?

The answer to this question is extracted from the analysis of the questionnaires, interviews with key stakeholders in three countries, and conducted research by other institutions. It should be stated here that the best strategic options to facilitate the compliance of the horticultural export industry with the sanitary regulations included in the above-mentioned agreements and protocols may include the following:

- Establishing awareness programs in the three countries for explaining the importance of compliance with sanitary regulations on future food exports to the EU and other potential markets.
- Accelerating the process of adapting the SPS regulations into the sanitary system of the three countries as requested by the WTO. The SPS agreement also calls for establishing offices and contact points in signatory countries.
- Creating a qualified and certified staff in SPS and Technical Barriers to Trade (TBT) for training, inspection, and implementation (i.e. training of trainers).
- Training producers, importers, exporters, etc. in the technical aspects of the SPS and TBT.
- Involving of official, academic, and research institutions in the process at the national level.
- Establishing better communication channels with the international institutions dealing with SPS and TBT.
- Providing financial support in the form of loans, etc. for producers who are willing to establish the international systems in their facilities.
- Organizing mutual tours with international producers and importers.
- Issuing publications and newsletters dealing with the most recent updates on SPS and TBT.
- Reviewing the existing establishments in the country and advertizing them as success stories.

The main official institutions involved in the SPS system in the three countries are:

- Ministries of Industry and Trade as representatives of the countries in the WTO
- Ministry of Agriculture –Sanitary and Phytosanitary (SPS)
- Standards Organizations –TBT and Codex counterpart

While for EUREPGAP and HACCP, there are several consulting institutions (local and international) dealing with regulations as an essential part of the SPS measures.

10. Conclusions and Recommendations

Ten research questions were answered in this study based on three analytical procedures that utilized primary and secondary sources of data and information collected from the three countries and other international sources. This study concluded that complying with food sanitary regulations as applied in the SPS, HACCP and EUREPGAP is faced by several impediments which can be classified into: specific impediments related to SPS and other food sanitary regulations, technical, and commercial.

According to the exporters and producers, the key impediments related to SPS include: 1) Serious lack of knowledge about SPS requirements and regulations; 2) high cost of infrastructure needed to meet SPS conditions; 3) absence of inspection mechanisms to monitor production areas at domestic producers; and 4) non-existence of local legal bodies responsible for the implementation and monitoring of SPS and other agreements regulations.

However, the technical impediments are those related to: 1) the lack of highly qualified laborers; 2) the absence of modern and efficient packing and grading facilities; 3) the low quality of the local produce in the three countries; 4) the tough requirements imposed by the EU; 5) the limited capacity

of air cargo especially to East Europe; and 6) the absence of quality control laboratories in the region especially for testing chemical residues. While the commercial impediments include:1) the high cost of exported products from the original sources; 2) the difficulties in shipping and forwarding procedures to EU markets; 3) the lack of commitment of local producers in terms of dates of delivery and product quality; 4) the difficulties in issuance of needed certificates and other routine procedures (bureaucracy); 5) national rules and regulations; 6) the high shipping costs; and 7) the unorganized horticultural export industry.

Other commercial impediments at the international level include: 1) the lack of experience and knowledge in international rules and regulations especially those related to EU regulations; 2) the lack of funding for establishing needed infrastructure to meet international requirements; and 3) the high competition in the export markets especially from neighboring countries.

This study has also concluded that any additional food safety standards imposed by the EU will definitely increase the level of protectionism in favor of EU producers unless these regulations are also imposed on locally produced products in the EU zone, which is not currently the case since SPS and EUREPGAP are usually imposed on imported horticultural products from outside the EU region. The imposed regulations will improve the competitiveness of the EU products through raising the protection level of these products as a result of the increased costs of imported similar products from outside the EU region by an average of 17 percent.

The analysis of competitiveness showed that much of the horticultural exports from the south MPC will continue to be competitive despite the burden of the newly added costs on MPC exporters as a result of complying with sanitary regulations. The comparative advantage indicator that was used to test whether the newly added cost in terms of new equipments and handling procedures or not, showed that the selected horticultural products exported from the three countries to the EU will continue to enjoy a comparative advantage as well as positive economic profits.

The interviewed private sector players in the horticultural export industry concluded that the type of needed technical assistance from the EU may take the following forms: 1) intensive training on SPS and other quality related regulations; 2) support in establishing proper shipping fleets to EU markets; 3) elimination of all commercial barriers; 4) modern infrastructure in terms of advanced grading and packing facilities needed to improve product quality; 5) awareness programs on SPS and other EU regulations tailored to producers and exporters; 6) support in establishing a certification and accreditation authority for SPS and EUREPGAP regulations and protocols in the different countries in the region; 7) financial and technical support to small farmers; and 8) providing specialized marketing information about EU markets and regulations and importing partners.

The researchers of this study were able to identify the following strategic options that could be used to formulate a comprehensive strategy to help the MPCs to comply with SPS, EUREPGAP and HACCP:

- Establishing awareness programs in the MP countries for explaining the importance of compliance with sanitary regulations on future food exports to the EU and other potential markets.
- Accelerating the process of adapting the SPS regulation into the sanitary system of the MP countries as requested by the WTO. The SPS agreement also calls for establishing offices and contact points in signatory countries.
- Creating a qualified and certified staff in SPS and Technical Barriers to Trade (TBT) for training, inspection, and implementation (i.e. training of trainers).
- Training producers, importers, exporters, etc. in the technical aspects of the SPS and TBT.
- Involving official, academic, and research institutions in the process at the national level.
- Establishing better communication channels with the international institutions dealing with SPS and TBT.
- Providing financial support in the form of loans, etc. for producers who are willing to establish the international systems in their facilities.
- Organizing mutual tours with international producers and importers.
- Issuing publications and newsletters dealing with the most recent updates on SPS and TBT.
- Reviewing the existing establishments in the country and advertizing them as success stories.

11. Major impediments and limitations of this research

There were no serious impediments that faced the researchers in achieving the objectives of this research except for some of the usual research problems that included: 1) arranging meetings for completing questionnaires from busy business persons through face-to-face interviews; 2) obtaining reliable and updated data; 3) delays in communications among researchers in the three countries; and 4) budget limitations and high cost of obtaining primary and secondary data.

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Council Directive 93/43/EEC

US FDA 21 CFR Part123, 416, 417, 120

Food Act of Japan

The Practices of Food Act, Japan

FDA Guidelines - Hazard Analysis and Critical Control Point Principles and Application, Adopted August 14, 1997

Annex 1: Main components of the EUROGAP Protocol

Abbreviations

- CB: Certification Body
- CPCC: Control Points and Compliance Criteria
- CP: Control Point
- GPS: Global Positioning System
- Nº: Number.
- IAF: International Accreditation Forum
- MLA: Multilateral Agreement
- TSC: Technical and Standards Committee EUREPGAP

EUREPGAP definitions

- Applicant Farmer or Farmer Group: Candidate for Certification that has applied or is in the process of applying for Certification by a EUREPGAP approved CB.
- Approved Farmer (or Farmer Group): Applicant that has successfully applied and obtained a Certificate by a CB approved by EUREPGAP
- Active ingredient: In any pesticide product, the component that kills, or otherwise controls, target pests. Pesticides are regulated primarily on the basis of active ingredients.
- Annual crop: When the time period between the end of propagation stage to first harvest date is less than 12 months. For potatoes: Mother Crop is seed treatment, not propagation material. Also covered are Strawberries, asparagus, cassava.
- Arable land: Land worked regularly, generally under a system of crop rotation, which includes fallow land.
- Audit: See ISO 9000:2000 A systematic and functionally independent examination to determine whether quality and food safety activities and results comply with planned procedures and whether these procedures are implemented effectively and are suitable to achieve objectives.
- Benchmark: A measurable set of variables used as a baseline or reference in evaluating the performance of Quality Schemes.
- Biennial: A plant which completes its life cycle within two years and then dies.
- Biodiversity: Assemblage of living organisms from all sources including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part.
- Body of surface water: A discrete and significant element of surface water such as a lake; reservoir; a stream, river or canal; part of a stream, river or canal; transitional water or a stretch of coastal water.
- Buffer zone: The region near the border of a protected area; a transition zone between areas managed for different objectives.
- Bund: A barrier on the surface of the soil to prevent runoff, spillage, and soil erosion. Bunded: That is surrounded by a Bund.
- Calibration: Measurement of the uncertainty degree of the machinery used to apply any product. Set of operations that establish, under specified conditions, the relationship between values of quantities indicated by measuring instrument and the corresponding values realized by standards.
- Certification: All those actions leading to the issuing of a certificate in terms EN45011 /ISO Guide 65 Product Certification.
- Certification Committee: Decision making person or group of persons within a CB that has the responsibility for making the final decision on whether an Applicant Farmer or Farmer Group become an Approved Farmer.
- Chain of Custody: An unbroken trail of acceptability that ensures the physical security of data, records and/or samples. Also: a process used to maintain and document the chronological history of the evidence.
- Compost/Composting: The controlled biological decomposition of organic material in the presence of air to form a humus-like material. Controlled methods of composting include

mechanical mixing and aerating; ventilating the materials by dropping them through a vertical series of aerated chambers, or placing the compost in piles out in open air and mixing it or turning it periodically.

- Consumer: An individual who buys products or services for personal use and not for manufacture or resale.
- Contamination in storage sites: EU 19-12-2000/365 Regulation: Contamination arising from food, storage environment, and cleaning substances and pests.
- Corridor: (1) A linear strip of land identified for present or future location of transportation or utility rights-of-way within its boundaries. (2) A thin strip of vegetation used by wildlife and potentially allowing movement of biotic factors between two areas.
- Cover crop: A close-growing crop grown to protect and improve soils between periods of regular crops or between trees and vines in orchards and vineyards.
- Critical Control Point (CCP): A point, step, or procedure at which control can be applied and a safety hazard can be prevented, eliminated, or reduced to acceptable levels.
- Critical defect: A deviation at a CCP which may result in a hazard
- Critical limits: The maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce to an acceptable level the occurrence of the identified food safety hazard (adopted from Corlett, 1998 as the 1996 FSIS-USDA/1997 NACMCF definition).
- Critical non-compliance: An incident that results in:
- no confidence in the product compliance with quality and food safety requirements for export; or no confidence that a Quality and Food Safety Management System is in place and being operated as per the company's procedures, and this immediately places export certification at risk;
- Critical load: (1) Carrying capacity is the ability of eco-systems/the earth to bear environmental load without significant damage. The threshold is the critical load. (2) The maximum load that a given system can tolerate before failing.
- Crop: the plants which produce the Produce.
- Crop Protection Product risk analysis: Covers the following risks, Exceeding MRLs, legal registration issues, Residue Analysis decision making, and reasons behind decision making for Residue Analysis
- Crop rotation: A crop rotation system means that the crops on a certain plot are following other crops according to a predefined plan. Normally the crops are changed annually, but they can also be multiannual.
- Crop rotation: The practice of growing different crops in recurring succession on the same land. Crop rotation plans are usually followed for the purpose of increasing soil fertility and maintaining good yields.
- Crop year: Generally, the 12-month period from the beginning of harvest of a particular crop.
- Customer: A customer is anyone who purchases products or services from a supplier.
- Declaration: Written statement that covers the relevant subject, and which is signed by the Farmer/Farmer Group that makes the statement, and will be taken by the CB as evidence for verification of compliance to the applicable points.
- Deviation: Failure to meet a critical limit
- Drainage basin: The area of land that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel.
- Documentation audit: A review by an auditing panel of the company's Quality and Food Safety Management System manual;
- Environment: water, air, land, wild species of fauna and flora, and any interrelationship between them, as well as any relationship with living organisms;
- Farm: A farm is an agricultural production unit or group of agricultural production units, covered by the same operational procedures, farm management, and EUREPGAP decision making activities.

- Farmer: Person or business representing the farm, (horticultural, agricultural or livestock, according to the relevant scope) who has legal responsibility for the products sold by that farming business.
- Farmer Group: Group of farmers applying for certification with an internal procedure and internal control of 100 % of members registered to the EUREPGAP requirements. It must have a legal structure, contracts with each farmer, must state entry and exit requirements, have a stipulated suspensions, and agrees to comply with EUREPGAP requirements for registered members. List of all members of the FARMER GROUP with registration status must be available. The FARMER GROUP must have a management representative with ultimate responsibility.
- Field, orchard or greenhouse: Separate units of land within a farm which, summed up as a whole, form a farm.
- Food safety: The assurance that food will not cause harm to the consumer when it is prepared and consumed according to its intended use;
- Groundwater: All water which is below the surface of the ground in the saturation zone and in direct contact with the soil.
- Harvesting containers: Containers used for transporting produce during harvest.
- Harvesting tools: gloves, scissors, knifes, clippers, etc.
- Hazard: A biological, chemical, physical, or any other property that may cause a product to be unsafe for consumption.
- Herbicide: A chemical that controls or destroys unwanted plants.
- Individual Farmer: A Body or Person Responsible for on-farm production, who retains ownership of all the produce covered in his EUREPGAP certificate, and is a legally acting individual or organization that represents the farm enterprise.
- Inspection: The examination of food or systems for control of food, raw materials, processing and distribution, including in-process and finished product testing, in order to verify compliance with requirements; See also ISO 9000: 2000
- Integrated Crop Management (Croplife International): ICM is a farming system that meets the requirements of long-term sustainability. It is a whole-farm strategy which involves managing crops profitably, with respect for the environment, in ways that suit local soil, and climatic and economic conditions. It safeguards the farm's natural assets in the long-term.
- ICM is not a rigidly defined form of crop production but is a dynamic system which adapts and makes sensible use of the latest research, technology, advice, and experience.
- Integrated farm management: An approach to farming that aims to balance production with economic and environmental considerations by means of a combination of measures including crop rotation, cultivations, appropriate crop varieties, and careful use of inputs.
- Integrated pest control: The rational application of a combination of biological, biotechnical, chemical, cultural or plant-breeding measures whereby the use of chemical plant protection products is limited to the strict minimum necessary to maintain the pest population at levels below those causing economically unacceptable damage or loss.
- Integrated Pest Management (IPM) -(Croplife International): The careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations, keep pesticides and other interventions to levels that are economically justified, and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural and/or non-chemical pest control mechanisms.
- Major non-compliance: Means an incident that results in a decrease in confidence in the product compliance with quality and food safety requirements for export; or a decrease in confidence in the Quality and Food Safety Management System to the extent that ongoing provision of Export Certification is in doubt and requires corrective action to be implemented immediately in order to regain confidence that Export Certification meets requirements;
- Manure organic fertilizer: non-proprietary organic fertilizer; animal excreta collected from stables and barnyards with or without litter; used to enrich the soil.

Rules

- These General Regulations establish the rules applicable to CBs approved by EUREPGAP Secretariat to the scope of EUREPGAP Fruit and Vegetables, for granting, maintaining, and removing EUREPGAP Fruit and Vegetables certification. Certificate owner can be any of the following:
- Individual Farmer applying for EUREPGAP Certification
- Farmer Group applying for EUREPGAP Certification
- Farmer and/or Farmer Group working under a Scheme that has successfully benchmarked to EUREPGAP
- EUREPGAP issues licenses to approved CBs, who are thus empowered to issue certificates of compliance to the EUREPGAP standard.
- The certificate is the document that a Farmer holds to show he has been certified, and the license is a contractual relationship that EUREPGAP and the Farmer or Farmer Group enter into by means of a Sub-license Agreement signed between the Farmer and the EUREPGAP Approved CB.
- The Sub-license agreement is published by EUREPGAP in different languages, only the official EUREPGAP translation may be used for the languages in which it is available.
- EUREPGAP is a registered trade mark. The use of this registered trademark is regulated by the EUREPGAP Secretariat, specified in the Trademark and Logo Use Guidelines.
- The normative documents that conform the EUREPGAP Scheme are the following:
- EUREPGAP General Regulations: Provides instructions as to how the Certificate can be applied for, obtained, and maintained and the rights and responsibilities involved, with annexes that go into further detail.
- EUREPGAP Control Points and Compliance Criteria: Contains all the Control Points and Compliance Criteria that must be followed by the Applicant Farmer/Farmer Group and which are audited to verify compliance. This document is divided into 14 sections and it lists Major Musts in red (47 Control Points), Minor Musts in yellow (98 Control Points) and Recommended (65 Control Points) in Green, with a total of 210 Control Points.
- EUREPGAP Checklist: Contains the Control Points and is a tool for inspecting and evaluating compliance.
- Excerpts of these normative documents may be published from time to time by EUREPGAP, but these do not constitute normative documents in their own right.
- In addition to these Normative Documents, Guidelines for dealing with general interpretation and application of Control Points within the CPCC Fruit and Vegetables and Guidelines dealing with specific geographic and cultural differences may be approved and issued by the TSC Fruit and Vegetables, with support from the recognized EUREPGAP Regional or National Technical Working Groups. These Guidelines will also define their scopes of application (general application scope or specifically defined Geographic areas and/or product groups respectively. Transition and implementation rules will be set within the guidelines, and application is mandatory for all CBs and Farmers/Farmer Groups operating within the defined application scopes of the Guidelines

Compliance levels for EUREPGAP certification

Compliance with EUREPGAP Fruit and Vegetables consists of three types of control points that the applicant is required to undertake in order to obtain EUREPGAP recognition: MAJOR MUSTS, MINOR MUSTS and RECOMMENDATIONS, and must be fulfilled as Follows:

- MAJOR MUSTS: 100% compliance with all Applicable Major Must Control Points is compulsory.
- MINOR MUSTS: 95% compliance with all applicable Minor Must Control Points is compulsory. For the sake of calculation, the following formula will apply:]
- Total number of Minor Must Control Points) - (Not Applicable Minor Musts Control Points Scored on the farm)} x 5% = (Total Minor Must Control Point non-compliance allowable)
- RECOMMENDATIONS: No minimum percentage of compliance is set.

Options and verifications for EUREPGAP certification

Farmers can achieve EUREPGAP certification under any one of the four Options described below.

OPTION 1: Individual Certification

OPTION 2: Group Certification

OPTIONS 3 and 4 (Benchmarking):

Option 4: Farmer Group applies for EUREPGAP benchmarked scheme Certificate

Annex 2: Hazard Analysis Critical Control Point (HACCP)

In the HACCP framework, the term hazard refers to any agent in or condition of food that is unacceptable because it has the potential to cause an adverse health effect. Examples of hazards are pathogenic micro-organisms and/or their toxins, chemicals such as carcinogens and allergens, and physical objects such as stones, bones, etc. that may injure the consumer.

Conditions conductive to hazards may be any of the following:

- The unacceptable presence of a biological, chemical or physical contaminant in raw materials, in semi-finished products, or in a production line environment.
- The unacceptable potential for growth or survival of microorganisms and the unacceptable potential for generation of undesirable chemicals (e.g. nitrosamines) in semi-finished products, or in a production line environment.
- The unacceptable (re)contamination of semi-finished or finished products with micro organisms, chemicals, or foreign material.

Hazard Analysis: it is a procedure used to pinpoint significant potential hazards and conditions leading to their existence in food. It assesses the possibility of the hazard being present and the severity of an adverse health effect when it occurs in order to determine if it is significant for food safety. If significant hazards and conditions are identified, measures for their control have to be established.

A Critical Control Point (CCP): it is a raw material, location, practice, formulation or process where measures can be applied to prevent or reduce the likelihood of the existence of hazards at unacceptable levels. (the term control as used here means "to have/to bring under control," and should not be confused with testing, checking or verification).

Application of Good Manufacturing Practices (GMP) – including Good Hygienic Practices (GHP) – (sometimes referred to as "prerequisites to HACCP"): these are necessary to ensure that safe products are produced by keeping many elements of food production under control. Nevertheless, specific aspects of GMP are essential for food safety and have to be selected as "critical" control points (CCPs). If a potentially severe hazard has a high probability of occurrence at a certain point in a food processing or preparation line, specific control measures are needed, and such a point is called a CCP.

Critical Limits: these are values or characteristics of a physical, chemical, or biological nature that draw the line between acceptability and unacceptability for whatever is being measured. They point out when acceptable (controlled) situations become unacceptable (out of control) with respect to the safety of the final product.

Monitoring: this is checking the conformity of the control at a CCP. It involves systematic observation, measurement, recording and evaluation. For example, recording the temperature during pasteurization of milk.

Corrective actions: should be taken when monitoring indicates loss of control. Corrective actions should ensure the prevention of unsafe products from reaching the consumer and should preclude the reoccurrence of the incident.

Verification: it is carried out to test whether the system is properly implemented and achieving its objectives.

Record keeping: this to ensure that information from the HACCP study and implementation of the resulting HACCP plan is available for verification, review, inspection, auditing or other purposes.

Since there is no recognized international standard for HACCP application at present, certain requirements of some specifications are recommended for the implementation of the system.

The system requirements describe the key elements for the adequacy, effectiveness and the compliance of HACCP system to ensure the hygiene and safety of foodstuffs.

The system requirements are generic and applicable to all organizations concerned with the food chain from preparation, processing, packaging, storage, and distribution until the point of customer consumption.

At present, the primary applicable legislation and regulations in force are the following: Vertical: EU 93/493/EEC, 92/5/EEC, 92/46/EEC, 89/437/EEC, 91/492/EEC, USA 21 CFR Part 106, 123, 113, 114, 120, 129, 9 CFR Part 416, 417, China National Code of Quality Management for Fish Processing, etc.

Horizontal: Codex Alimentarius Commission, Codex General Principle of Food Hygiene, Codex Guidelines for the Application of the Hazard Analysis and Critical Control Points (HACCP) System, CAC/RCP 1-1969, Rev. 4-2003, Council Directive 93/43/EEC, USA 21 GMP CFR Part 110, Food Act of People's Republic of China, Food Act of Japan, The Practices of Food Act, Japan, Food Safety Act, UK etc.

a. Definitions

Corrective Action: - Actions undertaken by the organization to clear deviations or non-conformity to satisfy system requirements and improve effectiveness of the system.

Critical Control Point (CCP): - A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Critical Limit: - A criterion, which specifies the acceptability and unacceptability.

CCP Decision Tree: - A systematic sequence of questions to be considered in the process to decide whether or not there is a CCP.

Organization: - An Organization providing products or services with the food chain from production preparation, processing, packaging, storage and distribution until the point of consumption.

HACCP Plan: - A document prepared in accordance with the HACCP principles ensuring control of hazards which are significant for food safety in the segment of the food chain under consideration.

HACCP System: - A food safety management system that identifies evaluates and controls hazards, which are significant for food safety.

Hazard Analysis: - The process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan.

Monitoring: - To conduct a planned sequence of observations or measurements of control parameters to assess whether the CCPs are controlled by the food organization.

b. Restricted Ingredients: - Definition.

SSOP: - Sanitation Standard Operating Procedures.

Verification: - The application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan.

c. Prerequisite Programs

i. Management Assurance

Management shall make commitment to a safety management system through safety policy and employee awareness for the implementation of an effective HACCP system.

The management has responsibilities for establishing, implementing, and maintaining a HACCP system and providing adequate resources to ensure the effective implementation of the HACCP system and its continuous improvement.

The top management has the final responsibility for the safety of products.

Note: Resources include manpower, infrastructure, finance, information, etc.

ii. Sanitation Standard Operation Procedures

The organization must primarily comply with the general hygiene requirements of appropriate codes and regulations. The organization must specify and implement documented sanitation standard operation procedures. The procedures shall include, but not be limited to the following:

Safety of water; condition and cleanliness of food contact surfaces; prevention of cross-contamination; maintenance of hand washing, hand sanitizing and toilet facilities; protection of food, food packaging material, and food contact surfaces from contamination or adulteration; proper labeling, storage and use of toxic compounds; control of employee health conditions, exclusion of pests, construction, process flow and plant layout; and waste control.

The sanitation monitoring records shall be maintained and evaluated. Corrective actions must be taken in a timely manner if sanitation is out of control.

iii. Training

The organization shall develop, and implement a documented training procedure for all employees related to food safety ensuring that the HACCP plan can be implemented effectively.

The following shall be addressed in the training program:

- The identification of training needs and initiation of a suitable training plan;
- That all employees are well trained in HACCP principles/sanitation controls and applications;
- That at least two persons in the organization are trained in HACCP principles/applications, the relevant legislation and regulations, and internal audit program;
- The evaluation of training effectiveness.
- That training records are retained.

iv. Recall

The organization shall establish a documented procedure for recall of the products in the event of a food safety incident. The procedure must ensure that all products are properly identified and traceable.

The procedure shall include:

- Product information, including the description of product, production date, lot number, and other relevant data.
- In what circumstances the products would need to be recalled
- All participant parties to be notified
- Disposal of recalled product
- Consideration for improving the existing HACCP system and product
- Compliance with requirements of relevant regulation, if applicable

The recall shall be documented.

v. Complaints

The organization shall establish a documented procedure to handle consumer and customer complaints, which shall include:

- Responsibility for receiving the complaints and collecting all necessary information (label, lot, production date, etc.) for the product concerned.
- Responsibility to investigate the complaint and communicate findings to the customer.
- Evaluation of consumer complaints concerning product safety.
- Actions to be taken, if needed. (This action will include starting the recall procedure, if necessary.)
- Complaints and subsequent actions shall be fed back to HACCP system verification for corrective actions.

All complaints and the action taken shall be documented.

d. HACCP Plan Requirements

i. General Information

1. Organization Information

The organization shall provide the following information in the HACCP plan:

- Name of the organization
- Address, telephone/fax numbers, e-mail address, etc. of key personnel.
- Number of employees with respect to food safety

2. Product Specification

The organization shall make the following information available about the products covered by the HACCP plan.

- Full description of the products
- Safety information (such as pH, Aw, etc.)
- Raw materials
- Ingredients (restricted ingredients and non-restricted ingredients)
- Packaging (contact and non-contact)
- Storage conditions
- Labeling
- Valid shelf life data
- Logistics
- Intended use and target consumers
- Specific methods of use by the consumer to ensure the product remains safe

3. HACCP-Team

The organization shall form a HACCP team to establish, implement, and maintain the HACCP plan, including:

- Appoint a team leader who has the responsibility and authority to plan and facilitate the HACCP team activities.
- A multi-disciplinary team to establish, implement, maintain, and regularly review the HACCP plan. The HACCP team shall have sufficient knowledge and experience with respect to the organization's products and process within the scope of the HACCP system.
- The tasks, responsibilities and authority of the HACCP team members shall be defined and documented.

The members of the HACCP team shall be trained in the principles of hazard analysis.

ii. Process Flow Diagram

Process flow diagrams shall be prepared to provide a complete description of all stages of the product/service realization process from materials receipt, through preparation, to finished the product/service.

The Process Flow Diagrams shall include:

- Details of raw materials and ingredients (clearly identify restricted from the non-restricted ingredients).
- The sequence of all steps in the operation, including transportation, storage, and any process that has an impact on food safety.
- Packaging material
- Rework opportunities
- Possible delays in processing
- Other information related to food safety (such as temperature, pH, etc.)

Process flow diagrams shall provide adequate information for identifying potential hazards. The process flow diagram shall be verified on-site and documented ensuring consistency with the actual operation.

e. Hazards Analysis and Preventive Measures

All potential hazards (biological, chemical, or physical) likely to occur and are associated with the product or process at each step, from materials preparation, processing, storage and distribution, until the point of consumption, shall be identified and documented.

As a minimum, the following shall be considered in the hazard analysis:

- All hazards that may reasonably occur and the severity of their adverse health effects at each step from materials preparation until the point of consumption
- A risk evaluation, including occurrence, probability, qualitative, and quantitative aspects
- Raw materials and ingredients
- Product characteristics (e.g. Aw, pH, etc.)
- Process parameters and process design
- Processing facilities, equipment and layout
- Storage facilities and conditions
- Packing and Packaging material
- Methods of distribution and use
- Sanitation conditions and control procedures

The HACCP team shall validate the hazard analysis for adequacy to ensure food safety.

If any changes occur, which could lead to a requirement to modify the HACCP plan, the hazard analysis shall be repeated. Such changes include, but are not limited to:

- Raw materials and ingredients
- The sources of raw materials and ingredients
- Processing methods or systems
- Production volume
- Packaging
- Personnel
- Finished product distribution
- Intended use or target consumer group

The organization shall define preventive measures for each identified hazard.

The preventive measures shall include:

- Product specifications (labeling, intended use, etc.)
- Process control (cooking, sterilizing, etc.)
- Storage and distribution control (environment conditions)
- Sanitation control procedures
- Maintenance
- Training, etc.

f. Critical Control Points (CCPs)

All significant hazards shall be controlled to an acceptable level by measures established at one or more critical control points.

The justification of CCP determination shall be documented.

Note: It is recommended to use a CCP Determination Tree.

g. Critical Limits

For every identified critical control point, the control limit that is critical for the safety of product shall be specified and documented.

The basis of the critical limit shall be defined

- The requirements of the relevant legislation and regulations
- The requirements of national/international standards, experimental data, literature references, etc.
- Expertise

The critical limits shall be achievable in the manufacturing facility.

h. Monitoring Procedures

Monitoring procedures shall be established to ensure that the critical limits for each CCP are consistently met. The monitoring procedures shall include a sequence of planned measurements to demonstrate that the critical control points are under control.
The procedures shall define the following points:

- What to be monitored
- Monitoring method, including
- Calibration of monitoring and measuring equipment
- Identification and traceability of product
- Validation of sampling plan, if applicable
- Monitoring frequency
- Monitoring personnel, including dedicated personnel responsible for monitoring who are trained and qualified

The established monitoring system shall be able to respond to any violations that may occur as specified in the Corrective Actions.

The monitoring results shall be recorded on a daily basis and signed by the personnel responsible for monitoring and reviewing respectively.

i. Corrective Actions

For each critical control point (CCP), a documented corrective action procedure shall be established and implemented to deal with deviations when they occur.

The corrective actions shall include:

- Defined personnel who have the responsibility and authority to implement the Corrective Action;
- Identification of affected products;
- Correcting the cause of the non-compliance to prevent a recurrence;
- Demonstrating that the CCP is back in control by means of examining the process or product at the CCP;
- Evaluation and disposition of non-conforming product (including recall procedure, if necessary);
- Verifying/evaluating the effectiveness of corrective actions taken;

Modifying the process or HACCP plan, if the critical limit is repeatedly exceeded.

Corrective actions shall be signed, reviewed by authorized personnel and documented.

j. Verification Procedures

The organization shall establish, implement and maintain documented procedures to plan, specify, and conduct all activities that verify the adequacy, compliance and effectiveness of HACCP system to ensure the safety of the food and continuing improvement of the system.

The responsibilities, authorities, methods, frequency, and assessment (internal and external audit) shall be clearly defined in verification procedures, including the calibration of monitoring equipment and the evaluation of consumer complaints. The personnel responsible for verification shall be trained or qualified on HACCP principles and system audit techniques.

The HACCP system shall be updated accordingly with the development, technology, and information available.

Verification procedures shall include, but not be limited to:

- Initial validation of the elements of the HACCP plan, such as process flow diagram, hazards analysis, determination of CCPs, critical limits, monitoring procedures, corrective action, document/record keeping system, etc.
- On-going HACCP system assessment
- Review of records
- Observation of operations
- Review of deviations and product dispositions
- Confirmation that CCPs are under control
- Calibration of monitoring equipment
- Sampling and testing
- Evaluation of consumer complaints and records concerning product safety
- Verification of the overall HACCP system
- Internal audit covering all activities in the HACCP plan shall be performed at least once every six months;
- Feedback of audit data for improvement of the HACCP system
- Any changes made that may affect the HACCP system
- External audit

The results of the verification shall be evaluated, documented and fed back to the HACCP team for continuous improvement.

k. Documentation and Records Keeping System

The organization shall establish an efficient and effective documentation and record keeping system to demonstrate that the product safety and compliance with the requirements of the applicable legislation and regulations are achieved.

The system shall ensure that all necessary documents (procedures, instructions, forms, etc.) are available where needed and that obsolete documents are promptly removed from all locations.

The documents/records shall include all the elements of the HACCP system, including:

- Description of HACCP system
- Hazard analysis
- CCP determination
- Critical Limit determination
- CCP monitoring activities and results
- Deviations and associated corrective actions
- Training
- Verification
- Modifications to the HACCP system
- Internal audit
- Sanitation control monitoring results
- Complaints
- Recall
- External audit
- Other activities

The documentation and record control system should be set up while taking into consideration the size and nature of the organization, its processes, and products.

All relevant documents, records, and data shall be maintained according to the applicable legislations, regulations, or organization's requirements.