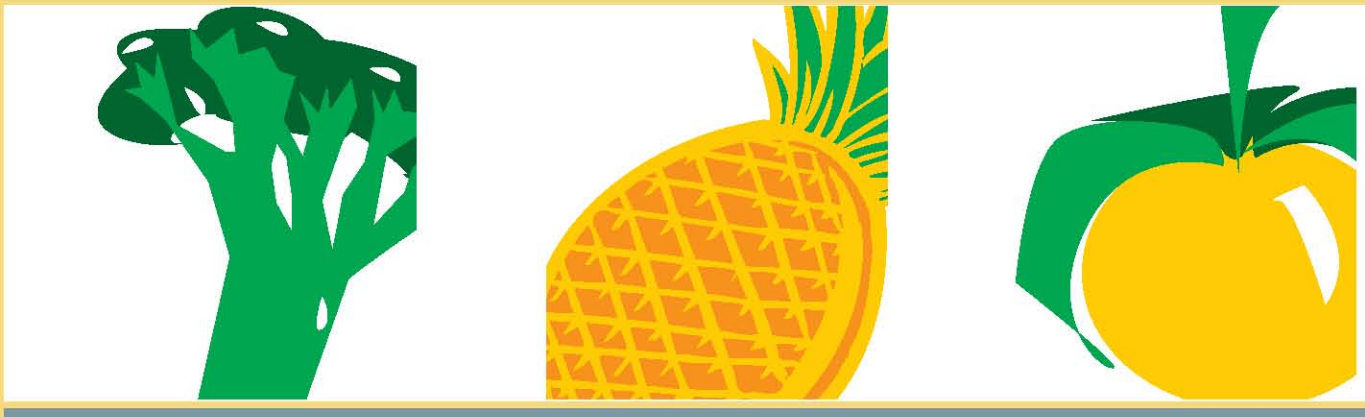
Implementing programmes to improve safety and quality in fruit and vegetable supply chains: benefits and drawbacks

Latin American case studies



Implementing programmes to improve safety and quality in fruit and vegetable supply chains: benefits and drawbacks

Latin American case studies

Prepared by:
Maya Piñeiro
(Senior Officer)
Luz B. Díaz Ríos
(Consultant)

Food Quality and Standards Service
Nutrition and Consumer Protection Division

Food and Agriculture Organization of the United Nations
Rome, 2007

ISBN 978-92-5-105901-2

For further information, please contact:

Food Quality and Standards Service
Nutrition and Consumer Protection Division
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla, 00153, Rome, Italy
Fax: (+39) 06 57054593
E-mail: food-quality@fao.org
Web site: http://www.fao.org/ag/agn/agns/

Executive summary

While many developing countries are making efforts to develop competitive advantages so that they can participate in the world fruit and vegetable trade, recent developments in import markets concerning strict safety and quality requirements are posing fresh challenges to such countries to improve their production, marketing and control systems in order to meet these requirements, or even anticipate them.

The possibility of carrying out the required improvements will depend to a large extent on the technical, administrative and financial capacities already existing within the sector and within institutions supporting the various commodity sectors. In this connection, there is a fairly widely-held view in developing countries, especially in the small-scale horticultural sector, that improvements in safety and quality to meet the demands of import markets generate high costs and few benefits, inasmuch as they do not have any direct effect on price. These high costs then reduce small producers' chances of entering export markets.

This negative view springs from a poor understanding, both in the institutional sphere and also among those involved in the sector, of the benefits and drawbacks of implementing safety and quality improvement programmes. With a view to improving this understanding, FAO provided support for three case studies of export fruit and vegetable sectors in Latin America – cape gooseberry in Colombia, broccoli in Ecuador and fresh pineapple in Costa Rica. These studies encompass an effort to identify and assess the benefits and drawbacks of carrying out improvements in safety and quality in order to meet market requirements.

The case studies were carried out by experts from institutions with functions concerned with safety and quality within the countries, using the following general methodology: i) identification of the point of departure or the gap to be made up between the present situation and the desired one in terms of the capacity to provide the safety and quality guarantees required by the target market; ii) analysis of the various changes or practices required in order to improve safety and quality, taking into account the capacities and limitations of producers, particularly small-scale ones; iii) analysis of the benefits and drawbacks linked to implementation of the improvements; iv) formulation of a proposed intervention, identifying the institutional support needed in order to carry out the improvements or changes identified.

The results of the case studies indicate that the benefits and drawbacks of making improvements in production and marketing processes in order to meet the demands of the target market are directly related to the point of departure or the size of the gap to be closed in order to move from the present situation to the desired one. In this regard, capacities to make safety and quality improvements vary among the sectors studied and also within the category of small producers. Sectors where the actors are more technically advanced, organized and coordinated have greater possibilities of meeting – or even anticipating – market demands, as is seen in the cases of pineapple and broccoli. In the case of cape gooseberry, the technological problems of cultivation and the lack of coordination among the actors are aspects that have to be resolved if safety and quality improvement programmes are to be successful.

In terms of the capacities of producers in the three sectors studied, small producers generally face technical, financial and management constraints that impede the implementation of safety and quality improvements. Their low educational level hampers their ability to keep proper records and the other documents needed to comply with safety programmes or to serve as instruments for farm management and planning. From the technical point of view, the present level of capacities with regard to appropriate pest and disease control systems and appropriate production practices is limited, resulting in low efficiency in the use of production resources (excessive applications of pesticides, low efficiency in the use of fertilizer etc.) and high risks for produce safety.

Analysis of all the recommendations/practices to be implemented to meet safety and quality objectives indicates that the largest improvements concern the implementation of programmes to reduce

chemical residue hazards, investment in building health infrastructure, produce storage facilities and chemical storage facilities, payment for soil and water analysis, and the general optimization of production practices.

What are the advantages and disadvantages for small producers of making the required improvements? In this connection, the case studies highlight the fact that the costs connected with making improvements in safety and quality are considerable, mainly in connection with the building of health infrastructure and storage facilities, and payment for technical advisory services and soil and water analysis. The amount of these costs varies depending on how sophisticated the sector is, the production technology applied, the type of producer etc. In the case of small pineapple growers, for example, the results indicate that the improvements needed to meet the safety requirements of the EurepGAP Protocol account for between 36 and 55 percent of the costs of implementing good practices programmes.

Do the costs connected with implementing the programmes represent a real obstacle to small producers' participation in export sectors? The study results indicate that costs will hamper the implementation of improvements, depending on various factors:

- small producers' access to economic resources (funding, subsidies etc.) in order to carry out the improvements needed in terms of infrastructure construction, payment for services (advice, laboratory analysis etc.), purchase of equipment etc.;
- the public and private infrastructure available to support and facilitate the implementation of programmes by small producers;
- careful analysis of the *drawbacks and benefits* of the practices to be implemented: an analysis that considers solely the drawbacks will very probably define the costs as an obstacle to implementation of the required improvements and will thus act as a disincentive for the implementation of such programmes on the part of small producers.

In terms of benefits, the major benefit of making improvements in safety and quality is connected with the possibility of supplying a lucrative market. However, as in the case of costs, the size of the benefits derived from implementing safety and quality programmes will depend to a large extent on the point of departure in terms of the producers' levels of technical advancement and technical and administrative abilities. The case studies illustrate major benefits connected not only with improved productivity (yields per hectare) and the percentage of produce meeting export demands and thus marketed at a higher price, but also with the reduction in variable costs as a result of more efficient use of agricultural inputs (pesticides, fertilizers etc.). Since small producers work under traditional systems (as in the case of broccoli and cape gooseberry), improvements in the production process are clearly reflected in improvements in yields and other production variables. These benefits are less evident in the case of producers working under more technically advanced production systems (as in the case of pineapple). In this category of producer, improvements to meet market requirements are centred on the construction of support infrastructure and other investments to ensure the safety of produce, and also on keeping records of the practices adopted and setting up tracking processes – activities with less clear benefits for producers because they do not affect production variables. The creation of incentives, for example financial support to carry out the required investments, are therefore needed in order to encourage small producers to take part in these programmes.

Analysis of the benefits and drawbacks connected with the implementation of safety and quality improvement programmes indicates a positive relationship. Producers in the broccoli and cape gooseberry sectors appear to draw benefits from the increased income resulting from improvements in quality, the reduction in variable costs and higher yields per hectare. However, if small producers are to secure these benefits, they need institutional support in order to strengthen and/or develop the technical and administrative capacities needed to implement the recommended practices.

In this regard, capacity-building concerning safety and quality must be seen as a gradual, ongoing

process, allowing specific improvements to be made while taking into account the *existing capacities* and the identified needs. When building small producers' capacities in this sphere in order to facilitate their participation in export sectors, it is therefore important to consider the amount of public and private effort needed and also to define realistic short, medium and long-term objectives.

The existing capacities to implement safety and quality programmes obviously vary depending on the category of producer, as is seen in the case studies. Different levels of institutional support or intervention are therefore needed in order to bring about safety and quality improvements to meet export market requirements. In this connection, institutional efforts could have greater impact if they focused on identifying and rectifying the specific constraints of the various categories of producer, first optimizing the opportunities of the small producers with the most possibilities of carrying out the required improvements.

In conclusion, it is clear that the approach to promoting safety and quality improvements must take an over-all view in analysing the various sectors. Producers' possibilities of meeting market requirements with regard to safety and quality depend on a number of factors (technological elements, structure of the sector, coordination of the actors, international and national competition, economic benefits, actors' technical, economic and administrative capacities, etc.). In the three sectors analysed, institutional efforts, both public and private, have focused mainly on: i) strengthening the various "resources" external to the producer – creating an appropriate regulatory framework, providing support for research, establishing laboratories etc.; ii) strengthening small producers' *technical and administrative capacities* through training and advice, the promotion of links or forms of coordination among producers etc. However, if small producers are to secure the benefits of adopting practices to improve safety and quality, they must have the *financial capacity* to adopt these practices and make the investments required. Public and private interventions that combine the above-mentioned elements with the creation of incentives by increasing farmers' financial capacities will therefore have a greater chance of success. Examples of this type of incentive are the granting of subsidies for certain services (low charges for soil and water analysis), financial support to pay for certification, the construction of infrastructure and the purchase of equipment, and the supply of advice and other support. These aspects represent the main costs involved in implementing safety programmes and have a major effect on total production costs, as is seen in the cases studied.

Table of Contents

Acronyms and abbreviations

AGN	Nutrition and Consumer Protection Division, FAO
AGNS	Food Quality and Standards Service, FAO
BRC	British Retail Consortium
CORPEI	Ecuadorian Export and Investment Promotion Corporation
EU	European Union
EUREP	Euro-Retailer Produce Working Group
EUREPGAP	EUREP Good Agricultural Practices
FAO	Food and Agriculture Organization of the United Nations
FBD	Food-Borne Disease
FDA	Food and Drug Administration, United States
GAP	Good Agricultural Practice
GDP	Gross Domestic Product
GHP	Good Hygiene Practice
GMP	Good Manufacturing Practice
g	Gram
ha	Hectare
HACCP	Hazard Analysis and Critical Control Point System
IPDM	Integrated Pest and Disease Management
IQF	Individual Quick Frozen process
ISO	International Organization for Standardization
km	Kilometer
LOD	Level Of Determination
MRL	Maximum Residue Level
msl	Metres above Sea Level
PROCOMER	Costa Rican Foreign Trade Promotion Agency
PROEXPORT	Colombian Export Promotion Agency
t	Metric tonne
WTO	World Trade Organization

Acknowledgements

FAO's Nutrition and Consumer Protection Division expresses its sincere gratitude to the work teams in each of the countries for the commitment shown in carrying out the case studies concerning the implementation of safety and quality programmes in fruit and vegetable export sectors, the results of which are analysed in detail in the present document. Appreciation also goes to the producers, market operators, exporters and experts from support institutions, for their invaluable contributions to the work carried out.

Work team in Colombia
Coordinators from national institutions:

- Anita Torrado. Coordinator of the Agricultural Agrofood Sector Safety Group
- Colombian Agricultural and Livestock Institute
- Germán Sánchez, Research Expert, Integrated Pest Control Programme, Colombian Agricultural and Livestock Research Corporation
- Jesús María Pedraza, Coordinator, National Good Agricultural Practices Programme, National Training Service
- Myriam Saavedra, Expert, Technological Development Directorate, Ministry of Agriculture and Rural Development

Research experts:

- Luz Mireya Pinzón
- Arley Almanza
- René Escobar

Work team in Ecuador
Coordinators from national institutions:

- Susan Espín Mayorga, Autonomous National Institute for Agricultural and Livestock Research
- Hipatia Nogales, Ecuadorian Plant and Animal Health Service
- Jorge Daniel Montalvo Espinosa, National Coordinator, Special Food Safety Programme, Ministry of Agriculture and Livestock
- Wilfrido Salazar Naranjo, Ministry of Agriculture and Livestock
- María Enriqueta Dávalos Velasco, Ecuadorian Standards Institute

Research experts:

- Nancy Medina Carranco
- Lizardo Maldonado
- Hernán Naranjo Mejía

Work team in Costa Rica

Coordinators from national institutions:

- Francisco Marin Thiele, National Production Centre
- Rafael Ángel Mena Villavicencio, Ministry of Agriculture and Livestock
- Víctor Hugo Ruiz Obando, National Training Institute

Research experts:

- Martín Parada Gómez
- Pablo Peralta Quesada
- Karla Meneses Bucheli

Supervision and technical direction:

- Maya Piñeiro, Oficial Superior
- Luz B. Díaz Ríos, Consultora

List of Tables and Figures

List of Annexes

Introduction

As part of its efforts to build institutional, public and private capacities for the implementation of safety and quality improvement programmes in the fruit and vegetable sector, between 2004 and 2005 the Food Quality and Standards Service (AGNS) of FAO's Nutrition and Consumer Protection Division (AGN) provided support for three case studies concerning the implementation of safety and quality improvement programmes in the sphere of primary production in fruit and vegetable export sectors in Latin America and the Caribbean.

In this context, the exercise proposed by FAO – and carried out by a group of experts from institutions involved with safety and quality in the various countries – entailed an effort to identify the benefits and drawbacks of implementing safety and quality improvement programmes, and then, on the basis of this identification, to propose incentives and strategies to encourage the actors, mainly small producers, to take part in such programmes. The case studies do not involve any complex economic analysis to identify and quantify the benefits and drawbacks of implementing such programmes. Analysis is confined to exploring the economic feasibility of growing the crops under production systems that incorporate good practices in order to meet safety and quality objectives, and also the impact of such practices on the various cost variables and other production variables.

It is hoped that the work carried out, with its results as presented in the present document, will help to improve understanding of the factors that facilitate and/or hamper the implementation of safety and quality improvements on the part of fruit and vegetable producers, especially small-scale ones, and also of the need to propose integrated solutions that take account of the producers' technical, administrative and economic capacities, together with the amount of institutional support needed in order to develop and/or strengthen these capacities.

The present document gives the detailed results of the exercise and is made up as follows:

- section 1 gives an overview of the background and general context in which the case studies were carried out;
- section 2 gives details of the regulatory and policy framework with regard to the safety and quality standards required by the main countries that import fresh fruits and vegetables from Latin America and the Caribbean; such requirements are the main incentive for implementing safety and quality improvement programmes in the region;
- section 3 gives a general description of the methodology recommended by FAO for the present exercise;
- sections 4, 5, 6 and 7 give the detailed results of the case studies;
- section 8 gives a general overview of the aspects of the studies that should be highlighted;
- lastly, there is a short section (9) on the conclusions to be drawn and lessons to be learned from the whole exercise.

1. Background

Various international organizations and governments are carrying out campaigns to increase fruit and vegetable consumption, since this is a fundamental element in a healthy diet. In view of the importance of these items in nutrition and health, their safety should be a foregone conclusion and hence a non-negotiable consumer right.

However, recent data support the view that food-borne diseases (FBDs) are increasingly connected with the contamination of fruits and vegetables, particularly fresh produce. For example, the consolidated data of the Center for Food Safety and Applied Nutrition of the United States Food and Drug Administration (FDA) report a total of 8 039 cases of illness caused by fresh fruits and vegetables for the 1996-2005 period,[1] with the following cases standing out in particular: the contamination of raspberries with *Ciclospora cayetanensis* in 1996 and 1997, with 2 489 people affected; the contamination of tomatoes with *Salmonella nitrica serotype Newport*, in 2002, with 512 people affected; the contamination of onions with Hepatitis A virus in 2003, with 950 people affected; and, more recently, the contamination of spinach with E. Coli O157:H7 in 2006, leading to the deaths of 3 people and affecting about 204 others. In 1996, Japan saw the largest outbreak linked to contamination of fruits and vegetables, in this case radishes, affecting about 4 000 children and causing one death. The figures are based on reported cases where a direct link with the contamination of fruits and vegetables has been proved, but they would be much higher if they included estimates of unreported cases and those where there was a suspected but unproved link with the consumption of fruits and vegetables.

In developing countries there is a lack of detailed figures showing the extent of health problems linked to the consumption of contaminated fruits and vegetables. However, in view of the production methods used in some of these countries and the deficiencies in terms of infrastructure to handle, transport and distribute the produce, it is very probable that there are considerable numbers of diseases linked to the consumption of fresh fruits and vegetables.

Along with recent outbreaks of FBDs linked to the consumption of fresh fruits and vegetables, the expansion of the world trade in such produce has increased consumers' awareness of safety issues, leading in turn to the application – on the part of governments or the industry – of increasingly strict safety and quality requirements.

For many developing countries, the growth of the world fruit and vegetable trade is fundamental to the diversification of their traditional exports and the generation of foreign exchange. At the same time, however, consumers' awareness of the safety risks associated with this growth has raised huge challenges in terms of the need to adapt production and marketing systems to comply with the strict safety and quality requirements of importing markets.

The challenge for the governments of developed and developing countries, and for the industry as a whole, is to make sure that the benefits derived from the increased consumption of fruits and vegetables and increased world trade in these products are not undermined by consumers' negative perception regarding the safety risks associated with their consumption.

In this regard, FAO has been collaborating for a number of years with international bodies and associations of developing countries on the issue of the safety and quality of fresh fruits and vegetables as a way of improving public health and promoting economic development. In 2002, as part of these efforts, the Food Quality and Standards Service of FAO's Nutrition and Consumer Protection Division launched its *"Programme to improve the safety and quality of fresh fruits and vegetables",* which stresses the adoption of practices at appropriate points or stages in the chain "from farm to plate" to prevent dangers of contamination of fresh fruits and vegetables. The programme is based on two types of strategy, *capacity-building* and *information-sharing,* as a basis for improving the safety and quality of fresh fruits and vegetables.

As part of the first component, the programme supported the carrying out of *three case studies* on the

[1] These data are given by L. Zink, Opportunities for Food CGMP Modernization, Food Safety Magazine (August-September, 2006).

implementation of programmes to ensure safety and quality in Latin American countries, the scope and results of which are discussed in detail in the present document. The FAO *Programme to improve the safety and quality of fresh fruits and vegetables* is described below in general terms, together with the initiative that led to the case studies.

-Building regional, national and local capacities concerning safety

Training has been the central element in activities to build safety and quality capacities under this FAO programme, and the training component of the programme was based on the following principles:

i) the importance of fruits and vegetables as value-generating sectors in the economies of developing countries, with a market orientation as the fundamental characteristic of value sectors;

ii) the need to adopt a chain approach to safety and quality issues, based on the understanding that all those involved in the production, handling and distribution of fruits and vegetables share the responsibility for supplying safe produce;

iii) the adoption of a preventive approach to controlling hazards critical for the safety and quality of the produce;

iv) the importance of taking environmental and social considerations into account in programmes to improve safety and quality;

v) recognition of the multidisciplinary and interinstitutional nature of programmes to ensure safety and quality.

These principles define the structure and content of the training programme, which has a strategy based on "training multipliers" or "pyramid training". In this strategy, a group of participants representing various institutions with functions concerning safety and quality within each country, takes part in regional and/or subregional courses. These multipliers or trainers are then responsible for carrying out training activities within their respective countries.

With a view to supporting implementation of the training programme, FAO's Food Quality and Standards Service produced a manual for trainers, which was issued in printed form and also on CD-ROM. This manual provides key information required by multipliers in order to hold similar workshops within their countries. Complementary information and reference material on the subject is provided through a global database containing approximately 800 entries concerning the safety and quality of fresh fruits and vegetables. The approach of the training programme was based on a process of **information-sharing** and **capacity-building**, taking account of **existing regional and national capacities**. The regional and subregional workshops are a unique opportunity for the sharing of experience on initiatives implemented in the various countries with regard to the safety and quality of fresh fruits and vegetables.

Although the programme's activities focused initially on Latin America and the Caribbean, the programme has now expanded to other regions. Since 2003, a total of nine regional and subregional workshops have been held in Latin America, the Caribbean, Africa, Asia and the Middle East. Further information on the activities, scope and results of the programme can be found at http://www.fao.org/ag/agn/foodproducts_fresh_en.asp

During the subregional workshops held in Latin America, the participants carried out a SWOT (strengths, weaknesses, opportunities and threats) analysis, which allowed them to identify the positive or favourable factors (the strengths) and the negative factors or constraints (the weaknesses), and also the threats and opportunities connected with initiatives regarding the safety and quality of fresh fruits and vegetables in the context of each country. One aspect that was repeatedly identified by the participants as a constraint on implementing initiatives in this regard is the actors' (producers', exporters', support institutions' etc.) poor grasp of the benefits and costs associated with implementing such

programmes in the primary production sphere. There was also the almost unanimous view that the frame of application of these programmes is confined to fruit and vegetable sectors that supply export markets.

This situation led to the proposal to carry out **case studies** with the aim of *identifying the advantages, disadvantages, and economic, technical and administrative implications of implementing programmes to ensure safety and quality in specific fruit and vegetable sectors. The results of such studies will make it possible to focus institutional, public and private efforts on building capacities that will ensure improvements in safety and quality, and also to identify incentives and strategies to encourage the actors – mainly small producers – to take part in such programmes.*

2. Safety and quality requirements with regard to fresh fruits and vegetables

2.1 Ensuring safety and quality in fruit and vegetable sectors

The approach promoted by FAO with regard to the supply of safe and high-quality foodstuffs is based on risk management throughout the whole food chain, a process involving the implementation of regulatory and non-regulatory measures at appropriate points in the chain, ranging from preproduction practices up to the point of sale or distribution to consumers, so that the product meets current norms (FAO, 2005[a]).

Although the approach entails the identification and evaluation of risks all along the chain, interventions in this regard should focus on the point or points where they are most effective. Inasmuch as fruits and vegetables are often consumed raw or only lightly cooked, washing prior to consumption does not completely eliminate possible pathogens. This fact has led to the appearance of a series of interventions of a regulatory and non-regulatory nature (obligatory and voluntary standards, training, advice etc.) on the part of the public and private sectors, resulting in improvements in production, handling and distribution methods intended to ensure the safety and quality of fresh fruits and vegetables the whole length of the chain.

At the international level, the Codex Alimentarius is the intergovernmental body responsible for establishing international standards governing food safety. The International Organization for Standardization (ISO) has recently expanded its activities into formulating private food safety standards, with publication of the ISO 22000 standard. These international organizations convene national governments, experts and observers in order to develop standards, recommendations, codes of practice etc., which can then be used by countries to support regulatory initiatives. The Codex Alimentarius is the reference text for food safety and quality in the Sanitary and Phytosanitary Measures Agreement of the World Trade Organization (WTO), so that national regulations based on the Codex Alimentarius standards comply with WTO requirements with regard to international trade.

However, although the final aim of the standards established by countries, chiefly in the form of regulations, is to protect consumers' health and facilitate trade, they are set up in the framework of a whole collection of interests on the part of the industry, consumers, producers etc. Differences in income, in the perception of risks associated with the consumption of certain products and in preferences etc. increasingly shape national regulations, which in many cases incorporate stricter requirements than those accepted at the international level (Josling *et al*, 2004).

Interventions with regard to standards – with the way being led by developed countries, where consumer awareness of safety and quality factors is greater – have had a major impact on fruit and vegetable production systems in developing countries. In the case of Latin America, initiatives with regard to standards of both an obligatory and voluntary type carried out in Europe and the United States – the main target countries for fruit and vegetable exports – have provided the motor for implementation of programmes to improve safety and quality all along the fresh fruit and vegetable chain in the main countries supplying these markets.

In the European Union (EU), there have been various major initiatives with regard to food safety regulations, and these have had and will have a major impact on fruit and vegetable sectors in exporting countries. Regulation 852/2004 on the hygiene of foodstuffs lays down general rules for all businesses involved with foodstuffs, including those devoted to **primary production**, stating that establishments producing food within the EU or importing such products must comply with general and specific hygiene requirements, and also register their operations with the relevant European authorities. With regard to initiatives concerning pesticides, the EU has started to review all the active substances used in crop protection, determining the inclusion or exclusion of each from the list of substances whose use is permitted in the EU or in imports. The process of evaluating all the registered substances should be completed in 2008. The EU is also carrying out a process to establish common maximum residue levels (MRLs) for pesticides, and in 2005 it adopted Regulation 396/05, establishing the mechanisms to determine and control MRLs in foodstuffs. With a view to establishing a common MRL in the EU,

the interested parties must provide data giving the results of residue analyses in line with good agricultural practices (GAPs) and the evaluation of safety criteria for the consumer. If no results of such evaluations are presented, the MRL is fixed at the level of determination (LOD), which is in fact close to zero (Jaffee, 2003).

In the United States, public initiatives concerning the safety of imported fresh fruits and vegetables are carried out mainly by the FDA under the national programme entitled *Produce and Import Safety Initiatives*, which is applied in coordination with the Department of Agriculture and the Center for Food Safety and Applied Nutrition. These bodies promote the implementation of good practices in the production of fresh agricultural produce, basing themselves on the *Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables* published by the FDA in 1998. This guide, which is voluntary in application, is intended to help farmers, packers and others to improve the safety of fresh agricultural produce, whether national or imported. With regard to pesticides, MRLs are established by the Environmental Protection Agency and are applied both to domestically produced foodstuffs and imports. The FDA carries out inspections of domestic and imported produce to ensure that these limits are observed.

Other regulations, albeit not focusing directly on safety objectives, but undoubtedly contributing to the success of measures applied for this purpose, are concerned with the adoption of tools making it possible to assure the traceability of products, for example article 18 of the EU's Regulation CE 178/2002 on traceability, in force since January 2005, and the regulation concerning the establishment and keeping of records in connection with article 306 of the 2002 law on public health safety and the prevention of bioterrorism in the United States, published officially by the FDA in December 2004.

2.2 Private-sector interventions with regard to standards

Initiatives carried out by the private sector in Europe – in response to developments regarding regulations or as a way of anticipating such developments – with the aim of ensuring the safety and quality of fresh fruits and vegetables are marked by the emergence of protocols that are used by third parties as the basis for granting certification. A notable example is EurepGAP, an initiative of the Euro-Retailer Produce Working Group (EUREP), under which certification is granted following compliance with GAPs in primary production. With regard to packing operators, there are various types of standard or protocol used as the basis for certification, depending on the European target country, for example, the British Retail Consortium Global Standard—Food, promoted by a group of retailers in the United Kingdom, and the International Food Standard promoted by retailers in Germany and France. These standards are generally based on application of the principles of the hazard analysis and critical control point (HACCP) system and the hygiene principles established by the Codex Alimentarius. European legislation (regulation 178/2002) delegates direct responsibility for the safety of foodstuffs to food companies, which has undoubtedly fostered the appearance of private initiatives.

In the case of the United States, although the direct responsibility of the food sector is less explicit, the FDA's Federal Food, Drug and Cosmetic Act prohibits the sale of adulterated foodstuffs or those with misleading labels, taking the term "adulterated" as encompassing safety considerations. With regard to microbiological contamination of fresh fruits and vegetables, whether domestically produced or imported, there are no specific regulations on the practices or measures that are to be adopted, and application of the FDA's recommendations is basically voluntary.

On the other hand, the emergence of private initiatives concerning third-party certification as to safety and quality in primary production are uncommon in the United States. In this connection, the Food Marketing Institute grants certification of compliance with the requirements of the SQF 1000 Code, which concerns the implementation of good practices but does not include check lists or specifications regarding the good practices to be applied in the sphere of primary production.

Public or private programmes are basically monitoring and verification programmes based on the

implementation of good practices as found in the FDA's guide, and inspections to verify implementation of good manufacturing practices (GMPs) in packing plants for fresh fruits and vegetables. These include inspections carried out by Primuslabs, Davis's Fresh Technologies and the Government itself under the programme implemented by the Department of Agriculture through its Agricultural Marketing Service.[1] Some retailers require their suppliers, whether local or in exporting countries, to show a certificate guaranteeing that the merchandise has undergone such inspections. In the specific case of good practices, companies that supply inspection services have their own check and verification lists and criteria according to which the merchandise is accepted or rejected. The frequency of such inspections varies, but they are normally annual. In some cases, a producer who supplies two or more buyers will have to request inspections from different companies depending on the various buyers' preferences or demands. The recent outbreaks of disease connected with the contamination of fresh produce is likely to have a considerable impact in terms of regulations and/or the promotion of certification initiatives by the private sector.

2.3 Initiatives concerning the safety and quality of fresh fruits and vegetables in Latin America

-What are good practices, and is there a generally agreed understanding of the concept?

The concept of good practices in the agricultural sphere is not new. Agricultural colleges throughout the world have been promoting application of the principles of good practices for a number of decades as a way of promoting the environmental and economic sustainability of production systems. However, the concept has taken on a new dimension as a result of the links established between primary production and the final safety of the product within the chain approach. These links are much more critical in the case of produce that is consumed raw, for example fresh fruits and vegetables.

FAO has been working on a draft conceptual framework for good practices based on four GAP principles applicable to all scales of farming (COAG, 2003):

- economic and efficient production of sufficient, safe and nutritious food;
- maintenance and enhancement of the natural resource base;
- maintenance of viable farming enterprises and contribution to sustainable livelihoods;
- satisfaction of the cultural and social demands of society.

In practice, the protocols, codes of practice, guidelines and standards concerned with good practices for fresh fruits and vegetables, as promoted by the private sector and/or governments and international bodies, vary in the objectives they seek to meet or promote. Some stress the prevention and control of hazards to product safety and others promote the adoption of production systems or practices aimed at environmental and economic sustainability, while others seek to combine various principles of good practices in the pursuit of objectives of environmental protection, safety, quality, and improvement in social aspects connected with workers' safety and protection. There are also differences in approach within good practices initiatives focusing on safety objectives in order to comply with regulations or market requirements. In some cases, stress is laid on various aspects of the prevention of contamination by microbiological agents, with little or no stress on the prevention of chemical contamination, while other programmes stress correct pesticide handling as a way of reducing chemical contamination. Other initiatives seek to apply an integrated approach to the prevention of risks linked to microbiological, physical and chemical hazards during the production and handling phases of fruits and vegetables in the field and during post-harvest phases.

Developments with regard to good practices in markets importing fresh fruits and vegetables, particularly the initiative carried out by the FDA in the United States to promote the implementation of good practices in order to prevent microbiological hazards, and the EurepGAP initiative of the European

[1] With regard to primary production, the Agricultural Marketing Service carries out inspections only at the domestic level.

retail sector, have to a large extent been responsible for the boom in good practices initiatives in the fresh fruit and vegetable export sector in Latin America, promoted by both the private and public sectors.

In Chile, the Fruit Development Foundation has been carrying out initiatives to promote good practices in the fruit and vegetable export sector since 2000. The foundation is currently responsible for the Technical Secretariat of ChileGAP, a protocol through which certification can be obtained to meet the GAP and food safety requirements of purchasers in Europe and the United States.

In Mexico, the Mexico Supreme Quality Programme is a certification system that uses a seal (the property of the Federal Government, the Secretariat for the Economy, the Ministry of Agriculture and Bancomex) to generate added value for Mexican agrofood products that have been produced according to quality, hygiene and safety standards. This programme has developed its own GAP standards, which include all the requirements of the EurepGAP system for fruits and vegetables.

In Brazil, the Ministry of Agriculture is implementing an Integrated Fruit Production Programme, which originated towards the end of the 1990s with the aim of adopting technology with a reduced impact on the environment and human health, pursuing food safety and quality, environmental quality, profitability and social equity. With regard to safety, the programme's stress is on rationalizing the use of agrochemical products.

In Guatemala, the Ministry of Agriculture and the Association of Non-traditional Export Trade Groups are implementing an Integrated Agricultural and Environmental Protection Programme, under which a seal of safety can be issued.

With regard to standards, various government initiatives have promoted the development of national standards for specific good practices for fruits and vegetables, as is seen for example in Peru and Colombia. The public sector in the countries of the region supports the development of guides to GAPs and is working together with the private sector to promote such practices, for example through the establishment of national commissions.

Moreover, the market for certification by third parties and verification inspections has grown considerably in fruit and vegetable exporting countries in Latin America. The same companies that provide inspection services for domestic production in the United States carry out operations in exporting countries. Various companies throughout Latin America provide inspection services for certification, for example according to EurepGAP and SQF 1000 principles. Safety and quality demands have also given rise, albeit gradually, to a whole market in services in terms of laboratories, technical advice and other services needed to demonstrate safe practices in the production and handling of fresh fruits and vegetables.

2.4 Incentives and constraints for the application of measures to ensure the safety and quality of fresh fruits and vegetables

As mentioned earlier, initiatives to adopt GAPs with a view to sustainability objectives have been in force for a number of decades. However, the growing importance of good practices programmes in the past ten years has been a result mainly of the market demand for safety and quality guarantees, and the recognition that the type of intervention that can be carried out in the sphere of primary production in order to meet such requirements is based on the implementation of preventive or good practices.

The main incentive for implementing safety and quality improvement programmes on the part of the fresh fruit and vegetable export sector in Latin America has therefore come from the need to meet the safety and quality demands of importing markets. The export sector in Latin American countries has been gradually modifying production and management systems in order to comply with these demands (FAO, 2005b). Díaz (2006) says that asparagus producers in Peru, for example, have made investments of about US$1 million in safety and quality improvements.

Inasmuch as the diversification of traditional exports – with products of high added value, including fruits and vegetables – is a priority for governments in various countries in the region as a way of promoting development and economic growth, there is growing concern over the negative effects that these strict safety and quality demands could have on the countries' export sectors, restricting their possibilities (especially in the case of small and medium producers) of taking advantage of market opportunities and/or maintaining their participation in the export markets they currently supply. On the other hand, in view of the absence of strict requirements on the part of purchasers within the country, there is a growing concern that the benefits generated by the implementation of such programmes will not reach local consumers.

The support of the public and private sectors and international cooperation bodies for improvements in the actors' understanding of the benefits and drawbacks of implementing safety and quality programmes, for the creation and building of institutional capacities and, in the sphere of production, for the required changes, is a necessary condition if these programmes are to have the desired impact on the production sector that supplies domestic and export markets, as is discussed in the following sections of the present document.

3.

The methodology adopted for the case studies

3.1 Objectives

Various individuals, groups and organizations help to build capacity with regard to safety and quality in the fruit and vegetable sector. Producers, workers in packing plants, handlers, distributors, consumers, inspectors, laboratories and various centralized and decentralized government bodies (ministries and departments of agriculture, health, trade, standards, extension services etc.) all play a role with regard to the safety and quality of fresh fruits and vegetables.

In view of the complexity of the subject, it is therefore clearly important to carry out coordinated work with the actors involved in order to improve understanding of the incentives and constraints on implementing safety and quality programmes. This coordinated work should also identify the institutional support required to overcome the technical, administrative and financial constraints encountered.

FAO therefore proposed that the multidisciplinary and interinstitutional teams taking part in the subregional workshops on "Improving the quality and safety of fresh fruits and vegetables: a practical approach" held in Latin America in 2003 and 2004, should carry out an application exercise (or case study) for each country in order to assess the technical, administrative and financial capacities required by producers, mainly small growers, if they were to implement programmes to improve safety and quality in local, regional and/or national fresh fruit and vegetable sectors. This exercise would provide the basis for drafting a joint *Plan of action* to overcome the constraints identified.

The sectors selected should be of major economic and social importance in the local, regional and/or national contexts, with a high participation of small and medium producers, and should be sectors where the implementation of safety and quality programmes is particularly appropriate or necessary in order to meet market requirements and/or national or international standards. Three case studies were thus carried out:

Table 1. Case studies carried out in Latin America

	Case	Bodies taking part:
1	Implementation of good practices in the cape gooseberry sector: case study of small producers in Granada Municipality, Colombia.	The Ministry of Agriculture and Rural Development, the Colombian Agricultural and Livestock Institute, the National Training Service and the Colombian Agricultural and Livestock Research Corporation.
2	Implementation of good practices in the broccoli sector: case study of the Huertos Gatazo Zambrano enterprise, Ecuador.	The Ecuadorian Plant and Animal Health Service, the Autonomous National Institute for Agricultural and Livestock Research, the Ministry of Agriculture and Livestock, and the Ecuadorian Standards Institute.
3	Implementation of good practices in the pineapple sector: case study of the Huerta Norte Region, Costa Rica.	The National Production Centre, the Ministry of Agriculture, and the National Training Institute.

Questions to be addressed in the course of the studies

The case studies sought to provide answers to the following questions:

- What is the gap between present production systems and the situation required to meet market requirements or current standards regarding the safety and quality of fresh fruits and vegetables?
- What steps have been taken to comply with the safety and quality requirements of the target market or the standards currently in force?
- What measures need to be taken to bring about a transition from the present production and management systems to systems based on the implementation of good practices with a view to meeting safety and quality objectives?
- How are the necessary changes to be carried out? What was the point of departure? What institutional, public and private infrastructure is required to support the changes? How have producers been encouraged or how could they be encouraged to adopt good practices?
- What is or should be the role of the private sector and public institutions in this transition, and how are these roles coordinated?
- In cases where processes to implement good practices have already been launched, where did such initiatives arise? What roles have the public and private sectors played in the success of these initiatives?
- What type of producer and exporter is involved in such programmes? Who takes part?
- What are the benefits – for the various actors in the sector – of carrying out the required changes?
- What are the general costs of implementing these practices, and who meets them?
- What are the main constraints hampering the success of programmes and how can they be overcome?
- What are some of the possible impacts, both positive and negative, of implementing programmes to improve product safety and quality?

3.2 Stages in the studies

The Food Quality and Standards Service of FAO's Nutrition and Consumer Protection Division designed a reference methodology for the case studies, which was supplied to each working group. This methodology was composed of four stages, which are summarized below:

Stage 1- Description of the present situation of production systems in the study zone in terms of good practices, with a view to meeting safety and quality objectives

How far are current production systems from being able to offer the safety and quality guarantees required by the target market or the standards in force?

Through a general analysis of the sector, an effort is made to identify the context in which the actors interact, the size of the sector, the technological problems, the type of producer involved, the regulatory context, the competition to be faced etc. An analysis of the sector is then carried out through a detailed description of present production systems, identifying what is done, in other words, the various phases in the production and post-harvest management process, analysing how such operations are carried out, identifying problems connected with product safety and quality, and examining these

in the context of standards or market requirements.

Stage 2- Identification of the changes required for the transition to production systems based on good practices in order to meet safety and quality objectives

Analysis of all the changes required in order to make the transition from current production systems to systems based on the adoption of good practices

In this stage, workshops are held in order to reach a joint definition – with producers and other actors – of the changes required in order to make the transition from the current production systems to systems based on the implementation of good practices, taking as a reference point the practices or recommendations contained in a code of practice, market protocol or national or international set of standards. The constraints/difficulties are identified, and also the strengths and opportunities for producers and other actors in the sector, resulting from implementation of the good practices recommended, and a consensus is reached on a set of practices that will allow the safety and quality objectives laid out in the protocol or standards to be met.

Stage 3- Implications of implementing the programmes: benefits and less positive aspects (drawbacks)

General evaluation of the benefits and drawbacks connected with the implementation of good practices

This stage involves a general evaluation of the benefits and drawbacks connected with the implementation of good practices. A set of indicators is defined that will allow quantitative and qualitative evaluation of the benefits and drawbacks of compliance with standards or market requirements.

With regard to data collection, in the four stages of the case studies, appraisals and studies carried out by various national institutions – for example the Ministry of Agriculture, export promotion bodies (the Colombian Export Promotion Agency [PROEXPORT], the Costa Rican Foreign Trade Promotion Agency [PROCOMER], CCI etc.) and research institutions – are reviewed, along with statistics available for the sector and the product, and other available reference material. Information is also gathered from primary sources through workshops with producers and exporters, interviews, and field visits to farms and packing plants.

Stage 4- Formulation of the proposed intervention

Prioritization of the measures to be taken and analysis of the institutional support required in order to carry out the proposed changes

On the basis of a prioritization of practices to be adopted in the short, medium and long terms, a joint action plan is agreed, indicating what is to be done, how it will be done, who will be responsible, and the time and resources needed in order to implement the plan. The type of necessary institutional, public and private support is also analysed, together with the roles of the various actors (who is to do what) and the strategies needed in order to encourage actors to undertake the changes.

3.3 Anticipated results

It is anticipated that the results of the case studies will provide elements that will help in:

- identification of future challenges and opportunities for producers, farmers, support institutions and other actors wishing to initiate and implement programmes to ensure the safety and quality of fresh fruits and vegetables;
- improved understanding of the various actors in the sector as to the economic, technical and administrative implications of implementing such programmes;
- proposal of strategies to improve the relevance and effectiveness of training programmes in this connection;

- identification of strategies that could be implemented to encourage producers, particularly small growers, to adopt programmes to ensure the safety and quality of fresh fruits and vegetables.

The reference methodology proposed by FAO was adapted by the working groups on the basis not only of the particular conditions of the sectors being studied, but also of the experience of the experts who were to carry out the work. The results are presented in the following sections of this document.

3

4.

General characteristics of the sectors studied

4.1 The cape gooseberry *(Physalis peruvianum)* sector in Colombia

-Background

The cape gooseberry sector in Colombia developed towards the end of the 1980s, partly as a result of the policy of diversifying exports, among which "promising fruits"[1], including cape gooseberry, were to make up the range of non-traditional products promoted by PROEXPORT. Since then, the cape gooseberry has become the leader among Colombian exports of promising fruits, with exports in 2004 constituting 54 percent of those of all such fruits. It also occupies second place in Colombian exports of fresh fruits and vegetables, following the banana.[2] However, exports in terms of both value and volume account for only a very small proportion of Colombia's total agricultural exports. In 2005, the country exported a total of 6 421.6 t, equivalent to a value of US$23.8 million (PROEXPORT, 2005). Between 1995 and 2004, the average annual increase in cape gooseberry exports was 8.37 percent, with particularly marked growth in more recent years: thus the value of cape gooseberry exports was US$9.0 million (2 647 t) in 2001, while it had risen to US$23.8 million (6 421 t) in 2005.

According to figures from PROEXPORT, a total of 58 operators were involved in the cape gooseberry export trade in 2005. In the Cundinamarca zone, which accounts for 75 percent of production, there are about 40 enterprises. Colombia currently exports cape gooseberry to 29 countries, although 97 percent of exports are to the European market, with Germany, the Netherlands, the United Kingdom and France as the main importing countries, accounting together for 86.47 percent of such exports. The growth in exports to these countries has been rapid. For example, Belgium imported 80 t in 2001, but the figure had risen to 558 t in 2004, meaning an average annual increase of 63 percent, while Germany imported 911 t in 2001 and 1 850 t in 2005.

Exports of this fruit to the United States market started in 2003 as a result of the Department of Agriculture's approval of cold treatment to control pests. This approval was based on the results of analysis of pest hazards carried out by the United States' Animal and Plant Health Inspection Service in collaboration with the Colombian Agricultural and Livestock Institute and the Colombian Center for Phytosanitary Excellence. However, the volume of such exports is still very small (81 t in 2005).

Although cape gooseberry is produced in a number of countries (Zimbabwe, Malaysia, China, Kenya, South Africa, the Caribbean, France, Spain, Costa Rica, Ecuador, Peru, Bolivia and Mexico), the two main competing countries in the world market are Colombia and Zimbabwe. The Colombian product competes in terms of quality and the continuous nature of supplies, so that it enjoys a preferential price on the world market, whereas the Zimbabwean product competes in terms of price because of the country's lower freight costs (CCI, 2002).

-The domestic market

The growth rate of imports by the EU, the main destination of Colombian exports, has been lower than the growth rate of the exportable supply, so that a considerable proportion of production remains within the country (only about 26-40 percent of total production supplies export markets). Although the domestic market was initially fairly restricted due to consumers' lack of familiarity with the fruit and the absence of industrial alternatives, a domestic demand has gradually developed. Between 1995 and 2003, apparent cape gooseberry consumption in Colombia saw a dramatic increase, with an average annual growth rate of 79 percent, while per capita consumption grew at an average rate of 76 percent in the same period, increasing from 0.001 kg in 1995 to 0.16 kg in 2003 (CCI, 2005). In the most recent two years (2004 and 2005), domestic prices for cape gooseberry in its two forms (with and without calyx) have risen considerably, particularly in the season when supplies are low (CCI, 2005).

[1] "Promising fruits" include tree tomato, cape gooseberry, pitahaya, mango, baby banana and granadilla.

[2] The value of banana exports was US$365 million in 2005.

-Production

The fruit and vegetable survey[3] carried out in 2004, showed the existence of approximately 360 ha planted to cape gooseberry, 76 percent located in the Cundinamarca Department. Like the area harvested, cape gooseberry production grew in the 2000-2003 period at an average annual rate of 12 percent. The total area planted is in the hands of about 500 producers, 78 percent of whom are under 45 years old, a fact that facilitates the formulation of technical assistance plans and training in general. More than 57 percent of the country's productive population is found in Cundinamarca, spread over about 320 production units, with an average area of 0.86 ha per plot and a predominance of smallholdings.

Cape gooseberry farms are under various types of land tenure: 60 percent of producers farm leased land, 30 percent farm their own land and the remaining 10 percent farm community land. Apart from a few cases where the producer has his or her own capital resources to finance crops, the most frequent situation is one in which the producer has severe capital restraints on growing activities. Producers receive little official technical advice, a situation that provides opportunities for representatives of commercial agrochemical companies, who encourage intensive production with the use of external inputs (generally of chemical origin).

-Job generation

Cape gooseberry is a labour-intensive fruit in the various growing, harvesting, post-harvest and marketing phases. It is estimated that during the growing cycle (9-11 months) an average of 400 workdays are needed per hectare for the various tasks (Quintero *et al.*, 2004), which means that in 2004 more than 145 000 workdays would have been needed on the 360 ha planted to cape gooseberry in the country. In the post-harvest phase, market operators in the zone are the main source of employment of women to carry out activities connected with selection, inspection or control, packing in plastic baskets, weighing and final packaging of the produce for export. In the marketing phase, the crop generates indirect employment in the production zone for loaders and transporters (in the latter case both for the produce itself and for workers), while within the marketing companies it generates employment in terms of administrative jobs and skilled labour. The promoters of agrochemical products and the technical representatives of agricultural stores also benefit indirectly. In general terms, the cape gooseberry trade is a major motor for the economy of the municipalities producing the fruit, providing a dynamic boost to local trade at all levels.

-Marketing systems

The demand of the international market is not stable, and different marketing channels come into play at different seasons. During periods of low international demand, cape gooseberry marketing is generally carried out under the influence of wholesale supply centres. This is a traditional system in which producers have no direct commercial link with exporters or specialized domestic markets and their connection with the market takes place through a middleman (in some cases these are producers connected to exporters and buyers for the domestic market) who distribute the fruit to exporters, supermarkets and agribusiness operators (Espinal *et al.*, 2005).

On the other hand, during periods of high international demand (February-May and October-December), the predominant marketing system is marked by a direct relationship between growers, sometimes individually and sometimes organized into associations, and exporters. Under this system, the domestic market is supplied by the surplus and rejects that are not exported but are now sold by the export companies to specialized domestic markets (chain stores), so that in this case export companies become one more link in the domestic marketing chain.

Exporters generally have a group of established suppliers with whom they have agreed some type of contract, usually verbal, as to volumes, prices, supply period, place of delivery and in some cases handling of the produce. The producer harvests the fruit and transports it in baskets to the exporter's collection centres, where the selection, grading, inspection and packing processes are carried out, after which the

[3] National survey of ten agroindustrial fruits carried out by the Ministry of Agriculture and Rural Development, the National Statistics Department, the National Fruit and Vegetable Fund and the Colombian Fruit and Vegetable Association.

producer is informed of the results, the payment is agreed and rejects are returned.

When producers have no supply contract with a market operator, they sell their produce to the operator offering the highest price. And here the popular saying "short-term gain, long-term loss" applies, for in the low-demand period, the same producers have to accept the conditions laid down by the middleman or even in extreme cases resign themselves to writing off the crop completely. The traditional form in which cape gooseberry has been exported to the European market is with a dry calyx and to the United States with or without the calyx. The packaging varies according to the market (the European country where the fruit is retailed).

4.2 The broccoli sector in Ecuador

-Background

The expansion in commercial broccoli growing started in 1990, and the agroindustrial sector, specifically focusing on the individual quick frozen (IQF) process, started to develop in about 1992. From the start, the sector has seen a marked and constant growth, accounting for a growing proportion of non-traditional exports. According to estimates made by processing and export companies, 97 percent of Ecuador's total broccoli production is exported in frozen form through five processing plants: Provefrut, Ecofroz, Padecosa IQF, Valley Foods and Pilvicsa. The first four use the IQF agroindustrial process. The remaining 3 percent is sold on the domestic market in fresh form, with an annual per capita consumption of a mere 0.7 kg. The sector generates about 11 571 jobs per year, spread over the various phases of the production chain (Ecuadorian Export and Investment Promotion Corporation [CORPEI], 2006).

In 2005, 86.6 percent of broccoli exports were to European countries and the United States. In 2000, the main purchaser of the Ecuadorian product was Germany, with the Netherlands in second place. However, these proportions have changed since the United States market started expanding, and by 2005 25.7 percent of exports went to this market (CORPEI, 2006).

In 2005, 86.6 percent of broccoli exports were to European countries and the United States. In 2000, the main purchaser of the Ecuadorian product was Germany, with the Netherlands in second place. However, these proportions have changed since the United States market started expanding, and by 2005 25.7 percent of exports went to this market (CORPEI, 2006).

-Production

Ecuador's environmental conditions are particularly favourable for growing broccoli, thanks to its location on the Equator, which gives greater luminosity and hence lends the crop a brighter green colour than supplies from other parts of the world. Broccoli production has been located especially in the Sierra Centro-Norte Region, where Cotopaxi Province is the main producer, accounting for 68 percent of the country's production.

The area planted to broccoli has grown very considerably in the past 15 years, especially on the basis of the growing demand from international markets (the EU, United States and Japan) due to a shift in consumer habits towards more healthy and balanced diets.

It is estimated that at the start of the 1990s, the area planted to broccoli in Ecuador was a mere 200 ha, while in 2000, according to data from the 3rd National Agricultural and Livestock Survey, the area under broccoli was 3 359 ha, with a total production of 50 000 t. In view of continued growth in the sector, it is estimated that there are 5 000 ha devoted to broccoli today.

According to CORPEI (2003), small producers (those with less than 20 ha) constitute 20 percent of

all producers, while medium (20-100 ha) and large producers (over 100 ha) constitute 47 and 33 percent respectively. In 2005, large producers accounted for 65 percent of the total volume produced (CORPEI, 2006.

The estimated average yield for the country, according to the 3rd Agricultural and Livestock Survey, is 14.6 t per hectare. Analysis of the yields according to provinces shows that Cotopaxi Province has the highest yields, with 23.5 t per hectare, as against an average for the other provinces of less than 10 t. The highest yields, when advanced technology is used, can be as great as 25 t per hectare, depending on such factors as types of irrigation, seed and variety.

-Job generation

According to investigations carried out by Ecuador's Fruit and Vegetable Producers' Association with producers using both traditional systems and advanced technology, the number of workdays needed for each hectare from sowing through to harvesting is 80, and the growing cycle lasts three months, which may stretch to four depending on climatic conditions; in other words, there are basically three harvests per year. It is estimated that the number of work places generated by the sector is 11 571 in a year, spread over the various phases of the production process. On this basis, the number of people depending on income from work on farms, in processing plants and in the marketing of broccoli would be 19 703,[4] or approximately 4 000 Ecuadorian families (CORPEI, 2006).

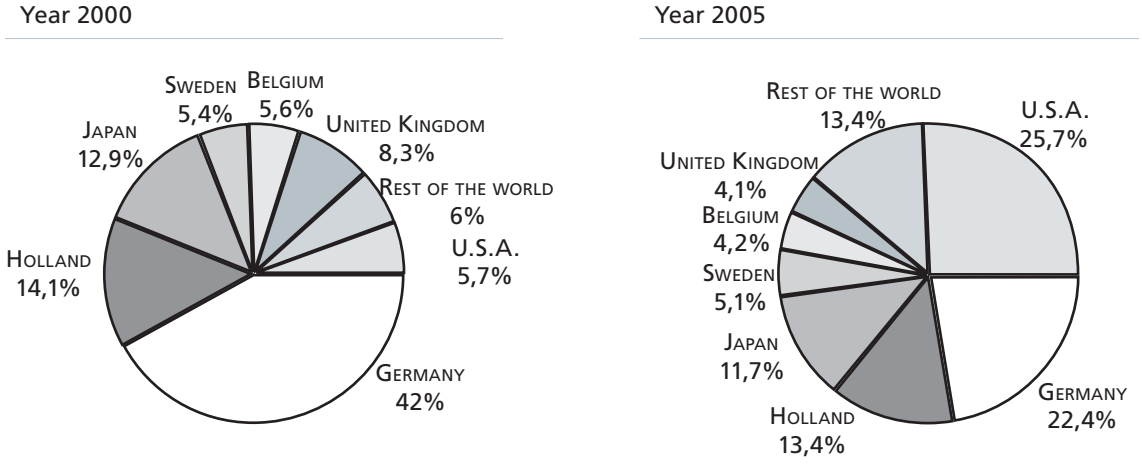
-Marketing systems

Small and medium growers produce broccoli under contracts with processing plants (CORPEI, 2003). According to the estimates of processing and marketing companies, large growers such as the Nintanga and Brocoagro companies account for 33 percent of total production, while medium and small growers account for 67 percent. Small producers generally grow for the local market, although if they are part of an association, as in the case of Gatazo Zambrano, they can deliver produce for the export market, since they have larger quantities and greater continuity of production.

There are five broccoli processing plants in Ecuador, all of them members of the Fruit and Vegetable Producers' Association: Provefrut (the largest in the country), Padecosa IQF, Ecofroz, Valley Foods and Pilvicsa. The first four process fresh broccoli into frozen broccoli. Only Pilvicsa prepares broccoli for export in its fresh form. The processing companies themselves undertake the marketing of the broccoli, doing this through brokers, in one of two forms. In the first, the broccoli is exported in bulk to be repackaged later, with or without a trademark (generic broccoli), while in the second the packaged

[4] This estimate has been based on the supposition that families do not depend exclusively on one person, but that two or three members of the household work in this sector, while the remainder depend on these individuals.

Figure 1. Destinations of Ecuador's broccoli exports



Source: data from the Central Bank of Ecuador, processed by the research team.

broccoli is exported ready for final consumption with private trademarks or blank labels.

According to data provided by CORPEI (2003), the extended broccoli sector generates about US$72 million, divided as follows: 15 percent in the primary production phase, 62 percent in the processing stage, 9 percent in customs costs and handling, and 14 percent in transport to end markets. In the structure of production costs, labour accounts for a total of almost US$13 million per year, and such linked sectors as fertilizer, agrochemical products and equipment in primary production account for US$3.8 million, while the estimated values for the energy and packaging materials sectors in the processing stage are US$9.3 and US$5.3 million respectively.

4.3 The fresh pineapple sector in Costa Rica

-Background

Pineapple production in Costa Rica is occupying an increasing place in the agricultural and livestock sector, given its contribution to the gross domestic product (GDP) of this sector, estimated at 27.83 percent in 2005, whereas its share had been estimated at 7.60 percent in 1998. Costa Rica's pineapple production has met with wide approval on the international market. Some of the reasons for this favourable reception are connected with the advanced technology used in the production process, favourable climatic conditions, a high-quality product, and a strategic geographical location for the United States market. Fresh pineapple is now one of Costa Rica's main export products, having advanced from eighth place in 2000 to sixth in 2005 (PROCOMER, 2005). Pineapple exports represented approximately 4 percent of total exports and 20 percent of agricultural exports in 2004. The average annual growth rate between 1999 and 2004 was 14 percent in terms of value and 16 percent in terms of volume.

Pineapple exports grew considerably between 1998 and 2004 – 131 percent in value and 139 percent in volume, with the highest growth rate (27 percent in value and 25 percent in volume) in 2004. The United States is the main purchaser of exports of this fresh fruit, accounting for 55 percent of exports, while the EU accounts for 42 percent.

-The international market

Fresh pineapple production in the world context today is headed by Costa Rica, which supplies 85 percent of the United States' imports. The countries that have led the world's pineapple exports (accounting for 60 percent of total world exports in 2002) are Costa Rica, Côte d'Ivoire and the Philippines.

Fresh pineapple, the processed juice and pineapple pieces are sold on such large markets as those of the United States and Europe. Large corporations such as the Del Monte Food Company, Maui Pineapple Company and Dole Food Company have consolidated their places as leaders in the world market, and the reputation of their brand names has encouraged pineapple consumption throughout the world; for example, per capita consumption of fresh pineapple in the United States is about 1.8 kg.

The main exporting countries include Costa Rica, Belgium, France, Ghana and the Netherlands. With regard to imports, trends have been very similar to those for exports: world imports were 1.97 million t in 1990 and rose to 3.27 million t in 2003, representing an increase of 65.8 percent.

-Production

Single-crop growing of this fruit started in the 1970s as a result of the appearance on the stage of large transnational corporations, which at the time cornered the majority of the country's production. Thus in 1989, 65 percent of the country's pineapple production was owned by Pindeco, a subsidiary of the Del Monte transnational corporation. However, the present situation is very different, for there is large-scale participation of small producers, who focus on production to supply both local and export markets.

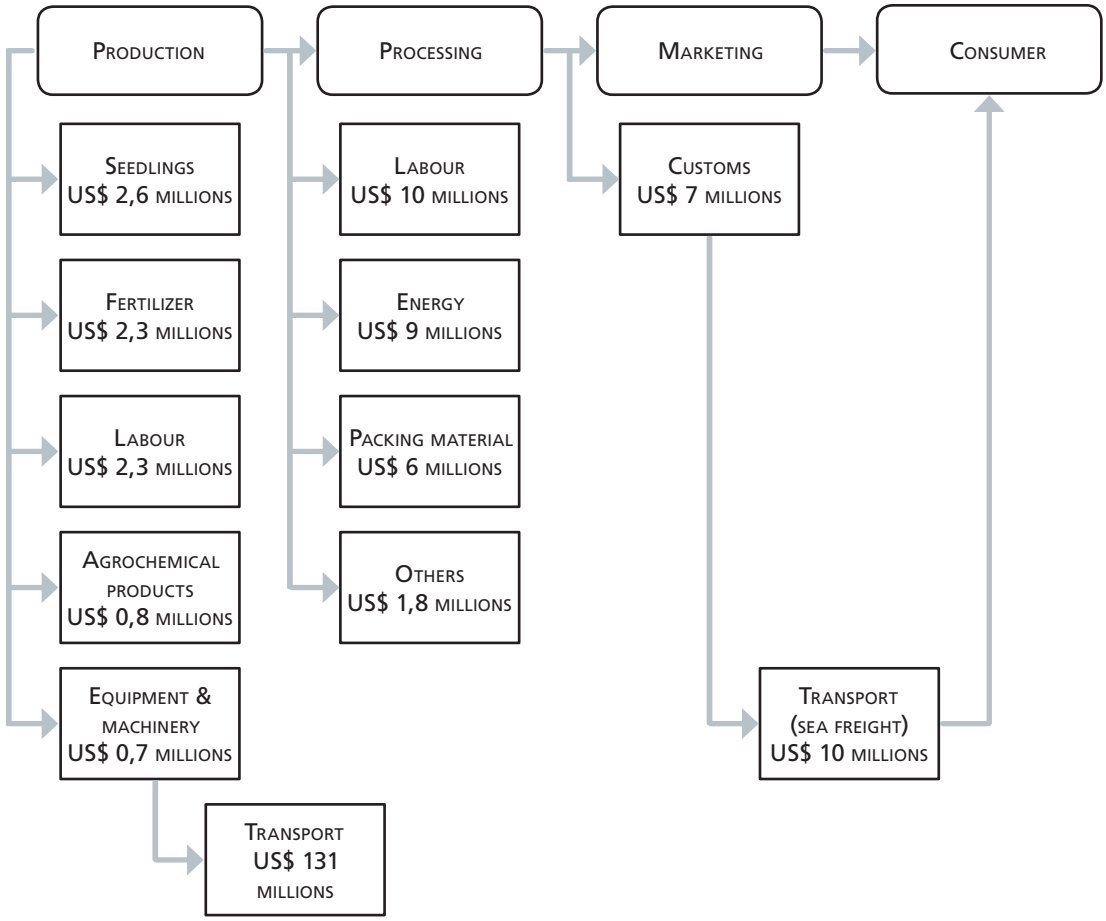
According to data from the Executive Secretariat for Agricultural and Livestock Sectoral Planning and the National Pineapple Programme, production has risen significantly. The average increase in metric tonnes between 1991 and 2005 was approximately 103 percent, rising from 600 000 to 1 483 200 t harvested. In the same period, the area under pineapple rose 300 percent from 6 000 to 27 720 ha.

The average growth in production in tonnes and area planted for the period 1991-2005 were 7.51 percent and 11.62 percent respectively, while the average yield during this period was 86.25 t per hectare. According to information supplied by the National Pineapple Programme, in January 2005 more than 50 percent of the area under pineapple lay in the Huerta Norte Region.

-Employment

According to information from the National Pineapple Programme, 0.7 workers are employed per hectare under pineapple, indicating a total of approximately 16 100 workers. The Huerta Norte Region employs approximately 8 500 workers. It is estimated that by the end of 2005, with a total of 24 720 ha planted to pineapple, approximately 17 300 people will be employed in the sector.

Figure 2. Distribution of value generation in the export broccoli sector



Source: data supplied by production and processing companies for 2003 and processed by the Ecuadorian Fruit and Vegetable Producers' Association.

-Marketing

International marketing of export pineapple is dominated by a small number of enterprises. According to Board of Trade figures, 60 percent of international marketing is carried out by a single enterprise. In the case of domestic marketing, producers supply the fruit directly to supermarkets and markets or use a wholesaler as a distribution channel. In the case of international marketing, producers sell the fruit to specialist wholesale distributors.

Markets and local supply centres absorb 51.7 percent of production, while 47 percent supplies the export market.

5.

Implementing good practices in the cape gooseberry sector:

case study of small producers in Granada Municipality, Colombia

5.1 Context

The study zone

Cundinamarca Department is Colombia's main cape gooseberry producing zone, having 76 percent of the country's total area planted to this crop. The municipality of Granada, where the case study was carried out, has 27 percent of the planted area within the department. Cape gooseberry producing zones are located in high marginal areas. The strategic location of this municipality, close to the country's largest consumption centre, Bogotá, and the main airport for cape gooseberry exports, together with the availability of road infrastructure, financial services, educational centres, agrochemical marketing companies, and public and welfare services are all factors that foster the competitiveness of this zone as against the country's other productive zones.

5.2 The actors

a. Producers

The results of a sampling of 38 producers in Granada Municipality, carried out by the Colombian Agricultural and Livestock Research Corporation in 2001, show that 16 percent are large growers (with 6 to 10 ha under cultivation), 21 percent are medium (between 2 and 5 ha) and 61.2 percent are small (with less than 2 ha). So far as land-tenure systems are concerned, the study indicates that producers are divided fairly evenly between owners and tenants. However, in terms of cultivated area, small growers are the ones who own their farms, whereas the medium and large farms are mainly leased. Two groups can be distinguished among producers in the zone: those using traditional production systems and those using more technologically advanced production systems.

-Traditional producers

A variety of production methods are found within this group, ranging from producers who farm individually to the formation of production companies by two farmers, in which the partners agree on the resources that each will contribute and how income from the sale of the produce will be divided. Producers in this category generally have a low educational level (not having gone beyond primary school, which means they have received only four or five years of schooling). Their high dependency on external inputs as a result of their broad experience of this crop (over 15 years) and entrenched attitudes to cropping methods and poor understanding of the technological model, especially as regards the handling of agrochemical products, make it hard to change their growing methods. In terms of trade, these producers have no permanent links with export companies, but are highly dependent on middlemen and have little information on which to base decisions on the crop and its commercial aspects. This situation means that they are vulnerable to price fluctuations and the middlemen's economic power. In the traditional production system, cape gooseberry is intercropped with sweet potato, pea or maize as a way of using the land productively during the first three or four months after the cape gooseberry crop is planted.

Traditional production is generally carried out on small farms on sloping land at a considerable distance from urban zones. These growers have no working capital or technical assistance, almost never have soil and water analyses carried out, and use organic fertilizers with little prior treatment. The distances between plants are small (2 x 2 m) and they tend to carry out no post-harvest activities such as selection or grading. In some critical low-supply periods, standing crops are sold prior to harvesting.

-Producers using technology in their production systems

These producers have a medium to high educational level, having attended secondary school or technical college, and in some cases a professional training institution. They have less experience than traditional producers – approximately five years – and grow on areas of more than 3 ha, receiving technical advice to choose well-located land with good agricultural and environmental features. Most of them have two or three-year leases. They grow as individuals or in well-organized groups that allow greater resources to be assembled. They generally have their own means of transport. Although cape gooseberry is usually grown on its own on terraced land, there are also cases where it is intercropped

with other species.

Since they are carrying on a strictly commercial activity, before planting they plan their growing cycle so that the harvest period coincides with the demands of the external market. These producers are well informed and have good links with export enterprises, with whom they have supply contracts or what they call "agreements", which include not only the specific terms of the contract, but also technical, commercial and packaging advice. The agreement sometimes also includes partial financing of the costs of cultivation and transport from the collection zone to the marketing company.

These producers have greater access to the benefits of institutional support, and the farms are registered with the Colombian Agricultural and Livestock Institute in compliance with the regulations laid down for export fruits. Table 2 gives an overview of the characteristics of the various production systems in the zone, divided into different types of producer

b. Wholesaler-suppliers

Cape gooseberry marketing is in the hands of a small number of wholesaler-suppliers with strong bargaining power. The volumes they market individually varies, ranging from 100 to 300 t a year, over 70 percent of which is graded as of export quality, while the remainder consists of rejects that are released onto the domestic market. These wholesaler-suppliers are growers of cape gooseberry and other crops such as pea and fruits with export potential (granadilla, gulupa or purple passion fruit, and tree tomato or tamarillo) who have moved into marketing and are now recognized in the region in terms of their trade activities, which provide most of their annual income (70 to 80 percent). They have from two to over ten years' experience as traders, which has facilitated business relations with various actors in the sector through whom they learn of any changes in the market. Some of them have a legally constituted business organization, while others are in the process of establishing one. They generally have storage facilities and a basic staff of between 15 and 20, made up of labourers, office staff, transporters and a manager.

Most of these wholesaler-suppliers perform only functions connected with storing and transporting the fruit, although some carry out selection tasks, and others even carry out complete post-harvest processes under written agreements with the market operators, covering all the tasks from reception of the fruit from the grower, storage, selection and post-harvest tasks up to delivery to the market operator.

Suppliers with formal links with market operators, i.e. those who have written or verbal agreements laying down the terms of the operation, initiate certain crop monitoring activities with their suppliers (the producers), consisting of verification of health status, the use of permitted agrochemical products, the form of harvesting, the quality of the fruit and estimation of the length of the growing cycle. When the arrangement is verbal, there is no agreement as to price and they have to fill market operators' immediate purchase orders in difficult market situations. The producer-suppliers are paid after the fruit has been sold by the market operator.

The wholesaler-supplier generally has up to four sales choices, apart from the domestic market. However, when contracts are formal, they give rise to a certain fidelity to customers. With a view to guaranteeing a permanent supply of fruit to the market operator, wholesaler-suppliers have various alternatives: they may establish their own farms, make supply agreements with producers, where the main incentive is payment of a price above the market price and in cash, or, in situations of particular scarcity, turn to the informal market.

c. Marketing and packing enterprises

About eight marketing companies operate in the Granada area and have an assured reputation in the region: Comercializadora Frutierrez, Exportadora Frutirreyes–Novacampo, Comercializadora Sociedad Agraria de Transformación Cosechar, Exóticos Agrosefepa Ltda., Comercializadora Internacional, El Tesoro Fruit SA, Cidela and Frutas Comerciales.

These companies are supplied with fruit in two ways: through a group of suppliers with whom they

Table 2. Characteristics of the technology used in two cape gooseberry production systems in Granada Municipality, Cundinamarca, 2005

Activity	Traditional	With the use of technology/ a GAP approach
Altitude	1 900-2 400 msl	Above 2 400 msl.
Soil analysis	Not carried out.	On the basis of this analysis, a fertilizing plan is drawn up.
Technical assistance	Little access to technical assistance.	The producer hires technical assistance, and it is sometimes supplied by market operators
Preparation of the soil	Minimum tillage is carried out, and only the planting site is prepared.	Machine tillage, since this is the fastest way of preparing the soil.
Application of soil conditioners	Carried out as producers see fit.	Carried out on the basis of the soil analysis results.
Disinfection	Strong mixtures.	Use of recommended products.
Planting density	High planting densities, ranging from 2 000 to 2 500 plants per hectare.	Planting densities of between 1 500 and 1 600 plants per hectare.
Application of fertilizer	Follows a routine learned by the producer, with the use of organic fertilizer (chicken and pig droppings) and chemical fertilizer of various types.	Carried out depending on the results of the soil analysis and on the basis of technical recommendations.
Plant protection (against pests and disease)	Use of a wide range of inputs, little rotation of products and high dosages; Follows a preventive criterion and the producer's normal habits; Use of manual, low-maintenance sprinkling equipment.	Smaller range of products; Technical advice received on crop protection, and some integrated pest and disease management (IPDM) practices implemented; Use of motor-driven sprinkler equipment (fixed sprinklers).
Pruning for health and shape	Carried out by hand, sometimes with the use of a pruning knife; Residues burned.	Use of pruning clippers, although these are generally not disinfected; Residues are removed from the cultivated plot.
Use of stakes	Rare use.	Very frequent use.
Weed control	Carried out manually with a machete or mechanically with a scythe; When the situation calls for it, herbicides are used in the pre-planting stage; Residues are left in the alleys between rows as soil protection.	Similar to the traditional system.
Harvesting	Carried out manually without clippers, with high use of female labour.	Combining the manual system with and without clippers.
Production	Annual production per hectare of 18 t, approximately 50 percent of which is export-quality fruit.	Annual production per hectare of 17 t, approximately 70 percent of which is export-quality fruit.

Source: results of the study for the year 2005.

have made verbal supply agreements, or through their own farms established in the zone. They are legally constituted companies, implementing good practices in their growing and with the necessary and appropriate infrastructure to carry out post-harvest activities in compliance with the recommendations of good manufacturing and hygiene practices. Some of them have obtained certification under the HACCP system and ISO 9000.

-Interaction among the actors — marketing channels

There are two cape gooseberry marketing channels in the Granada production zone:

Traditional system - Producers make a verbal agreement with a middleman for the sale of the fruit. A lower price than the market price is agreed, and payment is in cash. The middleman then sells the produce to a **wholesaler-supplier** who supplies market operators. The function of the middlemen who take part in this channel is that of storage and transport (they bring the produce to the consumer) and they carry out no selection or grading activity.

Vertical cooperation - *Verbal agreements* are established between suppliers and market operators. This channel works as follows: the market operators send a negotiator to make an agreement with producers on purchase of the fruit, establishing a fixed price, the technical supervision of the crop, training, supply of part of the packaging material and the conditions for transporting the fruit. The market operator provides an agricultural expert who gives advice as to care of crop health, provides training, manages the farm's registration with the Colombian Agricultural and Livestock Association and promotes the use of good practices. For their part, the producers undertake to sell exclusively to the market operator, accept the recommendations of the agricultural expert, carry out a preselection of the fruit and keep the baskets hygienically.

A similar channel is made up of organized groups of medium producers, in other words those growing between 1 500 and 4 000 plants. The difference is that in this system, *the agreement is a written one* and includes some additional details as to the volume and frequency of sales, the quality conditions of the fruit (selection), packaging conditions, the handling and hygiene of baskets, and prices.

Vertical integration - A system that is gaining popularity among export operators is the direct planting of large-scale crops as a strategy to reduce costs, ensure the safety and quality of the produce and satisfy their customers.

5.3 Initiatives regarding safety and quality in the cape gooseberry sector in Colombia

-The domestic context

In September 2005, the National Economic and Social Policy Council approved a document (CONPES 3375) entitled "National Policy on Agricultural and Livestock Health and the Safety of Foodstuffs for the Sanitary and Phytosanitary Measures System". This policy states that with regard to primary production the Agricultural and Livestock Institute will be the body responsible for carrying out such action, giving priority to foodstuffs presenting a greater hazard to public health and those with export potential where this is a requirement for access to markets. Moreover, the Ministry of Agriculture and Rural Development published the "National Plan for the Implementation of Good Agricultural Practices" in December 2004, with the aim of establishing good practices in agricultural, livestock and fishery activities. The Interinstitutional Committee for Good Agricultural Practices was then set up in April 2005 to implement the plan by formulating, implementing and supervising an action plan under which each of the institutions, according to its specific perspective and field of competence, carries out activities contributing to the adoption of GAPs.

-Institutional actions regarding good practices

For more than five years, the Colombian Agricultural and Livestock Research Corporation, as the body responsible for research and technology transfer, has been carrying out various initiatives in terms of extension and training in good practices. Such initiatives are intended for institutional managers and

officers, technical staff and fruit and vegetable growers in the corporation's zones of activity.

The National Training Service is implementing the National Programme for Good Agricultural Practices, which is intended to contribute to competitive, sustainable and equitable development of the Colombian agribusiness sector through the implementation of good practices. The Colombian Agricultural and Livestock Institute established two new working groups in 2001, charged with promoting safety in agricultural and livestock production sectors. These groups have the task of formulating an integrated, preventive approach to ensuring the safety of foodstuffs during the various phases of primary production, so that hazards associated with food safety can be controlled or reduced starting in the field, thus increasing the competitiveness of the country's agricultural and livestock produce. The Colombian Agricultural and Livestock Institute has resources for the next few years, coming both from the national budget and from a World Bank loan, enabling it to carry out its activities regarding regulations and the implementation of good practices in the agricultural sector, together with the transfer and extension of the concept of safety in agricultural foodstuffs.

Resources were allocated from these sources to boost the National Agricultural Input Laboratory, which has been evaluating pesticide residues in agricultural produce, soil and water for a number of years and has accreditation to carry out such tests under the ISO 17025 standard.

One initiative particularly deserving of note was the formulation of the Colombian Technical Standard NTC 5400 on "Good Agricultural Practices for Fresh Fruits, Aromatic Culinary Herbs and Vegetables: general requirements". These standards are intended to define requirements and procedures, thus providing guidelines for small, medium and large producers in order to improve the conditions of primary production with a preventive approach, in the pursuit of safety, competitiveness, environmental protection and workers' safety.

Two Colombian Technical Standards have been developed for the cape gooseberry within the context of various projects, both of voluntary application:

-*Standard ICONTEC NTC 4580. Fresh fruits. Cape gooseberry. Specifications:* this standard is intended to establish the requirements to be met by cape gooseberry (Physalis peruviana L.) intended for fresh consumption or to be used as raw material for processing; the text lays down definitions, grades and sizes of fruit, quality requirements and tolerances, criteria of acceptance and rejection, a ripeness index, packaging and labelling; this standard formed the basis for development and approval of the Codex standard for cape gooseberry, Codex Stan 226-2001;

-*Standard ICONTEC NTC 5166. Fresh fruits. Cape gooseberry. Packing specifications:* this standard is intended to establish the conditions to be met by the packaging used for cape gooseberry harvesting and marketing, both for the fresh domestic and/or export market and for the agribusiness sector.

-Other initiatives supporting the sector

Institutional initiatives to support the sector include the following:

- a strategic plan for the competitiveness of fruit and vegetable produce coordinated by the Production Chain Directorate of the Ministry of Agriculture and Rural Development;
- programmes for cooperation between Colombian and similar control bodies in the United States (the Animal and Plant Health Inspection Service) and Japan in order to obtain approval for Colombian fruits, including cape gooseberry;

- implementation of various projects focusing on good practices, including particularly the project entitled "Assuring the competitiveness of cape gooseberry exports through implementation of a good agricultural practices programme, focusing particularly on the rational management of agrochemical products", which included the production of a handbook on the implementation of GAPs in cape gooseberry cultivation, providing guidelines for professionals and technicians, and also a handbook for producers and the necessary support and supervision for its implementation and adoption; training initiatives were also carried out for producers, produce buyers, students and multipliers;

- the project now under way entitled "Development programme for suppliers: implementation and certification of good agricultural practices on farms producing cold-climate exportable fruits in the Cundinamarca Department";

- studies carried out by national research bodies on the chemical, physical and sensorial qualities of cape gooseberry; these studies have been used as a basis to investigate possible cape gooseberry-based processed products for export purposes.

-The demand for safety and quality assurances

From the start of the present decade, the development of strict requirements on the part of purchasers in importing markets in Europe, as defined in the EurepGAP Protocol, has been placing strong pressure on Colombian exporters to improve production, marketing and management systems in order to meet these demands. Public and private efforts have been pooled to implement initiatives to promote good practices. Particularly in the study zone, although the efforts are clear, the results have not yet led to the country-wide adoption of a programme with much impact among small and medium producers, guaranteeing their capacity to supply marketing companies with the export volumes required for a growing market and with produce meeting safety and quality requirements. The study carried out in Granada Municipality therefore gives an analysis of the economic, technical and administrative implications and challenges facing cape gooseberry producers in moving from a traditional production system to one based on a good practices approach, with a view to showing the benefits and constraints or drawbacks of this transition, and also identifying actions and strategies that can help to overcome such constraints.

5.4 The present situation of production systems in terms of good practices, with a view to promoting safety and quality improvements

The analysis described below was carried out in order to distinguish traditional production systems from systems applying a good practices approach, identify and understand possible advantages and differences between the two systems, establish how production resources are used, and produce an estimate of the costs and benefits of the transition from one system to the other.

Activities carried out during the production process were identified, and the resources the producer uses in economic terms were divided into three groups, **inputs, labour and services,** taking into account the physical quantities employed in traditional cultivation and those connected with adopting production systems based on good practices.

-Problems connected with product safety and quality

A summary of the problems identified in connection with produce safety and quality is given in Table 3. It is clear that with regard to product quality, problems are connected with inappropriate crop management in terms of fertilizing and pest and disease control. With regard to safety, the main challenge is the inappropriate use of pesticides to control pests and diseases, giving rise to constant problems with residues of agrochemical products. With regard to microbiological and physical contamination, a number of factors considerably reduce the possibilities of contamination of the produce: the fact that producers, most of them small farmers, do not carry out grading in the field, the temporary nature of on-farm storage, the short time lapse between the moment of harvesting and transport to the plant, and the fact that the fruit is not washed during post-harvest processes. This means that fundamental

practices in terms of microbiological contamination are connected mainly with hygiene during the harvesting phase.

5.5 Analysis of the drawbacks and benefits of implementing good practices in order to promote safety and quality improvements

Analysis of the costs of implementing good practices

The analysis given in Table 4 shows the structure of cape gooseberry production costs under the two types of production system. In terms of total production costs, the differences between the two systems are not great – US$18 412 634/ha on traditional farms, as against US$19 077 735/ha on farms using good practices. Similarly, the data given in Table 4 do not show major differences between the yields obtained under the two production systems – 18 t and 17 t respectively for traditional farms and those using good practices. The main difference lies in the cost structure. Under traditional production systems, variable costs constitute 79.5 percent, in comparison with 60.5 percent under systems using good practices. Within the variable costs, the largest component is labour, and it should be noted that in traditional systems the cost of workdays is higher than in systems using good practices.

This latter difference can be explained by the level of technology used on the farms. Traditional producers make little use of machinery and equipment to carry out the various tasks, whereas more technically advanced producers use machinery and other equipment for tillage, planting work and plant health protection. However, it should be noted that despite the fact that on farms adopting a GAP approach, activities such as harvesting with clippers and manual pruning (thinning and suckering), which are carried out in order to induce flowering and reduce the application of chemical products, increase the use of labour. However, this effect is offset by the mechanization of such tasks as tillage and plant health protection.

Fixed costs represent 39.5 percent of the cost structure under production systems implementing good practices, and 20.5 percent under traditional systems, reflecting the investments made by the former in infrastructure, technical assistance and administration.

In the structure of fixed costs estimated for producers using good practices, technical assistance is an expensive service (29 percent of fixed costs) because the producer has to hire somebody to perform this service and to ensure permanent monitoring of crop management and thus guarantee the quality demands of the outside market. When the enterprise receives this service through contracts, the cost to the producer is reduced.

This cost can be set against results in terms of productivity and quality, for it is estimated that 70 percent of the yield obtained by producers using good practices corresponds to the extra quality that is required for the external market, while traditional producers, who do not hire technical assistance, report that only 50 percent of their production is of export quality, which means a reduction in their net income of approximately 43 percent as compared with that of producers using good practices.

Another element that contributes to the increase in fixed costs is the high cost of leasing the land, as a consequence of an incursion of producers with outside capital, increasing the demand for the best land for the crop, and consequently pushing up the prices of land and other resources. Another factor that has contributed to the scarcity of land suitable for the crop is the deterioration of land where it has traditionally been grown as a consequence of poor management on the part of farmers.

Under these circumstances, land suitable for growing cape gooseberry in this district is daily growing scarcer, and this has led to a shift of production to higher zones – between 1 900 and 2 300 msl – in an attempt to reduce plant health problems and thus avoid higher control costs. Although the decision to shift the crop has had effects in terms of plant health, growers have also had to accept a reduction in yields, thus reducing their profits.

In conclusion, in terms of production costs the benefits of implementing good practices to meet safety

and quality objectives can be summarized as follows:

- lower use of pesticides because plant health activities are carried out on the basis of technical recommendations, combined with crop management and efficient equipment to carry out these tasks, thus reducing risks of chemical contamination of the produce;
- lower use of fertilizer because the soil is analysed prior to planting, so that the farmer knows what is needed in terms of conditioners and the organic and chemical fertilizers that should be used, all of which is reflected in the improved quality of the produce;
- lower costs for props or stakes, because of the lower density of planting and the fact that in some cases this activity is contracted out; in terms of safety and quality, smaller planting distances allow more effective pest and disease prevention, and thus a reduced use of pesticides and also improved quality of the fruit produced;
- in general, lower costs of inputs, as a result of the greater efficiency consistent with the entrepreneurial approach of producers using good practices;
- high use of labour due to the implementation of IPDM practices.

Economic advantages/benefits of implementing programmes

Taking account of the fact that the average sale price for both traditional producers and those using good practices is similar, i.e. Col$2 500/kg (approximately US$1.1) for export quality fruit and Col$400/kg (approximately US$0.18) for lower quality fruit intended for the domestic market, the net income obtained from one hectare of cape gooseberry by a producer using good practices is 41 percent higher than the income obtained by a traditional grower.

This difference in income is fundamentally a result of *the capacity to produce better quality under production systems using a good practices approach: an average 70 percent of fruit produced under these systems is of export quality*, in comparison with 50 percent under traditional systems. Moreover, producers using good practices regularly have supply contracts with exporters, so that they plan harvesting to coincide with periods of high demand on the export market

Disadvantages in terms of costs

Although the economic benefits of adopting good practices are reflected in a better quality of fruit and in general in higher incomes for producers, the greatest obstacle facing producers, especially small ones, is a lack of the necessary resources to meet the fixed costs of implementing safety and quality improvement programmes. The reduction in production costs generated by more efficient use of production resources and the cropping practices applied compensate for the costs the producers have to meet in order to hire technical assistance services and build health and temporary storage facilities. Producers generally solve the problem of obtaining the necessary agricultural inputs by establishing links with agricultural input suppliers in the zone and through loans. Access to resources to build infrastructure is a constraint, so that public and/or private interventions facilitating access to technical assistance and resources to build the necessary infrastructure are fundamental in encouraging producers to carry out improvements.

Table 3. Problems connected with the safety and quality of cape gooseberries grown under traditional production systems compared with those grown under systems implementing good practices

Traditional production systems	Systems implementing good practices
INPUTS	
Fertilizer	
There are differences between the two systems, both in the specifications or types used and in the quantities. Producers using traditional production systems do not have the technical support of a soil analysis, recommending the corrections or additions needed by the soil, so that fertilizing products are applied with no technical criteria and compound formulae (10-30-10 or 13-26-6) are used, increasing the quantities and thus the costs. Chemical fertilizer is generally supplemented with organic material (chicken or pig droppings) without any prior decomposition process, and this can affect plant growth and sometimes cause burning (or total loss) and accelerate the appearance of soil-connected plant health problems. Moreover, this whole situation represents a hazard for the safety of the fruit.	Producers adopting a good practices approach apply fertilizer on the basis of the availability of nutrients as revealed by soil analysis and the recommendations of technical assistants with experience in managing the crop. Nutrition is carried out with straight or compound fertilizer and with fewer elements, normally in smaller quantities than on traditional farms and in amounts that allow the plants to grow normally. Unlike traditional producers, those trained in good practices use organic matter that has been properly decomposed, with microbiological analysis and a certificate issued by the Colombian Agricultural and Livestock Institute. In general, the larger amounts of fertilizer used by traditional producers can be explained by the different planting densities adopted by the two systems and the producers' belief that larger amounts equal larger yields and smaller risks of economic loss, and also by the unnecessary applications carried out by traditional producers towards the end of the crop's growing cycle.
Seedlings (propagation material)	
The quantity of material used on the different types of farm depends on planting distance, land form (slopes of between 25° and 70°) and the different types of soil found in Granada Municipality's production zone. The plant material used by both traditional producers and those adopting a GAP approach is not uniform and comes from nurseries where seedlings are produced in inadequate propagation and hardening-off conditions, as a result of the nurserymen and women's lack of training in carrying out this task in a technically correct and reliable manner.* However, the training received has made some producers using good practices aware of the need to obtain high-quality plant material, so that they prefer to obtain such material from nurseries certified by the Colombian Agricultural and Livestock Institute. In the case of traditional production systems, planting density ranges from 1 800 to 2 500 plants per hectare, while in the case of those adopting a GAP approach, densities are considerably less – between 1 333 and 1 667 plants per hectare.	
Stakes	
There are no differences in the systems of props or stakes used to support plants. The fundamental difference lies in costs, inasmuch as a higher density means higher costs under the traditional production system. The drawback of the system of stakes used in the zone is the excessive use of wood and the resulting deforestation because there are no forest plantations to be harvested for this purpose.	
Fungicides and insecticides	
A wide range of insecticides and fungicides is used under the two production systems because of the lack of specific products for this crop and the poor technical knowledge of the producers, who differentiate between products according to their commercial names and not their chemical composition. Plant health controls are carried out with applications of a combination of different chemical products in doses generally decided by the producer and sometimes without taking into account the compatibility of the products used. Such an approach is valid when farmers have sufficient technical knowledge, as is the case with those trained in GAPs, who have received instruction on permitted mixtures, how to make them up, product compatibility tests and toxic levels. Traditional producers' lack of technical know-how in the handling of pesticides means that they use a different range,** exceed correct dosages, make incompatible mixtures and cause themselves reaction problems that prejudice the crop and thus affect the safety of the fruit.	

Under traditional production systems, health control applications are more frequent, so that the number of applications is 26.3 percent higher than under systems adopting a good practices approach, despite the fact that the cropping cycle is shorter under traditional systems (10 months).

Moreover, the actual handling of agrochemical products gives rise to health hazards for workers employed to carry out plant protection tasks, since the owners of traditional farms do not possess protection equipment,*** and, if they do, the workers do not use it because of cultural conditioning and the lack of clothing suited to the environmental conditions of the region.

Herbicides

Herbicides are regularly applied in the pre-planting period, prior to preparation of the soil, in order to facilitate tillage if the selected plot has been grassland or has been overrun with weeds. When the crop has been planted, a chemical herbicide is occasionally applied in order to clear the paths or the spaces between crop furrows, an activity supplemented by the use of a scythe, in which case the grass and weeds are left on the ground in order to maintain humidity and protect the soil from erosion.

Labour

The most labour-intensive activity in both cases is harvesting, which is estimated to account for between 69 and 70 percent of the labour used during the whole production process under both systems. On farms where a GAP approach is used, the quantity of labour used for harvesting may regularly be slightly higher than on traditional farms because of the adoption of such practices as harvesting with clippers and washing and care in handling baskets on the farm. However, the amount of labour required for these tasks is directly proportionate to crop yields, which means that the form of payment for this resource also varies, with workers being paid per kilogram harvested. The remaining percentage of labour is divided among such activities as tillage, planting, installation of stakes, plant protection, pruning, weeding and fertilizing.

It should be taken into account that in some cases, where farms are large (over 3 ha), the producer makes contracts to carry out specific tasks, for example the installation of stakes, which will include the costs of materials and labour. This fact makes it hard to obtain precise information for cost analysis. Since some activities (installation of stakes, pruning and harvesting) require specialized labour, when the present study was being carried out producers were concerned over the constant increase in labour costs because of the farming boom in the zone and the shifting of crops to zones increasingly distant from urban areas, a situation that gives rise to competition for labour and higher costs.

Services

This heading covers items and activities that the producer hires or contracts out to third parties, such as the rental of machinery to prepare the soil and of sprinkling equipment to carry out plant protection tasks. It also covers transport for inputs and workers to tend the crop. For producers adopting a GAP approach, the use of machinery is confined to tillage, while intensity of use (hrs/machine/ha) is conditioned by the features of the plot, the type of previous crop (forage cover), the altitude and the implements used.

* Growth medium is handled with little or no disinfection in the nurseries, a situation that does not guarantee the healthy development of the seedlings or the quality of material for the users. This is a recognized factor in contamination of the region's crops.
** In the case study, producers reported the use of 15 trade-name fungicides and 10 trade-name insecticides.
***Masks, overalls, boots and gloves.

Table 4. Breakdown of cape gooseberry production costs under two production systems in Granada Municipality, Cundinamarca, 2005*

Concept				
Variable costs	**Traditional farming system**		**System using a GAP approach**	
Inputs	**Col$/ha**	**%**	**Col$/ha**	**%**
Conditioners or dressings	171.779	0,9	93.310	0,5
Organic fertilizer	651.074	3,5	241.606	1,3
Chemical fertilizer	1.506.135	8,2	1.203.430	6,3
Planting (seedlings)	300.000	1,6	133.300	0,7
Wood (stakes and poles)	975.000	5,3	546.530	2,9
Wire	170.424	0,9	89.755	0,5
Nylon string and yarn	357.142	1,9	239.940	1,3
Equipment		0,0	88.867	0,5
Fungicides	805.325	4,4	557.231	2,9
Insecticides	494.725	2,7	274.115	1,4
Herbicides	112.000	0,6	41.056	0,2
Oil and fuel		0,0	74.648	0,4
Subtotal for inputs	5.543.603	30,1	3.583.789	18,8
Labour	**Col$/ha**	**%**	**Col$/ha**	**%**
Preparation of the soil	170.000	0,9	49.500	0,3
Planting	102.000	0,6	66.000	0,3
Installation of stakes	561.000	3,0	709.500	3,7
Health protection	221.000	1,2	330.000	1,7
Pruning	459.000	2,5	346.500	1,8
Weed control	442.000	2,4	82.500	0,4
Fertilizing	340.000	1,8	132.000	0,7
Harvesting	5.000.000	27,2	5.198.700	27,3
Subtotal for labour	7.295.000	39,6	6.914.700	36,2
Services	**Col$/ha**	**%**	**Col$/ha**	**%**
Transport	1.800.000	9,8	790.913	4,1
Rental of machinery for tillage			124.413	0,7
Soil and water analysis			130.000	0,7

Subtotal for services	1.800.000	9,8	1.045.327	5,5
SUBTOTAL OF VARIABLE COSTS	14.638.603	79,5	11.543.815	60,5
Fixed costs	**Col$/ha**	**%**	**Col$/ha**	**%**
Rent	1.000.000	5,4	1.000.000	5,2
Administration (5% V.C.)	731.930	4,0	1.800.000	9,4
Technical assistance		0,0	2.160.000	11,3
Depreciation of tools and equipment	2.042.100	11,1	2.073.720	10,9
Construction and improvements		0,0	500.000	2,6
Subtotal of fixed costs	3.774.030	20,5	7.533.720	39,5
TOTAL PRODUCTION COSTS	18.412.634	100,0	19.077.535	100,0

Source: results of the case study, 2005.

Note: for the purposes of the present study, a useful life of more than one harvest was estimated for poles, stakes and wire used in props, so that the cost was spread over two years; the tools used in cultivation were depreciated over five years, so that the cost was spread over the same number of years; plastic baskets, buckets and bins were depreciated over three years; construction and improvements carried out by producers using GAPs were depreciated over five years.

*The information presented on costs tends to be affected by a number of factors, such as the scarcity of information due to the limited keeping of records on the production process, the system of crop management, the equipment used and, lastly, crop yields.

Table 5. Consolidated balance sheet of production costs under two cape gooseberry production systems in Granada Municipality, Cundinamarca, 2005

Item	Traditional system	System using GAPs
Subtotal of variable costs	**Col$** 14.638.603	**Col$** 11.543.815
Inputs	37,9 %	31 %
Labour	49,8 %	59,9 %
Services	12,3 %	9,1 %
Variable costs	79,5 %	62,7 %
Subtotal of fixed costs	**Col$** 3.774.030	**Col$** 7.533.720
Fixed costs	20,5 %	40,9 %
Production costs/ha	**Col$** 18.412.634	**Col$** 19.077.535
Production costs/kg	**Col$** 1.022,9	**Col$** 1.146,8
Yield	18 ton/ha	17 ton/ha

Source: analysis of information from the case study, 2005.

5.6 The context for promoting safety and quality improvements in the sector

It is clear that traditional cape gooseberry producers in Granada Municipality, for the most part (61 percent) small farmers, are more concerned with solving the problems inherent in production with regard to such aspects as controlling diseases that seriously affect crops, reducing not only yields but also the quality of the fruit and therefore the income from it, than in incorporating the fundamental elements of good practices in order to improve safety.

One of the main obstacles to the adoption of good practices is that of making producers aware of the benefits of keeping records, implementing hygiene programmes, installing appropriate sanitary facilities, analysing water sources etc. – practices that do not lead to increased production, but to the prevention of possible contamination of produce and the improvement of farm management. In this connection, analysis of traditional producers in the study zone shows that such features as a low level of education, the issue of land tenure, low economic resources, the backwardness of pest and disease control practices and a low level of business training act as major constraints.

Annexes 1 and 2 provide a summary of the situation in the zone in terms of good practices and a proposed solution based on the EurepGAP Protocol, which was used as a reference point in defining the components of the programme to improve cape gooseberry safety and quality, since certification is required by purchasers in the European market.

In addition, some components and their requirements were complemented by the Colombian Technical Standard NTC 5400 and the Code of Hygienic Practices for Fresh Fruits and Vegetables of the Codex, CAC/RCP 53-2003.

The description of the situation and the proposed solutions are based mainly on primary information obtained through interviews and visits, filled out with secondary information, especially from the case study included in the FAO manual entitled *Improving the quality and safety of fresh fruits and vegetables: a practical approach*.

In analysing the situation in terms of good practices and chemical hazards, it is important to note that the technological aspects of the crop presented in Annex 1 – the altitude of farms, planting density, appropriateness of plant nutrition and cropping practices such as the use of stakes and pruning – have a major bearing on the incidence of plant health problems and therefore on the use of products to control them, which, when not handled correctly, are a hazard for the safety of the fruit.

It should be noted that analyses of pesticide residues at the moment of harvest, carried out by the Colombian Agricultural and Livestock Institute before and after the adoption of good practices under the project entitled "Assuring the competitiveness of cape gooseberry exports through implementation of a good agricultural practices programme, focusing particularly on the rational handling of agrochemical products", show that, despite entrenched attitudes and habits in the use of pesticides for pest control in this crop, there was a reduction in the percentage of samples with pesticide residue levels above the MRLs.

Moreover, for this analysis and in terms of microbiological hazards, it was taken into account that traditional producers, most of them small farmers, do not carry out grading in the field, on-farm storage is temporary and lasts only a few hours, and the post-harvest process does not entail washing the fruit – all of which means that the practices employed on the farm reduce the possibilities of contamination.

-Factors favouring implementation of safety and quality improvement programmes

There is of course a *positive context* for the implementation of good practices programmes in the cape gooseberry sector, marked by:

- the existence of national policies and institutional schemes to support safety and quality improvement programmes for agricultural produce, with the allocation of considerable resources both from the national budget and from external resources;
- research projects and other work carried out in the sphere of standardization with a view to supporting export fruit production sectors; similarly, there are entrepreneurs involved in improving the exotic fruit sector in order to maintain and increase sales to the European and North American markets;
- the growing awareness among producers of the importance of adopting good practices as a strategy to ensure their participation in the export market;
- the location of the country's main production zones near to urban centres, with good production support services (roads, credit banks, presence of bodies concerned with the sector, public services), representing advantages in terms of access to air transport to dispatch fresh produce to other countries;
- the presence in these zones of public bodies particularly well placed to carry out research and technology transfer in order to improve production conditions, and other institutions qualified to carry out inspection and certification activities and also to improve information;
- soil and environmental conditions in the production zones that are suitable for commercial cape gooseberry cultivation, and human resources with considerable experience in this sector;
- the high productivity (15-20 t/ha/year) of cape gooseberry cultivation, and its potential for large areas of the country with medium and cold climates;
- the characteristics of Colombian cape gooseberry in terms of size, weight (4-5 g), bright colour and higher sugar content that of fruit from competing countries – all aspects representing advantages on international markets;
- the sharp growth of the cape gooseberry export market in recent years, with potential for expansion to such countries as Spain, Italy, Hong Kong and Japan, and also to Brazil, Mexico, Venezuela and the United States, linked to promotion campaigns for the fruit and technological developments in its cultivation.

-Factors hampering the implementation of safety and quality programmes in general terms

The lack of effective links among the various actors in the sector and the difficulties in production support services, as described in Table 7, are the main obstacles to be overcome in order to bring about improved safety and quality among small producers. The first step is clearly to rectify technical weaknesses, thus allowing improvements in the basic quality features of the produce. After this, there will be more chances of success for public and/or private interventions to build awareness of the importance of implementing safety improvement measures and create incentives for such implementation.

5.7 Proposed intervention

Once the situation has been analysed within the whole context of the sector, an action plan was established to facilitate the implementation of good practices in cape gooseberry production in Granada Municipality, taking into account the general context of the National Plan for the Implementation of Good Agricultural Practices, with a view to overcoming the problems identified. The following activities were carried out to this end:

- review and analysis of the secondary information identified;
- identification of critical points in the cape gooseberry production process through consultations with producers, workshops and interviews;
- identification of constraints in the production chain, hampering marketing of the fruit, through consultation with middlemen and the managers of marketing companies;
- consultation of specialists from the Colombian International Corporation and agricultural experts familiar with the crop and its problems;
- consultation of research experts from the Colombian Agricultural and Livestock Research Corporation.

Once all the problems had been identified, the technical study team and some research experts carried out a prioritization exercise, which was then reviewed and adjusted by the coordinating team.

The problems were then compared with those identified in the case study, with a view to setting priorities as to the main intervention areas, in terms both of time (short, medium and long-term) and of the actors responsible.

Annex 3 gives an overview of the consolidated action plan, which will be distributed and discussed with the various institutions and the production sector. It is hoped that this will help to steer actions promoting the competitiveness of the cape gooseberry production sector by improving the safety, quality and technical, economic and social sustainability of the crop. The plan encompasses pre-production, production, post-harvest and marketing components, adopting a chain approach.

5.8 General recommendations

With a view to enabling the action plan drawn up by the working group to act as the point of departure for a joining of public and private forces, the following actions are recommended:

- encouragement of the creation of spaces for the various actors to negotiate alliances and collective actions with a view to consolidating the competitiveness of the sector and encouraging actors to implement good practices;
- encouragement of the organization of small producers with a view to improving their business capacities;
- dissemination of the results of the present study in order to encourage producers to implement such programmes, especially those connected with economic benefits;
- integration of the activities of all the national, regional and local bodies responsible for the sector, and coordination with the private sector on a detailed plan to overcome the difficulties;

- improvement in production support services, including such strategies as: research to identify plant material found in the country; training programmes for nurserymen and women with a view to guaranteeing high-quality plant material; research to modify technical recommendations on crop management to fit specific production niches in the country; modification of current regulations and standards in order to ensure effective monitoring and supervision of those producing plant material (nurseries) and organic fertilizer; promotion of the creation of specialized enterprises for the production of high-quality plant material and the sale of such pre- and post-harvest services as the installation of stakes, the application of agrochemical products, harvesting and the washing of baskets;
- research into alternative materials for stakes that would reduce the environmental impact;
- training of producers in IPDM practices in order to reduce the use of agrochemical products;
- implementation of *training* programmes for producers, workers, transporters and middlemen to develop skills regarding the implementation of GAPs and good hygiene practices (GHPs);
- implementation of an incentivization programme to encourage the various actors involved in the cape gooseberry sector to promote the adoption of good practices;
- development of activities to promote and publicize domestic consumption of the fruit.

Table 6. Economic indicators under two cape gooseberry production systems in Granada Municipality, Cundinamarca, 2005

Item	Traditional system	System using GAPs
Number of plants	plants/ha 2.500,0	plants/ha 1.333
Plants in production (less percentage of dead plants)	plants 2.250,0	plants 1.279,7
Growing period	months 5,5	months 5,5
Production	Kg./plant 8,0	Kg./plant 13,0
Productive period	months 4,5	months 6,5
Crop cycle	months 10,0	months 12,0
Average production	ha/year 18.000,0	ha/year 16.635,8
Average variable costs	$/Kg 813,3	$/Kg 693,9
Average total costs	$/Kg 1.022,9	$/Kg 1.146,8
Average production	Kg./ha/year 18.000,0	Kg./ha/year 16.635,8
Quantity for export	Kg./year 9.000,0	Kg./year 11.645,1
Average price of export fruit	$/Kg 2.500,0	$/Kg 2.500,0
Quantity for the domestic market	Kg./year 9.000,0	Kg./year 4.990,8
Average price of fruit for the domestic market	$/Kg. 400,0	$/Kg. 400,0
Total gross income	$ 26.100.000,0	$ 31.109.020,8
Total net income	ha/year 7.687.366,5	ha/year 12.031.485,3
Net income	$/Kg. 427,1	$/Kg. 723,2
Rate of return	41,8	63,1

Source: results of the case study, 2005

Table 7. Summary of constraints on the implementation of safety and quality improvements by adopting good practices in the cape gooseberry sector

Characteristics of the sector
-unstable market with little transparency, due to lack of coordination among the various actors in the sector, giving rise to difficulties in the flow of information and preventing effective planning of the production, post-harvest and marketing processes.
-the absence of any real linkage, aggravated by the individualism of the actors and the search for short-term solutions.
-the lack of uniformity in market operators' quality demands, since their customers establish different requirements, especially regarding restrictions on the use of pesticides.
-occasional participation of certain producers, destabilizing the export market because they change the rules of play, bring about a reduction in price and negatively affect the country's image.
-producers' cultural and economic constraints.

	-land-tenure systems (commercial production is mainly carried out on rented farms). -producers' lack of incentives to implement good practices; prices to producers are low and unstable. -absence of a mechanism regulating commercial activity among the various actors in the cape gooseberry sector, which is particularly affected by verbal contracts among producers, middlemen and market operators. -low quality of the fruit sold on domestic markets because of deterioration caused by the use of inappropriate packaging.
	Services
Information	-scattered and uncoordinated national information, with each body managing its own information. -available information known by export companies, large producers and technical staff with access to information sources. -small producers' general lack of information on which to base growing plans. -increased seasonal nature of production due to producers' lack of information. -scarcity of information on the demands of each of the markets for which the product is intended.
Monitoring	-greater monitoring and supervision needed in order to improve handling in nurseries. -few health controls in companies producing organic fertilizer. -pressure on producers from commercial retail houses dealing in agrochemical products and wishing to promote and sell their products, thus creating confusion over product use. -major constraints on access of small producers to working capital.
Research and extension	-lack of advice, support and monitoring for the implementation of good practices. -poor cover by technical assistance. -generalized deterioration of the soil in production zones caused by pathogens, improper use of agrochemical products and inappropriate tillage practices. -lack of uniformity in cropping practices due to the absence of appropriate recommendations for the region.
Training and other	-producers' and traders' poor awareness of the importance of implementing good practices. -fairly unstructured training activities. -compartmentalized, individualized working methods for production (including contracting out), hampering the implementation of good practices; and those who are trained are often not those carrying out the production, harvesting, post-harvest processes etc. -absence of training programmes for contract workers who work on cape gooseberry farms. -constant reduction in the production period on farms in the region as a result of poor management. -defective post-harvest handling by producers, occasioning rejection of produce by market operators because of health and quality problems (splitting, size and colour of fruit).

5

6. Implementing good practices in the broccoli sector:

case study of the Huertos Gatazo Zambrano enterprise, Ecuador

6.1 Context

The Gatazo Zambrano community is part of Cajabamba Parish in the Colta Canton of Chimborazo Province, 20 km from the city of Riobamba. The Gatazo Zambrano production complex covers about 140 ha (Renou, 2002). The community is made up of 1 200 people, who play an active part in it, with women making up 52 percent and men 48 percent. There are 161 families in the community, with an average of five members each. The main economic activity is farming, so that its inhabitants have long years of experience, especially in growing vegetables. It is estimated that there are 400 producers in the community and that only 2 percent of the inhabitants generally work outside it.

Gatazo Zambrano is set up as an "independent commune", administered and managed by a town council (five main representatives and five alternates) made up of members of the community elected for one year. The council holds authority and approves the activities of the community as a whole. In 1998 the enterprise was constituted as a company under the collective name of Huertos Gatazo Zambrano (or Huertos GZ), initially with 86 members and a share capital of US$290, although it now has 111 members.

6.2 The actors

According to Renou (2002), the Gatazo Zambrano producers who make up the community can be divided into five categories, as described below and summarized in Table 8:

Very small producers

These growers have properties of less than 0.5 ha and constitute 5 percent of the community's producers. They grow vegetables but do not have access to broccoli growing for lack of financial resources to cover the initial investment or by being overdue with past payments. They have no access to credit.

Small producers who grow broccoli occasionally

These are small producers using a simple farming system with very slow capitalization, and they constitute 50 percent of the community's producers. They have properties of more than 0.5 ha and less than 1 ha. Their production systems are similar to those of farmers in the first category, but they do occasionally include broccoli growing when they have sufficient capital. However, there is a diversification of additional crops, including oats, camomile, lettuce, garlic and onion. Their annual income is approximately US$720, and is supplemented with casual off-farm work. One or at the most two broccoli-growing cycles are estimated per year.

Small producers who grow broccoli on a permanent basis

These are small producers who have obtained prior capitalization by growing onions or who are in the process of accumulating capital with broccoli. They constitute 30 percent of the community's producers. This group is very interested in the process of introducing technical and commercial innovations and has a good reputation among the wholesalers who purchase their produce if it is of good quality. In social terms, they are very active in the enterprise and like to know as much as possible about its commercial activities, boosting community organization. They have sufficient technical know-how to apply chemical products on their farms, often without having to consult promoters or technical experts. Their farms are located in the flat zone and have sizes of between 1 ha and 1.5 ha, with an area of between about 0.5 and 0.75 ha permanently devoted to broccoli. Their annual income is about US$1 500. They market their produce through Huertos GZ, and anything rejected by the quality control process is sold to wholesalers from Riobamba who transport it to Guayaquil.

Medium vegetable producers who grow broccoli on a permanent basis

These producers have been the real motor behind the technical innovations introduced in the single-crop growing of onions, which has enabled them to achieve a more stable capitalization. They constitute 10 percent of the community's producers. They started to grow broccoli individually, but suffered major losses with the bankruptcy of the Zhifood company. Since 2002, a new contract with an export

Table 8. General characteristics of producers in the Gatazo Zambrano community

Product	Area	Cropping systems	Livestock systems	Other activities	Approximate annual income	Proportion of the community
Type 1	Less than 0.5 ha	Carrot, coriander in pampa zones, maize, potao, quinoa on sloping land	Milking cow and bullocks for sale; presence of small livestock	Town council, labourer or bricklayer	US$ 550	5%
Type 2	0,5 to 1 ha	Carrot, coriander in pampa zones, maize, potao, quinoa on sloping land	Milking cow and bullocks for sale; presence of small livestock	Town council, labourer or bricklayer	US$ 750	50%
Type 3	1 to 1,5 ha (with 0.5 to 0.75 ha permanently under broccoli)	Same crops, plus broccoli	Presence of large and small livestock	Agriculture	US$ 1500	30%
Type 4	1,5 ha or more (with 1 ha permanently under broccoli)	Same crops, plus broccoli	Presence of large and small livestock	Agriculture	Not available	10%
Type 5	Variable	Broccoli, carrot, coriander	Presence of large and small livestock	Trade	US$ 2.500, plus US$ 40 or 50 per month from trading	5%

Source: Cécile Renou, 2002; Data processed by the research team.

company has offered them fresh growth prospects. They also grow other crops when there is an assured demand, and this activity temporarily reduces the area and resources devoted to broccoli. The average area farmed by each producer is over 1.5 ha, with 1 ha permanently under broccoli.

Producer-traders

This was the main group when commercial innovations were introduced. (They were the first ones involved in forming a business organization in Gatazo Zambrano.) They constitute 5 percent of all producers. Their activity as private traders has led them to distance themselves somewhat from the activity of the enterprise, fearing that it could affect their activity as wholesalers. Their annual income from growing broccoli is about US$2 500, plus some US$40-50 per month from their commercial activity. Table 8 provides an overview of the various types of producer identified in Gatazo Zambrano.

6.3 The present situation of production systems in terms of good practices, with a view to promoting safety and quality improvements

With a view to identifying the present situation of broccoli production systems in Gatazo Zambrano in terms of the implementation of good practices, field visits were made and interviews held with a total of 40 producers belonging to the various categories identified. Broccoli production in the community makes a relatively high use of technology and there are no major differences in this regard among the various categories of producer. The main difference is in the area cultivated. In general terms, broccoli production involves the phases summarized in Table 9.

-Safety and quality problems

For a number of decades, the Gatazo Zambrano community has dedicated itself exclusively to growing vegetables for household consumption and for sale on local markets. This production has been carried out in a traditional manner, without paying heed to the effects that such practices would have on the natural resources of the zone in terms of degradation of environmental resources, or on the health of the community's inhabitants and consumers. However, when the creation of a community enterprise got under way, this pattern started to change, since more importance was given to consumers' requirements, leading to modifications in certain techniques and attitudes that had until then been common. These changes gathered pace when Gatazo Zambrano started "contract growing" for companies that were more demanding with regard to produce quality. This connection led to changes in farming methods within the community. The purchasing companies provided technical assistance, training, improved varieties etc., leading to improvements in terms of quality. However, we cannot speak of a specific programme to improve the safety and quality of foodstuffs as such; rather, we can say that major improvements were made in crop management in order to comply with the policies of the processing plants with which they held and hold contracts.

Although there have obviously been major changes in production systems, there is still a long road ahead in order to ensure produce safety and quality, a fact that was corroborated when the dangers of contamination connected with the production and post-harvest handling of broccoli in the community were identified.

Annexes 4 and 5 give a consolidated overview of safety and quality problems associated with current production and post-harvest management systems. In terms of quality, the main problems identified are defective practices with regard to fertilizing and pest and disease control. In terms of safety, the most serious problems are connected with possible microbiological contamination resulting from such factors as poor hygiene practices on farms and in the storage centre, the lack of protection of water sources to avoid contamination from the presence of animals, and the irrigation system used. In terms of chemical contamination, the main problem is the inappropriate use of agrochemical products for pest and disease control.

6.4 Proposed intervention for the transition from traditional production systems to systems based on good practices in order to bring about improvements in safety and quality

The demands of broccoli purchasing companies focus on quality. In terms of safety, their demands are connected mainly with the use of agrochemical products, with each producer having to submit a list of the products used. However, the companies generally give a bonus in terms of a better price to suppliers who carry out improvements in their safety and quality systems. In terms of the market, there is no clear demand encouraging producers to adopt systems to prevent microbiological contamination, as occurs in the case of fruits and vegetables that are consumed fresh. However, the community also grows vegetables for the domestic market, and a proposal for intervention in the zone in terms of consumer protection and the environmental and economic sustainability of production systems has therefore been drawn up in such a way that it will be the most easily applicable, practical and accessible for Huertos GZ.

Table 9. Activities connected with broccoli production in the Gatazo Zambrano community

Preparation of the soil	This task is generally mechanized. Before tillage, producers usually cut the broccoli plants by hand with a normal knife in order to facilitate introduction of the plough onto the plot. After three weeks, when the cuttings have decomposed sufficiently, the ground is levelled and the furrows prepared. Organic matter is applied prior to the levelling process. The community has two tractors that provide their services to all the members. However, the latter have to pay for the tractor by the hour at a rate of US$10.
Transplanting	Planting distances are approximately 40 816 plants/ha, and planting is carried out by family members and neighbours under the "lending hand" system. Commercial hybrid varieties are grown, the seedlings are generally supplied by the consortium or can be purchased individually through companies specializing in their production.
Irrigation	Irrigation is carried out by flooding after transplanting and then once a week.
Fertilizing and weed control	Fertilizer is applied twice during each growing cycle. Weeding and ridging are carried out.
Crop protection	Pest and disease control is carried out with insecticides and fungicides. Little importance is given to residues of these products, often with a consequent failure to observe an adequate time lapse between application and harvesting.
Harvesting	Harvesting starts on average after 12 weeks (84 days, give or take 4), depending on climatic conditions, especially temperature. For the harvesting work, farmers generally start very early in the morning so that the sun cannot damage the raw material (by dehydration). Kitchen knives are used for cutting. During harvesting, caps are worn to avoid physical contamination through the presence of hair. However, no precaution is taken with regard to the hands (washing or disinfection). Approximately 5 percent of the harvest is sold to middlemen who market it in Guayaquil: the produce is packed into sacks holding an average of 30 broccoli heads and is then usually transported by mule.
Post-harvest activities	The produce is transported in bulk from the field to Huertos GZ's storage facilities in pick-up trucks, covered with cloths made of jute or sacking. The produce is placed in bins or crates for weighing, and during this operation a sample is taken so that a representative of the purchasing company can carry out quality control analysis. This analysis tests for the presence of pests, disease, extraneous material, flowering, mechanical damage, physical, chemical or biological contamination, and average weight per unit. There is a range of tolerance for each of these elements and a maximum percentage for acceptance. Once the broccoli has been selected and weighed, it is loaded into a truck for transport to the purchasing enterprise's premises, normally in bins holding approximately 230 kg, and every effort is made not to mix produce from different growers.

Source: research team.

The main input in designing the proposed intervention was analysis of the risks associated with physical, chemical and biological contamination hazards in the production and post-harvest handling phases of the produce. A series of activities or practices to be carried out within the community in order to minimize hazards connected with contamination of the produce was thus established.

A distinction was made between activities of a non-negotiable nature, requiring a higher priority, and those falling into the category of recommendations, whose implementation will complement the programme to ensure the safety and quality of the produce and achieve objectives connected with environmental protection and the well-being of producers. In defining the activities to be undertaken, the

guidelines laid down in the *Code of Hygiene Practices for Fresh Fruits and Vegetables CAC/RCP 53–2003* were followed, together with the recommendations contained in the FAO manual entitled *Improving the quality and safety of fresh fruits and vegetables: a practical approach.* The recommendations of the Gatazo Zambrano producers were also included.

The recommendations were divided into categories concerning soil management, agricultural inputs, cropping practices, residue management etc., as is summarized in Table 12.

The exercise consisted not only of defining what should be done, but also how it should be done and an economic evaluation of the consequences of carrying out the proposed activities. A period of four years was established for all these activities, taking into account the most economical alternatives, involving materials from the study zone in order to make them more accessible (see Annex 9).

6.5 Appraisal of the possible drawbacks and benefits of carrying out the proposed intervention

-Current production costs

The estimated costs of growing 1 ha of broccoli in the community are given in Table 10. The largest item in the cost structure is seedlings, the cost of which is deducted from the payment the processor makes to each producer for his broccoli harvest. The second largest item is fertilizer. The entries for labour and services account for fairly similar proportions of the cost structure.

In the case of services, the largest component is the agricultural machinery used to prepare the soil and form furrows to plant the broccoli, while the second largest is the transport used to carry the harvested broccoli from the farm to the community's storage facility.

-High costs are the main constraint on implementation of the proposed intervention

The proposed intervention designed by the work team includes activities that are recommendations as well as those that are fundamental to achieving safety and quality objectives, as is seen in Annex 6. These activities include implementation of a residue management programme, improvement of the storage facility (signs, cleaning programmes), installation of latrines, implementation of soil and water analysis programmes, construction of infrastructure for storing agrochemical products, and maintenance of equipment. Table 11 gives an overview of the estimated costs of adopting practices considered fundamental in order to achieve safety objectives.

For the first year, the costs of implementing the proposed intervention would be approximately 31 percent of the resources the enterprise devotes to establishing the 60 ha of broccoli planted each year by the community. In view of the amount of resources needed to implement the proposed intervention, two fundamental elements must be considered: prioritization of activities and a progressive approach to implementation, setting short, medium and long-term objectives.

-What benefits would be generated by implementing the proposal?

In the medium term, establishment of the GAP system in Gatazo Zambrano will lead to benefits for all the producers involved and indirectly for their families in terms of health and well-being, benefits in terms of preservation of the environment and production resources, and benefits in terms of more lucrative marketing opportunities for the vegetables grown by the community. Many of the benefits generated by implementing these programmes are intangible (environmental protection, workers' well-being etc.) and hard to assess in quantitative terms. The case study represented an exercise to estimate the economic benefits of implementing the recommendations contained in the intervention plan. The following assumptions were used for the calculation:

- only two crops of broccoli are planned per year, with each cropping cycle involving 60 ha;

Table 10. Broccoli production costs in the Gatazo Zambrano community

Item	Quantity	Unit cost $ EE.UU.	Total Cost (Ha)$ EE.UU.	%
Seedlings	40.816	0,0015	428,57	32,5
Disinfection of seedlings			5,83	0,4
Agrochemical products			93,45	7,1
Fertilizer			391,05	29,6
Labour	39,99	5,0	199,94	15,1
Services			184,27	14,0
Machinery & equipment			70,00	5,3
Local consortium 2%			46,93	3,6
Transport			67,35	5,1
Depreciation			17,42	1,3
TOTAL			$ 1.320,53	100 %

Table 11. Estimated costs of implementing intervention proposal (prioritized activities)

Item	Year 0	Year 1	Year 2	Year 3
Location of the production and growing zone	1.772,44	45,99	50,59	55,65
Agricultural inputs	10.995,80	6.811,43	7.492,57	8.241,83
Cropping practices	0,00	0,00	0,00	0,00
Equipment, tools and implements	0,00	0,00	0,00	0,00
Facilities connected with the crop	7.849,70	7.468,67	8.215,54	9.037,09
Staff hygiene	1.110,00	1.221,00	1.343,10	1.477,41
Training	1.124,55	0,00	0,00	0,00
Record-keeping	0,00	0,00	0,00	0,00
Monitoring	480,00	0,00	0,00	0,00
Contingencies	1.166,62	777,35	855,09	940,60
Total Investment in GAPs	24.499,11	16.324,45	17.956,89	19.752,58

Data processed by the research team..

- in the first year, income comes basically from the sale of broccoli at a price of 22 cents per kilogram;
- for the year in which investments start (year 0), agricultural practices will change, but there will be no major difference in terms of prices or yields per hectare obtained in Gatazo Zambrano;
- in the second year, another type of income will start to be generated, especially thanks to training in the correct management of broccoli production and other actions connected with the adoption of good practices, inasmuch as these actions have the effect of improving cropping efficiency, thus allowing a saving on resources under certain headings; however, variations in yields will not yet be very great and the same yield per hectare (10 665.56 kg) is retained; similarly, the price is kept at 22 cents per kilogram;
- in the third year, a possible increase of 1 cent can be expected in the price received by producers, since producers in other regions adopting safety practices have been able to negotiate and receive this price; all this will depend on the agreements Huertos GZ can reach with the purchasing enterprise, or, failing this, with some other processing plant (US$0.23/kg);
- in the case of yields, a total growth of 20 percent has been estimated over the initial point when the proposed intervention was implemented; this means an increase from 10.6 t/ha each cycle in years 0 and 1 to 12.9 t in year 3; yields obtained by other producers in the region are taken as the basis for this calculation;
- the average production costs for 1 ha of broccoli in Gatazo Zambrano has been calculated as US$1 320.53; a reduction in these costs is anticipated from the second year onwards, as a result of implementation of the proposed intervention and the consequent improvements in production systems and greater efficiency in crop protection methods; a reduction of 20 percent has thus been estimated in the use of fertilizer, especially phosphorus and potassium, while a reduction of about 30 percent is anticipated in the use of pesticides, especially through the reduced use of insecticides, inasmuch as only two applications will be needed instead of the present four; these reductions would bring the initially estimated production costs down to US$1 214.30.

The exercise also entailed an effort to establish the overall balance sheet for the proposed intervention to implement good practices in Huertos GZ. According to estimates, the increased income would be greater than the investments and expenses required to establish good practices, which means that the proposal would be viable in terms of the cost-benefit ratio.

6.6. Analysis of possible institutional support for implementing the proposed intervention

Given the amount of economic resources that would have to be invested to carry out all the components of the proposed intervention, the following actions would be necessary:

- a prioritization exercise, with the participation of producers, purchasing enterprise, support institutions and cooperation agencies, with a view to determining which of all the practices identified as priorities would have to be undertaken in order to meet safety objectives in response to market expectations, while taking producers' capacities (availability of economic resources, time etc.) into account;

- promotion of strategic alliances and agreements to facilitate institutional support for essential components of the programme; with a view to addressing the issue of institutional support, the most significant groups of actions were selected in terms of the investment needed for this purpose, as follows:

a) with a view to supporting the carrying out of soil analyses, an agreement could be made with such institutions as the Autonomous National Institute for Agricultural and Livestock Research and/or the Chimborazo Policy School, institutions that provide this service in the zone; similarly, the university could support water analyses;

b) the application of fertilizer and the use of agrochemical and plant protection products were viewed as training components, which can be undertaken in alliance with the National Small-farmer Training Institute, NGOs and projects being implemented in the zone, for example the marketing support project executed by the Ecuadorian Agricultural Services Centre with the support of the Swiss Agency for Development and Cooperation;

c) the cleaning of water sources should be undertaken by the community, although funding could be obtained to feed the participants through NGOs or projects active in the zone;

With regard to the sanitation and hygiene situation, four lines of action were identified:

d) training in hygienic habits: this could be carried out in coordination with the National Small-farmer Training Institute, NGOs and projects being implemented in the zone, and with the support of the town hall and the Ministry of Public Health's health centres;

e) general health check-ups: an agreement with health centres is a key element here and could include public hospitals and the health service of the armed forces, so that the whole community has basic health check-ups;

f) the building of latrines: this is an infrastructure element for which an agreement should be made between the community and local government authorities (town hall and provincial council) so that the former participates with its labour and the latter with the work tools needed; the building materials can be financed through NGOs or as the outcome of negotiations with professional training colleges for builders or private building companies;

g) construction of field dining areas: as for the other infrastructure element, this should be carried out under a tripartite agreement among the community, local governments and NGOs for the construction, which is possible; the community must then be responsible for upkeep after a process of awareness-raising allowing it to take charge of these facilities;

Lastly, with regard to cropping practices, the following lines of action are proposed:

h) training of producers, with the support of broccoli processing companies, which have a major interest in seeing hazard reduction practices implemented, since they assume direct responsibility for exports; this initiative would be carried out with the support of the Foundation for Ecuadorian Fruit and Vegetable Producers' Associations;

i) establishment of a small weather station: this should be undertaken by the community, or financial support could be sought (the cost is not high) from such bodies as the National Meteorology and Hydrology Institute, NGOs etc.; a draft project could also be submitted for this purpose to Debt Swap competing funds.

6.7 Conclusions

Gatazo Zambrano is located in a privileged zone in terms of geographical position, climate, availability of water, temperature, and suitability of soil for horticultural crops, which is why many of the products grown by the community have gained a good reputation for quality on the domestic market. However, crops have not been managed as well as they might have been, which has led to a gradual degradation in the natural resources of the zone.

Gatazo Zambrano has attained a good level in terms of community development as a result of the efforts made by the members and also the support received through the years from various private and public institutions and NGOs. In this way, the community has gained access to various services (storage centre, tractors, community hall, computers etc.) that have helped to improve the inhabitants' standard of living.

Broccoli growing is one of the main – if not *the* main – activities of the community, inasmuch as there is a sure market for the produce, representing a high incentive for producers to work in this activity: they can rely on prices fixed prior to planting and a guaranteed sale, the price agreed per kilogram is paid, and technical assistance is supplied by the purchasing enterprises.

With regard to the issue of safety and quality, the information collected showed that major efforts are needed to improve the general safety and quality conditions of vegetable production in the consortium. However, it is important to mention that the farmers in the consortium have learned a great deal about the workings of the market and in many cases they are aware that constant changes are needed in order to ensure that they keep their place in it. There are therefore possibilities of bringing about a transition and a successive gradual adoption of good practices.

In terms of safety in particular, the fact that broccoli is not intended to be consumed fresh means that the requirements of the purchaser are focused more on the residues of chemical products than on microbiological aspects. However, the implementation of an integrated good practices programme, which would take account of the potential contamination hazards for fruits and vegetables grown in the community, would have considerable benefits for consumers on both international and local markets.

-Phase of adding value and marketing

In the case of broccoli, there are five enterprises that add value to the product. These processing plants sell their output on the international market, so that they have directly felt the changes in international consumers' requirements and have progressively adapted their production systems to meet these demands and achieve sales levels ensuring their profits and hence their continuation in the market.

The majority of them have therefore been progressively adopting various systems and processes in line with the food safety requirements that have appeared in recent years to ensure consumers' health, environmental protection and workers' quality of life. It can thus be said that in the sphere of processing plants, there has been progressive compliance with GMPs, despite certain problems that have been resolved as the broccoli business has developed.

Although there are undoubtedly certain requirements that are not fully met, it is important to stress that most of the plants strive to ensure that they operate in an appropriate manner, for they have clearly understood that they must adapt to the requirements of the international market, and also that food safety standards have the aim not only of meeting market requirements, but also of protecting consumers' health and improving people's standard of living.

With regard to marketing, there are similarly excellent practices that ensure a high-quality product for the end consumer. The vast majority of transport units used thus meet the requirements for the transport of fresh or frozen vegetables: refrigeration systems in the units, constant and timely maintenance of these systems, temperature and humidity control systems, together with proper records concerning the use of containers made of non-toxic materials suitable for transporting foodstuffs, washing and

disinfection processes for containers etc.

With regard to processing and marketing, the enterprises responsible have thus achieved a high standard in terms of ensuring the safety of foodstuffs by implementing procedures in line with international standards. Nonetheless, it is important to point out that all this effort would be wasted if it were not also ensured that all the producers who supply raw material to the processing plants implement programmes to ensure the safety and quality of their produce.

Table 12. Proposed intervention to improve safety and quality within production in the Gatazo Zambrano community

Component	Proposed activities
Plots and surrounding areas	Efforts to improve the sanitary status of the plots and surrounding areas (currently there are plastic containers, animal excreta, food wrappings etc.) through: -Construction of four special containers for waste generated by the community, to be built by the producers themselves and located at specific points in the community for ease of use; these containers will be simple wooden structures with zinc or plastic roofs to prevent water from leaking into the 55-gallon tanks intended to contain the waste; -General cleaning of plots through communal work to be carried out every six months during the first year, thus encouraging the community to place all waste in the containers that have been built.
Soil management	-Annual soil analyses for each producer's plots, so that future fertilizing can be based on the specific nutrient needs of each farm. -Use of certified organic fertilizer, thus generating benefits in terms of improved physical and chemical status of the soil, in turn leading to increased yields per hectare. -Similarly, encouragement of soil conservation by boosting the crop rotation practices already used in the community and designing planting plans.
Water management	Annual analysis of the quality of each of Gatazo Zambrano's water sources is recommended; however, although such analysis is important, the most important component is to implement a cleaning plan for the areas around water sources, irrigation ditches and water channels, and to build natural barriers to impede animals' access to water sources, thus minimizing any physical, chemical or biological hazards; such cleaning should be carried out only twice in the first year, after which it should not be necessary, inasmuch as the producers will have become aware of the importance of keeping their area clean from health and economic points of view etc.
Inputs...	Natural fertilizer: -Considering the livestock production systems found within the community, it is suggested that a composting system be implemented, allowing an improvement in the defective management of animal excreta. This system could become a sustainable source of income thanks to the sale of manure to agents outside the enterprise, or a source of inputs to improve the soil quality within the community's area. This activity would be based on the existence of sufficient livestock of different types within the community for the generation of manure. A piece of land would first have to be allocated for this purpose, and this could be done through an anticresis contract of the type customary in the zone.

	A plot of 100 m² would be large enough, and a person would have to be employed to carry out the work of preparing the manure correctly. It is estimated that this person would have to devote 144 hours per year to such work, or approximately three hours per week. Livestock owners in Gatazo Zambrano would have to collect their animals' droppings and bring them to the selected plot once a week, while the person hired would constantly prepare all this material to facilitate the decomposition process. According to the estimates of organic fertilizer producers in areas near Gatazo Zambrano, 1 900 sacks of fertilizer could be obtained on a 100 m² plot and could easily be marketed at a price of US$4 per sack. This activity should be ongoing, since it is anticipated that it would become a source of resources for the community through the sustainable use of materials generated within it. All this should be supported through training courses on the correct use of organic fertilizer.
...Inputs	Agrochemical products: -Training in the handling and use of such products and upgrading of equipment for all those involved in the broccoli trade within the community. This training should very clearly explain the necessary requirements for appropriate management of agrochemical products in order to obtain safe produce. It is important to note that the Gatazo Zambrano producers have received such training on various occasions, given the history of interventions by various organizations, but that there has been little commitment to follow-up and monitoring of the growers to see how the new know-how is being put into practice. In an effort to avoid the same error, the present proposal has stressed follow-up and monitoring as a cardinal component. -Improvement in sites for storing agrochemical products. -Purchase of protective equipment – waterproof outfits consisting of a jacket and trousers, a cap, a mask (the type with a carbon filter is recommended), protective goggles, gloves and a pair of boots – for each producer-member. All this protective equipment should be used by any person carrying out applications, a requirement that must be stressed during training sessions.
Cropping practices	Practical training in IPDM, based on crop monitoring and assessment of the extent of damage caused by pests and disease (damage threshold).
Environmental protection	A reforestation plan is proposed for the steepland zone of Gatazo Zambrano, covering an area of 20 ha, with a view to rehabilitating this badly degraded zone. Reforestation should be carried out in planned stages of 5 ha a year, using indigenous species that have no difficulty adapting to the particular features of the zone. Labour for this reforestation plan will come from all the Huertos GZ members.
Harvesting and transport of produce	Issues connected with harvesting should be addressed in some training classes, which should reaffirm concepts already assimilated by producers with regard to handling of produce (including how to harvest it, the tools to be used, the handling of containers for the harvested produce).
Equipment, tools and implements	The recommendations based on GAP standards for the handling of equipment, tools and implements are intended to avoid microbiological and chemical contamination hazards. Appropriate handling is needed for this purpose, involving correct cleaning and disinfection processes. Here again, training is needed if such actions are to become normal practice for producers in Gatazo Zambrano.

Facilities connected with the crop	The most important facilities connected with broccoli growing are the storage centre and the associated sanitary facilities, equipment to wash produce, stores for agrochemical products, and latrines to be set up in the fields. The storage centre is a key facility in ensuring that GAPs are observed in Gatazo Zambrano, inasmuch as the whole community's produce is assembled, analysed and stored there until it is transported out. In view of the systemic importance of the centre, it must be correctly managed in order to ensure that the broccoli produced in Gatazo Zambrano is free of physical, chemical or biological hazards. GMP principles must thus be observed, with standardized operational systems for equipment hygiene and maintenance. -With regard to the construction of latrines within the community's area, it is considered that a latrine complex should be built for each 10 ha, which means that in the pampa zone ten such complexes will be needed, and these must be located in visible, strategic places to facilitate people's access to them.
Staff hygiene	It is important to implement a programme to improve the community's hygiene and sanitation. Correct implementation of activities in this connection requires a considerable level of resources, and it is important to note that these activities (with the exception of training courses) must be continued over time if the community is to benefit. It is therefore planned that the situation should be addressed in a workshop on the importance of personal hygiene, both to maintain good health and also for broccoli production. Moreover, it is suggested that one of the policies of the enterprise should be to require each producer, and if possible his or her family, to have a general health check-up. Similarly, blood tests should be carried out at least once a year to determine cholinesterase levels in those carrying out agrochemical applications. It is therefore important for Huertos GZ to seek alliances with institutions that can facilitate this type of service.
Workers' safety	With a view to improving safety systems for workers, two very important components are included as recommendations. The first concerns the installation of first-aid kits containing the most necessary items, which must always be available during field work. The second concerns workers' safety when eating, since, as already mentioned, people tend to eat after their farm work without even washing their hands, which makes them vulnerable to any type of infection or poisoning from chemical products, and also means that refuse from the food is thrown away in the fields or into water channels, contaminating the area. With a view to eliminating this problem, it is suggested that ten simple dining areas should be set up throughout the community's area, so that Gatazo Zambrano producers can go there to eat. These facilities should be built close to the latrines, so that both services can be used at the same time if necessary.
Documentation and records	The collection of information in Gatazo Zambrano clearly showed that broccoli producers are not accustomed to keep proper records of their field practices, and this represents a major constraint, making it hard for each farmer to manage his farm efficiently and with a business-like approach, thus affecting both the performance of the Huertos GZ enterprise and traceability if this should be needed to solve any irregularity that may be detected.

Table 13. Breakdown of gross income from broccoli sales resulting from the implementation of good practices (in US$)

Costs of activities connected with:	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Location of the production and growing zone	0,00	1.387,00	0,00	0,00
Agricultural inputs	0,00	1.387,00	0,00	0,00
Income generated	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Income from broccoli sales (Community)	281.571,00	281.571,00	323.806,51	353.243,29
Total Income	281.571,00	284.346,00	323.806,51	353.243,29

Data collected by Huertos GZ and processed by the research team.

6

7. Implementation of good practices in the production of fresh pineapples for export: Case study of the Huetar Norte region, Costa Rica

7.1 Context of the case study

The Huertar Norte region of Costa Rica borders with Nicaragua to the north along a frontier of approximately 210 km. This region accounts for more than 50 percent of total pineapple cultivation in Costa Rica (National Pineapple Programme, 2005). The high demand of import markets and the price incentive have produced truly surprising growth in pineapple production in this region, displacing rangeland and other cultivation. The January 2005 regional census of tropical fruits and roots conducted by the Ministry of Agriculture and Livestock (MAG) indicated 11 168.4 hectares under pineapple cultivation in the whole region, with 3 566 hectares located in the district of Pital.

The district of Pital de San Carlos (Alajuela province), where the case study was carried out, has a high migratory inflow, especially from Nicaragua. This workforce is generally unskilled, without schooling and predominantly male. It works in pineapple production, cassava harvesting or construction. The area is also a point of transit, with workers moving to other parts of the region or country.

Table 14. Main agricultural activities in the district of Pital, 2005

Activity	Number of producers	Area (Ha)
Pineapple		3.565,60
Plantain	6	4,40
Roots and tubers	252	1.445,21
Total	567	5.015,21

Source: National Pineapple Programme.

7.2 Characteristics of the actors and production systems in the study area

The findings of local surveys and interviews identified five producer categories or groups whose characteristics are listed in Table 15. Producers differ in degree of specialization, size of operation and level of investment. The size of cropped area is determined by individual financial possibilities. Areas range from 1.5 ha (type I producer) to 50 hectares or more (type V producer) for the large-scale producer/packer category. Small producers generally also cultivate other crops besides pineapple.

Yield per hectare is directly related to quality of planting material and level of technology. The average yield per hectare works out at 67 MT, within a range extending from 2.8 MT to 113.4 MT/ha. The average production cycle is 360 days for the first crop and 668 days for the second. The region has plantations with production cycles for both harvests, extending from 330 to 390 days and 330 to 690 days respectively.

As regards the production system, pineapple is largely grown as a monoculture with 50.39 percent of the region's cultivated area dedicated solely to this activity. An average of 75 percent of the workforce have an education level equal to or below incomplete secondary schooling. The average age of producers is 40 years. Their experience in pineapple cultivation is relatively recent, on average 5 years, though some individuals have up to 15 years of experience. This is to some extent explained by the recent expansion of cultivation in the area.

Small producers represent 75 percent of all producers and cultivate between 0.5 and 10 hectares. A significant level of investment, calculated at US$9 900/ha, is required to take up pineapple production. However, many producers began with one hectare, then gradually built investment capacity to expand

Table 15. Types of pineapple producer in the study area in the district of Pital, 2005

	Micro Producer I	Small Producer II	Medium Producer III	Large Producer IV	Large Producer / Packer V
Cultivated area (ha)	< 1,5	1,5 – 3,0	3,1 – 15	15,1 – 50,0	> 50,1 with packing plant
% population in the sample	5	9	25	4	2
Production system	In transition from Champaka and Monte Lirio to MD-2, with other crops such as cassava	Seeking to specialize in MD-2	Seeking to specialize in MD-2, more intense activity	Specialization in MD-2, intense activity with high levels of technology	Specialization in MD-2, intense activity and high technology
Capacity	Household and apprentice	Experienced wage labour	Under technical and financial improvement	Purchase of equipment and machinery, ongoing training	Highly specialized production
Target market	Export, contract with packing house	Export, contract with packing house	Export, contract with packing house	Export, direct contract with clients in USA and Europe	Own export under registered brand to variety of markets
Approach to implementation of good practices	In transition to good practices	In transition to good practices	At advanced stage of adoption and a good percentage inspected	Programmes of good practices already adopted	Implementation of good practices, with 2 or 3 inspections

Table 16. Characteristics of pineapple production units in the Huertar Norte region, Costa Rica. 2004

Range of farm/holding area	Hectares	Proportion (%)
0-10	1.440,70	12,9
10,1-50	551,20	4,9
50,1-100	602,00	4,4
More than 100	8 574,50	76,8
Total	11.160,40	100

Source: Regional Census of Tropical Fruits and Roots. 2005.

to three, five or more hectares. Engaging in investment has been permitted by the export market and by sales prices that have maintained income levels.

-Integration and coordination of the sector

There is little vertical integration in small-scale production as it is difficult for producers to invest in their own packing plants. On the other hand, exporting companies are generally vertically integrated (sowing, packing and marketing) and are supplied from their own crops and/or through contract farming. Although some small companies are involved in export, such as the Association of Agricultural Producers of Legua (APROALE), the market is dominated by very few companies. According to data from the Chamber of Commerce, 60 percent of the domestic market is covered by one company. Table 17 details the companies present in the study area.

With regard to the domestic market, the producers sell their fruit directly to supermarkets or markets or use a wholesale distributor as their outlet. As for the international market, the producers sell their fruit to specialized wholesale distributors or directly to exporting companies on a contract basis. Regarding the study area, 51.7 percent of pineapple output is for the domestic market and 47 percent for exports.

7.3 The present status of production systems in relation to good practices for safety and quality improvements

Cultivating pineapples is a complex activity as is illustrated in Figure 3. A certain level of technology is required as Table 18 indicates. Sowing is staggered to ensure continuous production and to reduce the negative price impact of surplus supply. Pineapple that does not make the grade for the export market is sold as fresh fruit on the domestic market at low prices and as raw material for the fruit juice industry.

There are clear differences in the production technologies used by producers in the different categories. For example, small and medium producers make greater use of family labour for cultivation activities while machinery and equipment is used increasingly in correlation with size of operation. Similarly, the effectiveness of phytosanitary control and plant fertilization is greater the higher the producer category because of the technology used in cultivation.

The differences in production systems among producer categories and related economies of scale mean that it costs small producers more to produce a kilogram of pineapple as Table 19 shows.

Table 17. Pineapple exporting companies in the district of Pital

Name of company	Activities	Source of capital	Jobs generated	Linkage with producer groups
INPROTSA	Sowing, packing and marketing	Mexican	1.100	Linkage
FRUTEX		National	986	Linkage
HEL HUERTO		National	1.900	Linkage
FRUVER		Spanish	2.500	Linkage
PROAGROIN		Dutch	2.800	Linkage
BANACOL		Colombian	400	Linkage

Figure 3. Pineapple production chain, District of Pital

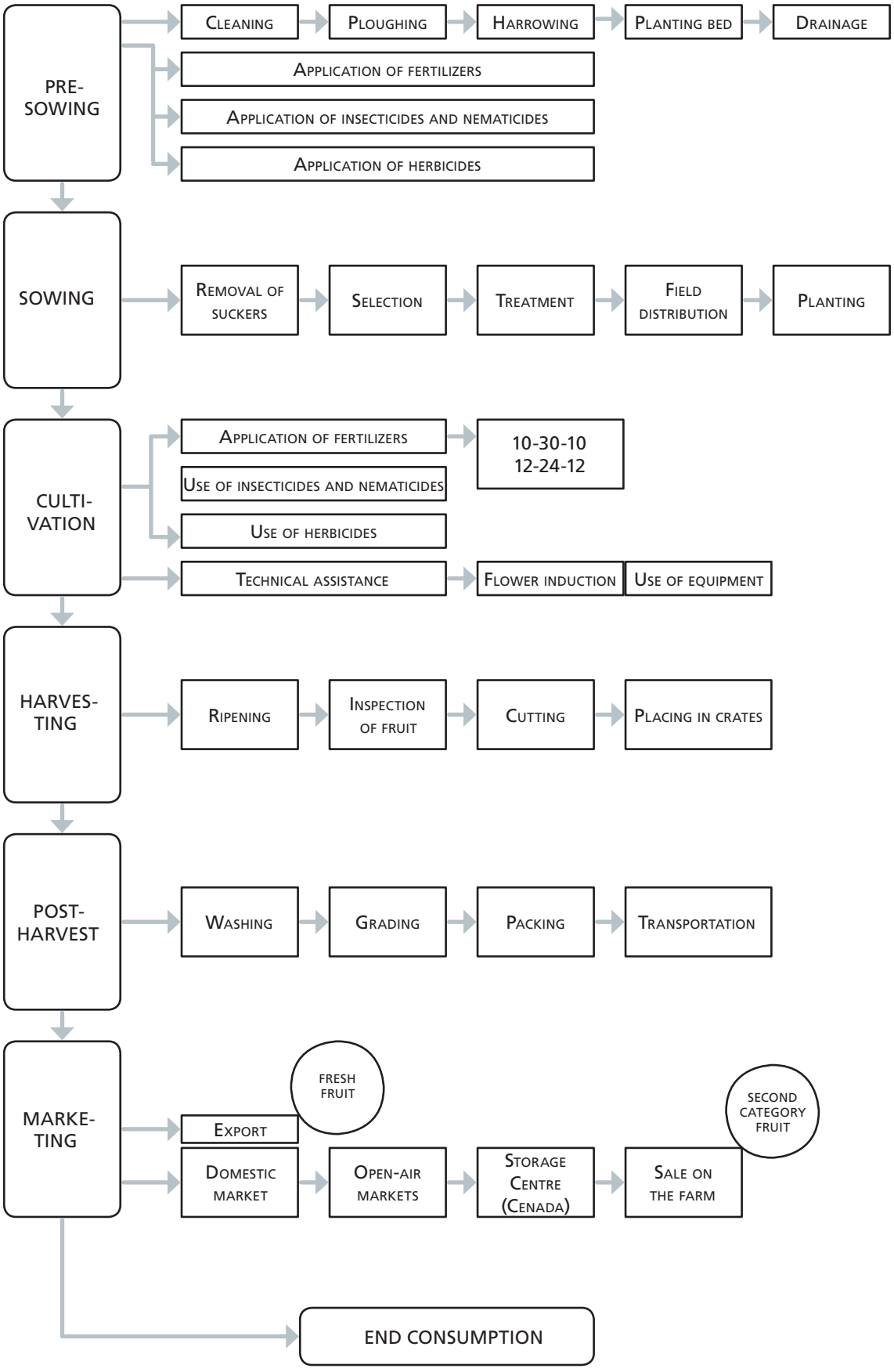


Table 18. Activities relating to pineapple production in the study area

Preparation of soil	Preparation of the soil includes the stages of cleaning, levelling, preparation of planting beds, designing drainage systems and laying out pathways. These are all labour-intensive phases. However, machinery is used to simplify these activities and make them more efficient. A total of 71.1 percent of producers use hired machinery. The average cost of hiring a wheeled tractor per hour varies between US$18.36 and $24.49. Social relations between producers are relevant to this phase as good relations determine the shared use of machinery. Some 36.7 percent of producers hire this service from a neighbouring producer; in second place, two persons in the area provide the service to 36.7 percent of producers; and there is only one cooperative providing the service to 6.7 percent of producers.
Pre-sowing and sowing	Most producers use herbicides and pesticides when preparing the soil. The seeds are usually bought from other producers or home grown. A producer opting to buy a "sucker" or seed has to pay between US$ 0.07 and $ 0.09, but if he grows and extracts it from his own plantation the cost varies between US$ 0.04 and $ 0.06. Most producers in the area choose to produce their own seed to save on costs, given that it takes an average of 54 000 seeds to cultivate one hectare. Otherwise, seed is provided by small and medium producers through sale or barter. The main activities for the sowing phase require 110 hour per hectare. A plot coding system is used to indicate number of plants, date of sowing, plot number and number of blocks. The most important detail is the number of plants sown, according to 31.1 percent of the production units.
Crop maintenance	This includes the application of granular and liquid fertilizer, liquid or dry pesticide and herbicide. Fertilizers are applied in granular or liquid form at monthly intervals, with at least 12 applications during the growing period. The fertilizers most commonly used are compounds. There is intermediate use of pesticides, with 3 to 4 applications per sowing period. Pesticides are used to a lesser extent. Machinery and equipment is used during the growing period to conduct many of these activities more efficiently. Calibration is a key element of good practices and needs to be done every month, according to 31.1 percent of producers. Others view calibration as needed every two or even 3+ months. Producers may accelerate flowering to advance the cultivation process. The key action here is assessing the stage of growth; the next step is to apply the inducer and then seek technical consultation to evaluate the result. Technical assistance is essentially provided by private entities; to a lesser extent by public agencies. Twenty-five percent of producers reported no advice received.
Harvesting	This is after 12 to 13 months. Producers use different indicators to determine when the fruit is ripe and ready for cutting. The main criteria are size of plant, colour of fruit and Brix content. Harvesting requires protective equipment, including gloves, overalls and protective goggles. Twenty-eight percent of respondents wear no protection during crop maintenance; only 2.2 percent use goggles and gloves. Producers generally hire machinery for the harvesting work.

Post-harvest*	This phase prepares the pineapple for market and includes washing, grading, packing, packaging and transport. On delivery to the packing house, the fruit is washed in chlorinated water for sanitary protection. It is then graded, packed and packaged, cooled and stored before transportation in containers. The criteria used by packing houses to grade fruit are colour, size and frequency and extent of external damage. With such selection criteria, an average of 18 percent of the fruit is rejected. Most of packing houses have refrigeration equipment, although 30 percent are not properly equipped. All the workers in the packing houses visited have the required materials and clothing. It is important to note that the workers in these establishments are the actors in the production chain that have received the least training and technical assistance. The fruit is stored for 3 days before being transported 250 km to the port, which takes 4 hours on average.

* The information regarding post-harvest activities was provided by four of the eight companies operating in the area.

Table 19. Production cost of one kilogram of pineapple according to producer category (US$)

Cost of producing 1 kilogram of fresh fruit US$				
Micro-Producer I	**Small Producer II**	**Medium Producer III**	**Large Producer IV**	**Large Producer/ Packer V**
0,081	0,036	0,013	0,010	0,003

Source: the authors.

-Safety and quality requirements

In Costa Rica, although the issue of "safety" in agriculture has been topical for some 15 years, actual implementation took some time to materialize. As regards the minimization of hazards (e.g. microbiological hazards), relatively limited progress was made because the basic measures were voluntary and not time-bound, besides focusing primarily on leafy vegetables. On the other hand, EurepGap established time frames for adherence to safety and quality requirements and to aspects of environmental protection and worker health and welfare.

The safety and quality assurance systems were generally well received by institutions and producers when first introduced, as pineapple cultivation was under full expansion. The institutional players developed training activities and provided a good range of services, while agrochemical companies developed activities in support of good practices, for example arranging for the collection and handling of pesticide containers.

Producers, especially large producers, have gradually adjusted their operations to market requirements. However, a significant proportion of producers responded differently and frequently redirected their activity (market) to avoid having to comply with such requirements because they lacked technological or financial capacity and did not produce on a sufficient scale. For example, in the Huertar Norte region, some 50 percent of producers have not adjusted their production systems to produce under a good practices approach. A significant number of producers, mainly small producers, initiated the process but failed to achieve certification, which has been a mandatory requisite of European buyers since 2006. The results of surveys conducted in the study area among producers who initiated the process of applying good practices to obtain certification are given in Table 20.

Table 20. Status of certification for producers in the district of Pital

	Status of certification		
Size of holding (Ha)	**Yes (%)**	**No (%)**	**In progress (%)**
0,5 – 2,0	0	86	14
2,1 – 10	3	30	47
10,1 – 25	28	0	72
> than 25	67	0	33

Source: Field survey team. October 2005.

7.4 Analysis of the constraints and drawbacks facing small and medium producers as they apply good practices programmes to achieve safety and quality objectives

a. Internal factors

-With regard to the support documentation for good practices programmes, small producers have difficulty maintaining records and using basic technology, including the computer and accounting and record-keeping software. The computer has been one of the main assets acquired but producers have had to recruit extra staff to help them maintain their records and accounts.

-With regard to cultivation, there have been clear inadequacies in the management of technical equipment. For example, 34 percent of producers failed to calibrate their cultivation equipment. Those who calibrate their equipment do so with the help of a technician or adviser and only 11 percent see to it themselves. Inappropriate calibration of equipment results in incorrect dosages against pests and diseases with concomitant risks of residues in products, either because more applications are needed when very low dosages are applied or because the dosages are too high. Likewise, with regard to equipment to determine fruit maturity, 57 percent of the time this is done directly by the fruit buyers or contracted advisers, while 28 percent of producers have their own equipment (refractometer) and 14 percent have neither the equipment nor an advisor to help them, which results in loss of quality when the fruit is cut at the wrong time.

-With regard to market information, 34 percent of producers use local meetings with counterparts as their source of information, 16 percent use the Internet, 17 percent acquire information from discussions with their clients, 16 percent combine the Internet with conversations with clients, while the remaining 17 percent lack the wherewithal to track market trends. This lack of information makes it difficult to understand the changes and adjustments required to improve safety and quality.

-The small and medium producers generally lack experience in pineapple growing. This translates into poor entrepreneurial management because of their ignorance of basic aspects such as production costs. There is little organizational tradition and limited integration between the links driving the production chain. For example, better coordination in seed provision is needed to achieve significant reductions in production costs.

-With regard to downstream linkages, i.e. the marketing phase, the study revealed that the producers had no understanding of the process, which rendered them vulnerable to decisions taken by managers of packing and exporting houses. Packing plants often arrange the certification of their suppliers to EurepGap standards. Payment for certification is not always one-off, but can be in the form of a percentage of fruit supplied to the packing house. Such terms of payment are not always clearly understood

by producers which expose them to agreements that are not always in their best interest.

-Producers have limited financial resources for the investment needed to provide proper facilities for the storage of agrochemicals, sanitary infrastructure and other requirements to meet the safety requisites of the EurepGap protocol, and banks do not offer lines of credit. Twenty-five percent of producers interviewed stated that high costs made it difficult to initiate or accelerate the application of good practices to achieve certification.

-In addition, the fact that efforts to apply safety standards are not reflected in a higher commodity prices discourages small producers from applying good practices programmes.

b. External factors

The external factors that discourage producers from applying good practices programmes are those factors that are outside their control: logistic services, infrastructure (roads, wharves, airports), price of fuel, macroeconomic policy and so forth.

-One disincentive mentioned was the poor quality of roads to freight the fruit from farm to packing or export plant.

-Lack of information, time and the cost and quality of training. Twenty-five percent of producers criticized the dissemination of information concerning requisites for the certification of their farms. Dissemination and quality of information were mentioned as major obstacles to implementation of the programmes.

-While 25 percent stated that high costs made it difficult to initiate or accelerate the process of certification, such costs were identified as applying not only to infrastructure but also to the advisory services needed from the private sector.

-Thirteen percent of producers identified time as a major constraint to completing the process and thus being able to export their fruit after January 2006.

-The institutional structure has not been sufficiently robust to provide producers with adequate support, in contrast to the support that was given to preparing for the food export requirements of the US Bioterrorism Act.

As a result of these critical factors, 32 percent of respondents in all categories have not yet initiated procedures to obtain certification. A further 45 percent are in the process of doing so; in other words, there are producers who have been in the process for an average of eight months while others have invested some 18 months in change, without having achieved their final objective. The remaining 23 percent now operate certified holdings.

Many producers are clearly uninterested in initiating the process because they see no greater benefit in terms of price. This makes it increasingly necessary to emphasize that this is an indispensable requirement to remain in the export sector, especially considering that 97 percent of producers are currently operating for the export market. One critical external factor in the production chain is the impact of fluctuating international prices. Although Costa Rica's pineapples are classified as among the best in the world, surplus global supply makes domestic production vulnerable.

c. The costs of applying safety and quality assurance programmes

Producers are incurring high costs in applying new forms of cultivation that will enable them to adjust to market requirements. Such costs increase producer vulnerability to low prices that might not be sufficiently high to cover the costs of changing the production process. The findings of the cost analysis conducted in the study area indicate the impact of such costs on profitability, especially for small producers. Figure 4 reports the analysis of 55 aspects (Annex 7) of the EurepGap protocol, grouped into 13 components (variables).

Significant differences were noted in the cost of each of these components of good practices[1], determined by the level of specialization (scale) of production and related activities. For example, in the category of producers carrying out packing activities and preparing the product for export (large producer/packer, type V), practices relating to post-harvest safety and quality assurance, environmental management, worker health and safety, and water management account for 86.8 percent of the cost structure (36.18; 20.21;15.66 and 14.82 percent, respectively).

For the small producers in category I, the activities with the highest impact on cost are harvesting, management of soil and growth medium and initiatives to ensure traceability and plant protection, with percentages of 27.28; 13.27; 12.69 and 12.37 respectively.

With regard to transportation, emphasis is on the hygiene of vehicles and holding baskets. This is relatively easy for most producers as they contract this service, with cleaning and maintenance of vehicles and baskets included. Plant protection contributes significantly to the cost structure of category I, II and III producers, with percentages of 12.39; 16.39; and 28.63 respectively. Fertilization is critical for categories II, III and IV, with 19.5; 12.76; 20.20 respectively. These aspects include activities relating to the building of infrastructure for storage of pesticides, fertilizers and other agrochemicals; the procurement of application equipment; the calibration and maintenance of equipment; constructions for the preparation of phytosanitary mixtures; the application of integrated pest and disease management programmes; the conduct of soil analysis, and so forth. Although investment in infrastructure is a major component of the cost of programme implementation, the small producers adapt solutions to their economic capacities, as Figure 5 shows.

The greater the technology, the fewer the resources needed for agricultural activities (e.g. soil management and plant protection). A producer with low technology will need to invest more in adjusting his production systems.

Investment in traceability is relatively higher for type I and II producers who have to counter entrenched cropping traditions and have to bear administrative costs out of proportion to their production.

Given the complexity of comparing producer categories because of differences in technology and scale of production, the study focused on estimating the total costs of applying good practices and their percentage of net earnings. The results are given in Table 21.

The differences in production costs resulting from economies of scale, integration of activities (production, packing) and production systems determine differences in the cost of producing one kilogram of the commodity, as illustrated in Table 19. The impact on net earnings of investment in the EurepGap protocol is therefore more drastic for small and medium producers. Category I and II producers have to invest a higher percentage of earnings to meet the requisites.

-Costs of meeting safety objectives

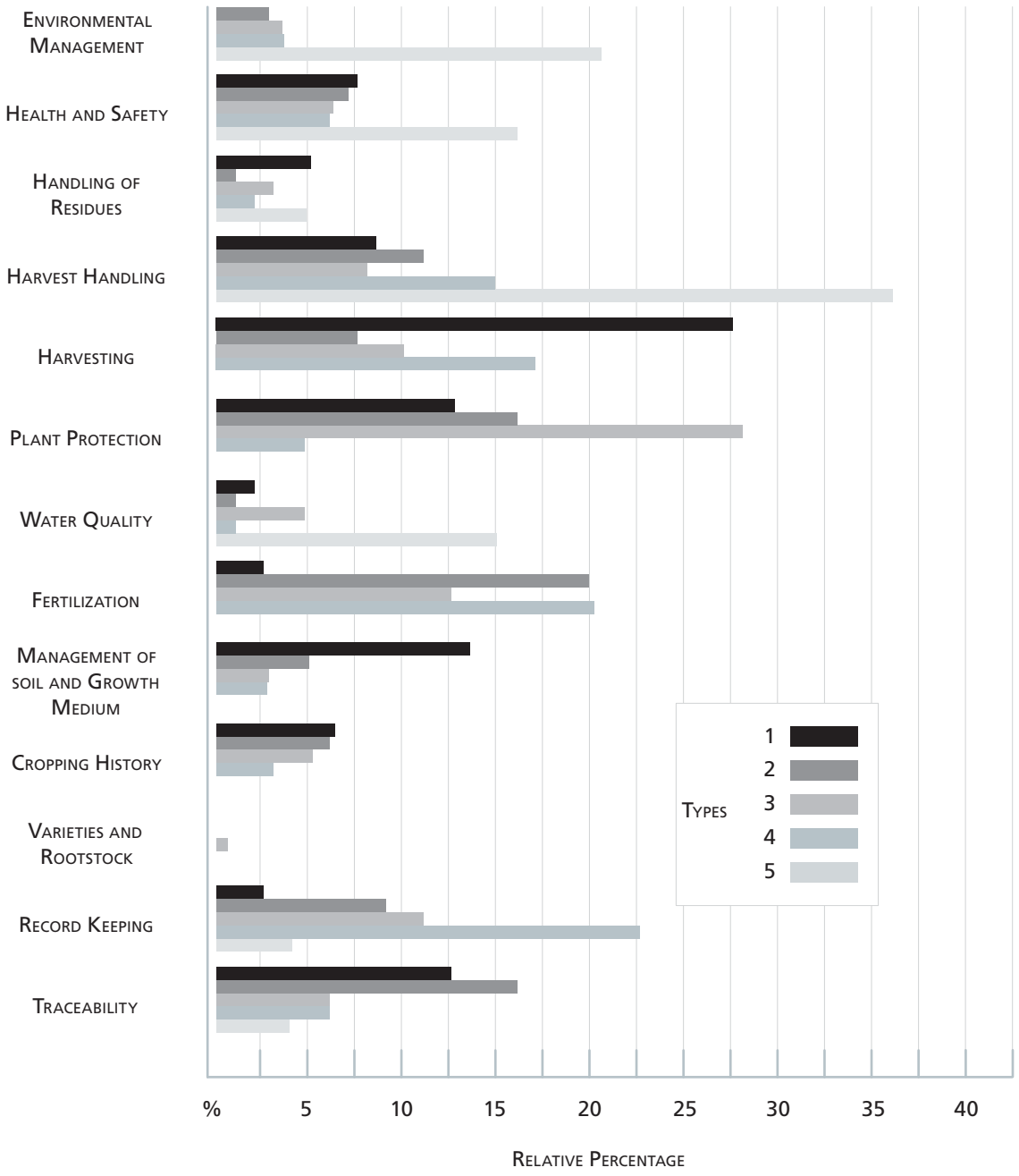
An independent exercise was conducted to estimate the impact of the safety variables on the total cost of the good practices programme. The regulatory components that targeted safety were selected and a cost estimate was made for each. Out of 55 variables studied, 28 were identified as directly related to safety. Disaggregating the variables is not easy as some activities target more than safety objectives. The results are given in Table 22, which shows that safety components account for a high proportion of the total cost of applying good practices (36 to 55 percent).

The results of these studies were presented by the survey team at a workshop attended by 34 producers. The intention of the workshop was to gauge their general perception of the benefits and drawbacks of applying good practices programmes.

The producers failed to fully understand the reason for so many practices, which they only implemented to meet requisites and remain in the market. There were differing opinions on the cost of applying the

[1] The analysis does not include the costs of certification as such.

Figure 4. Cost structure for application of EurepGap protocol by producer category



Source: Field Survey Team. October 2005.

system per holding, although all participants agreed that the larger the holding, the lower per hectare cost. With regard to the funding of activities, the larger the scale of operation, the greater the likelihood of self-financing, and the smaller the scale, the greater the need for loans or membership of support programmes.

As regards the impact on family incomes of applying good practices, 72.22 percent of the participants reported a clear and sometimes significant reduction in income, especially in a context of falling prices. Only 5.56 percent mentioned higher income from facilitated sale.

All the workshop participants had received training. However, 32.3 percent indicated that there was

still much to be done in this regard, while 53 percent considered that the training had been appropriate. The training had been provided by a variety of public and private entities, with the government producing the greatest share, accounting for 73.5 percent. Some participants reported significant change in workforce performance due to the implementation process and the training.

A total of 70.6 percent of participants considered that the implementation of safety and quality systems had a positive impact on environmental management, through aspects relating to conservation and protection, the safeguarding of landscapes and recovery. Widely differing features of fruit quality were reported but only four individuals saw clear changes in safety.

7.5 Conclusions

-There is an urgent need for measures to consolidate partnerships and policies aimed at improving the provision of financial, educational, organizational and other support services at a reasonable price.

-An interdisciplinary perspective is fundamental. Training, for example, has focused solely on the need for producers to meet the minimum requirements for certification; but not all producers have taken on board the implications for sustainability, for the conservation and safeguarding of production resources, for safety and quality.

-There needs to be a stronger entrepreneurial focus on the application of safety and quality assurance programmes. Producers need to be made aware of the importance of such programmes for accessing international markets, while trainers need to understand the commercial, social, environmental and agricultural context and the specific characteristics of local producers. This will mean reshaping the training process.

-An ongoing and sustainable strategic partnership between the public and private sectors must exist for the implementation of safety and quality assurance programmes by producers.

-The study confirms that the process of safety assurance is in the interest of producers and public institutions alike, as demonstrated by the many different efforts that are taking place in agricultural areas. The difficulties relate mainly to achieving an integrated assimilation of the process, because of disparities in actor population (contrasting categories) and the failure to reflect investment in the commodity price.

-This is also evident in interest rates on bank loans which are usually for traditional agricultural production. Investment in safety and quality assurance must therefore be found elsewhere, with short-term repercussions on net earnings, family income and the ability of producers to continue operating.

-A significant proportion of producers are unable to continue implementing safety and quality assurance systems because of the instability of commodity prices.

-Finally, this exercise has shown that local and international, public and private bodies need to promote integrated development strategies that include technical, commercial and social criteria in the evaluation of the applicability of safety and quality assurance systems, if these are to be implemented in a sustainable manner.

Figure 5. Solutions devised by different producer categories to meet market requirements

Above, area for the field preparation of phytosanitary mixtures and toilets;
centre, two sources of information: plot and regulated entry;
below, storage facilities of type II producer (left) and type IV producer (right).

Table 21. Cost of implementation of good practices as a percentage of net earnings

Cost of implementation of good practices (as % of earnings)				
Micro-Producer I	**Small Producer II**	**Medium Producer III**	**Large Producer IV**	**Large Producer/ Packer V**
47,63 %	21,54 %	7,40 %	5,92 %	0,56 %

Source: Survey team. October 2005.

Table 22. Safety variables as a proportion of the total cost of implementing good practices (%)

Safety variables				
Micro-Producer I	**Small Producer II**	**Medium Producer III**	**Large Producer IV**	**Large Producer/ Packer V**
49,9 %	54,3 %	36,2 %	38,1 %	49,5 %

Source: Survey team. October 2005.

8.

Overview of the case study findings

The case studies presented in the previous sections illustrate the impact that safety and quality developments in food importing markets have had on sectoral structure and organization in the exporting countries. The producers of each sector clearly face enormous challenges in making the adjustments needed to participate in the export market. This section provides a general analysis of the common characteristics and differentiating elements of the sectors studied in relation to their ability to rise to the challenges of meeting the safety and quality requirements of markets and existing standards, with a special focus on small producers.

8.1 The analytical approach to safety and quality aspects in each case study

The exercise proposed by FAO consisted in fostering coordination between national institutions responsible for food safety and quality, in order to analyse the problems of a specific horticultural sector in meeting the safety and quality requirements of markets and prevailing standards, and in order to determine actions to resolve the identified problems or constraints.

Although the three studies considered the general environment for each sector, the analysis was conducted in a local context (municipality, district) for pineapple and cape gooseberry and in an entrepreneurial context (Huertos Gatazo Zambrano consortium), for broccoli. This resulted in differences in analytical approach employed by the survey teams and in the detail of information presented.

The three case studies generally followed the methodology proposed by FAO, as described in Section 3. The analysis focused on a general description **of the external and internal environment of production systems and product management** in relation to difficulties in meeting the quality and safety requirements of target markets, principally in the context of small producers. The next stage was to identify the changes that were needed to improve safety and quality, identifying and estimating the advantages and disadvantages from a perspective of the costs and benefits of implementing the recommended changes.

The three case studies showed substantial differences in approach to estimated costs. In the case of cape gooseberry, the analysis was based on the impact of applying the recommended practices for improving safety and quality on total production costs. In the case of broccoli, the cost analysis included a detailed estimate of the costs of implementing the recommendations, including the costs of training and other support needed to improve quality and safety – this is one of the strengths of the study. In the case of pineapple, the cost estimate related to the implementation of practices recommended in the EurepGap protocol, supplemented by a detailed analysis of the costs of specific practices relating to safety. The analysis compared the impact of such practices on the production cost of different producer categories (type I - V); this comparative analysis is the greatest strength of the study.

The analysis of benefits in the case studies was based on an economic assessment of the "tangible" (quantifiable) benefits resulting from the positive impact of recommended practices on product quality, yields per hectare, reduced production costs, efficient use of production resources, and so forth. In the case of pineapple, the analysis centred on the assessment of costs, without dwelling on expected benefits from applying good practices in compliance with the EurepGap protocol, as detailed below.

The final stage of the methodology proposed by FAO was to draw up a plan to implement the suggested recommendations. This aspect was included in the case studies in Colombia and Ecuador. The following sections detail the results of the case studies conducted by the respective survey teams.

8.2 The general framework of the sectors studied from the perspective of improving safety and quality

The case studies focused on "emblematic" horticultural sectors within the non-traditional exports of each country, sectors that varied significantly in terms of size and scale. In Colombia, the cape gooseberry, the second (fresh) horticultural export after banana, represented a cultivated area of 360 hectares throughout the country and a total export value of US$14 million in 2004[1]. In Ecuador, an estimated 3 423 hectares were sown with broccoli in 2004 (an effective area of 9 000 hectares, given the three cycles each year), with an export value calculated at US$32 million for the same year. For pineapple, Costa Rica's sixth export commodity and the second horticultural product after banana, total exports amounted to US$365 million in 2005, from an estimated 23 000 hectares. The development of pineapple production for export was mirrored by other fresh horticultural produce, with Costa Rica featuring prominently in global exports of melon, papaya and cassava. The importance of the fresh horticultural exports sector (excluding banana) is less in Ecuador and Colombia, though growing. As they consolidate, these fresh product export chains will face greater challenges in securing the services and infrastructure needed to support the export process and the public and private capacity to promote improvements in safety and quality.

The sectors studied have important economic and social impacts. It is important to note the significance of fruits and vegetables as high-value products, although a distinction needs to be made between high-value products and products with high value added. Cape gooseberry, for example, is exported as a fresh commodity to niche markets and is a product with high value in terms of its price (6 421 MT generate an export value of US$23.8 million). In the case of fresh pineapple, the product is gradually entering the dietary habits of average consumers in its terminal markets and as its consumption broadens so its high value in terms of price gradually declines. The value added for the three commodities studied occurs in the processing, packing and distribution stages. In the case of broccoli, value is also added through freezing, which extends shelf life and minimizes marketing risk. The stages of production and value addition have strong social and economic impacts on the generation of employment and the development of allied industries, which is brought to light in the case studies.

The very nature of the product and production chains determines the challenge that producers and exporters face in meeting the safety and quality requirements of terminal markets. Fruits and vegetables that are consumed fresh, such as pineapple and cape gooseberry, face more stringent requirements in this regard than do products that are cooked, such as frozen broccoli.

Similarly, the level of global competition acts as an incentive or disincentive in promoting safety and quality improvements among producers. Broccoli and pineapple face strong international competition. In the case of pineapple, domestic and international competition has lowered producer prices per kilo and discouraged the application of safety and quality improvements, notably among small producers.

The existence of fierce international competition and the need to meet increasingly stringent safety and quality market requirements have caused production chains to regroup, with a higher concentration of production and closer linkages between actors, as described below.

[1] The sown areas probably increased significantly between 2004 and 2005 to reflect the surprising increase in exports during this period (the value of exports rose from US$14 million in 2004 to US$23 million in 2005).

8.3 Application of programmes to improve safety and quality. What is the present state of production technology, institutional support and organization of the sector?

The key export markets in the three case studies are USA and Europe, in particular; the latter accounts for 98 percent of cape gooseberry exports, 42% of pineapple exports and 86.6 percent of broccoli exports. The principal concern of exporters in the three case studies is to meet the safety and quality requirements of the European authorities and the certification requisites of importers as a means of ensuring the safety and quality of the fresh produce they import.

The challenge facing producers and exporters in meeting such requirements largely depends on point of departure in terms of production technology, institutional infrastructure for service provision, technical and administrative capacities and level of organization and interaction among actors. While the smaller producers in each case study share the same technical, administrative and financial inadequacies, these are compounded in the case of cape gooseberry by problems of structure and technology that cause added constraints for the implementation of safety and quality improvements, as detailed below.

8.3.1 Critical factors for the successful implementation of safety and quality programmes for the cape gooseberry. Technological problems and lack of coordination between actors

In theory, the consolidation of quality and safety improvements for cape gooseberry should be relatively easy given that only 360 hectares are involved nationally. Yet, the case study highlights a number of impediments, as described below:

-Available production systems and technologies

In contrast to broccoli and pineapple, the cape gooseberry is relatively unknown on the international market and is only produced on a small scale in the tropical countries. There has therefore been no major development of technology that can be transferred to other producer countries. Although institutions and cape gooseberry producers have made obvious efforts to resolve the technological problems, there are still critical production difficulties that need to be resolved before safety and quality assurance programmes can be successfully implemented. These include poor quality of seed and limited understanding of the cycles of pests and diseases affecting the crop and thus of the most appropriate methods of prevention and control.

-Low level of interlinkage and coordination between actors

The cape gooseberry sector is highly fragmented in production and purchase. With regard to production, there is a large number of producers, who generally work less than 10 hectares. With regard to marketing, a large number of companies are involved in the export trade which is relatively small (58 companies exporting a total of 6421.66 MT in 2005). There is inadequate coordination between producers to build the volumes needed to weaken the role of intermediary wholesalers. Although there is evidence of verbal or written agreements between suppliers and purchasing companies, these are more common between intermediaries and producers with larger volumes. Intermediation remains a significant sectoral feature that has restricted effective communication on safety and quality requirements between actors. Meanwhile, competition from so many buyers could reduce the need for producers/suppliers to secure forward sales for their produce and to observe the terms of agreements.

The relatively limited competition that the product faces internationally probably partly explains the limited coordination and organization that exists in the sector and the scarce linkage between actors. The larger exporting companies had previously started to grow their own crops but, because of the high labour requirements and the need for farmer experience, they subsequently opted to secure their supply of fruit by coordinating with suppliers (FAO, 2005b). However, the new need to meet safety and quality requirements could trigger significant changes in the organizational structure of the sector. Exporting companies are again beginning to grow their own crops on a large scale, mainly on leased

land, in order to ensure a reliable supply of fruit in sufficient quantities and produced to the safety and quality standards of purchasers. Given the pressure to meet the requisites of EurepGap certification, vertical integration (establishment of own crops) is likely to become more prominent as a supply strategy of exporting companies. The speed of such integration is difficult to predict and will be largely determined by the capacity of companies to minimize cultivation risks and by the suppliers' ability to ensure the safety and quality of their produce. The extent to which the establishment of own crops becomes viable and gains favour among exporting companies will largely determine the opportunities for small producers to participate in the export market or, failing that, to supply fruit exclusively to the domestic market, which is under steady growth.

There is also a lack of cooperation between exporters to consolidate volumes and resolve the problems affecting the sector. The National Association of Exporters of Colombia (ANALDEX) has a section on fruits and vegetables, but only a few companies exporting cape gooseberries are members. The association has run projects with actions grouping different institutional activities. These have resulted in the certification of some 50 cape gooseberry concerns[2]. However, the limited cooperation between exporters and producers has undoubtedly restricted the success of such initiatives.

-Regulations in the countries of destination

As mentioned in the case study, the sector has been the focus of recent institutional efforts to facilitate the application of safety and quality improvement programmes. A good practices manual exists and there have been training events to raise the awareness of producers and other actors to the importance of implementing those programmes. In spite of these efforts, the implementation of good practices has been slow. The use of agrochemicals in cultivation continues as an unresolved bottleneck.

From the perspective of safety standards of the countries of destination, one of the factors that could have a significant impact on competitiveness of the sector is European Union legislation on pesticides, both the harmonization of maximum residue limits (MRLs) and the registration of active ingredients for specific products. One of the difficulties currently facing exporters is the disparity in MRL requirements of different EU countries which suggests that harmonization should in principle have a beneficial impact. On the other hand, the small size of market makes it unlikely that pesticide companies will be registering products specifically for the cape gooseberry, so MRLs could be set at zero tolerance. This would present the enormous challenge of producing excellent quality cape gooseberry with minimum use of chemical products, thus further aggravating the control of pests and diseases which is already problematical given the lack of knowledge of alternative integrated control methods. Such a situation is less likely to arise in export sectors such as pineapple and broccoli that are more substantial in size of market for agrochemical companies and number of countries and stakeholders involved.

8.3.2 Technical, administrative and financial capacities of the broccoli and pineapple sectors and unresolved bottlenecks

In contrast to cape gooseberry, the factors limiting the application of safety and quality improvements in the broccoli and pineapple sectors relate more to the technical, administrative and financial capacities of producers, especially the small and medium producers, than to general structural and technological problems. Again in contrast to cape gooseberry, these sectors have greater interlinkage and higher technology and are far more integrated.

In the case of broccoli, which this is mainly exported frozen, the exporting companies doing the freezing need to comply with the safety and quality requirements of good manufacturing practices. However, an important related component is the safety and quality assurance of raw material from the field, which is why companies have invested time and effort in training their suppliers to meet the necessary standards.

The production and marketing of broccoli is far more concentrated than cape gooseberry, with five

[2] Information provided by Cesar Garcia, Director of Project Policy, Formulation and Implementation, ANALDEX.

exporting companies. These have their own producers (approximately 300 for the five plants) who are contract farmers and receive seedlings from company nurseries (CORPEI, 2006). The large agricultural production units (more than 100 ha) account for 65 percent of total output. The exporting companies have invested heavily in industrial infrastructure and cutting-edge technology, and use purchasing contracts to try to ensure the timely supply of sufficient raw material with the required quality. One of the main incentives for promoting quality and safety improvements through good practices is the ability to supply premium quality produce that meets the standards of importing markets and thus to stand out among the competition.

In the specific case of Huertos Gatazo Zambrano, the possibility for small producers to handle large volumes through their association has facilitated their access to the export market and institutional support services. The sector is more concentrated at purchaser level which facilitates relations between companies and suppliers. The companies prioritize quality aspects with producers given price bonuses for meeting company standards and incurring price penalties for failing to do so. Emphasis in relation to safety is placed on appropriate pesticide management.

Purchasers and producers are organized under the Foundation for the Association of Ecuadorian Fruit and Vegetable Producers (APROFEL) of which the five purchasing companies and some 130 producers are members. The association works on critical technological programmes, for example integrated control methods for *Plasmodiophora brassicae*, a pest that recently appeared in a number of broccoli fields. Technicians from the exporting companies collaborate in trials and studies to develop an integrated crop management model. The project envisages supplying the processing plants and producers with equipment to monitor and locate pests (GPS), meteorological stations and other items needed for better control and monitoring of crops. At the same time, CORPEI is delivering a funding programme to help producers of fresh exports to apply EurepGap.

In the case of the pineapple sector, trade is dominated by a small number of companies, with one alone accounting for 60 percent of national marketing. The integration of activities is a particular feature of this sector. There has been an increase in the number of companies involved in the export trade in recent years because of international prices, with their number rising from 37 in 2001 to 77 in 2005 (PROCOMER, 2005). As in the case of broccoli, coordination through contract is the usual form of fruit supply. The sector has benefited from the technological developments of major producer/exporting companies in Hawaii which have been transferred or adopted to the context of Costa Rica. Technology is thus available for production, although the environmental impacts of monoculture and inappropriate residue management constitute major challenges for sustainability of the sector (Acuña, 2005). The level of technology (in terms of mechanization) is very high for this crop, while coordination among producers is low. *The major challenge facing the industry in terms of safety and quality is to meet the EurepGap requisites in a context of unfavourable prices.*

To conclude, coordination initiatives between suppliers and purchasers exist in the three sectors, with these being more common in the case of broccoli and pineapple. This facilitates communication and the development of strategies to improve safety and quality. However, such cooperation tends to favour producers who can offer a larger volume of product. Although the sectors face challenges in optimizing their production systems, especially in the management and control of pests and diseases, those that have benefited from technological developments and technology transfer from other countries are in a better position to meet the challenge of applying good practices to achieve safety and quality objectives. Their point of departure for change is more advanced.

In the case of cape gooseberry, the sector faces enormous challenges in generating information and solutions to technological problems in the production and post-harvest stages that are fundamental for the achievement of safety and quality improvements.

8.4 Transition of traditional production systems towards good practices to improve product safety and quality

The scale of institutional and private effort needed to promote the implementation of safety and quality improvement programmes in each sector will depend, among other factors, on the gap that exists between current production systems and systems based on good practices to achieve safety and quality objectives.

In this connection, there are common elements among the producer categories of each sector. Small producers operate under traditional production systems with low technology, which is generally reflected in low productivity and low quality of product. The current status of the three sectors identifies the management and control of pests and diseases as a critical issue; there is a need to reduce problems associated with the use of agrochemicals in terms of residues, environmental impact and worker health. The three studies highlight the need to implement integrated pest and disease management programmes, to use and manage agrochemicals appropriately and to apply agrochemicals correctly, using properly calibrated and serviced equipment and providing workers with protective equipment. Other common aspects of the case studies relate to efficiencies in the management of chemical and organic fertilizers and the appropriate application of production practices, such as pruning and weed control. Clearly, the adjustments required from small producers in these aspects are greater than those from the large and medium producers who have a more advanced point of departure in cropping technology.

-Limitations and advantages of safety and quality improvement programmes for small producers

The three sectors have high linkage with small producers. Each sector defines a small producer in terms of investment in sown area. In the case of cape gooseberry, the cost of traditional production per hectare is approximately US$8 400 for a cultivation period of 10-12 months. In the case of broccoli, a producer in the GZ community invests an average of US$1 320.53 per hectare (for three month cycles); and in the case of pineapple, the average production cost is US$9 900 for a period of 360 days until the first cut or harvest. Cape gooseberry and pineapple producers therefore assume a higher investment, with a return on investment over longer periods.

Small producers in the cape gooseberry sector cultivate less than 2 hectares, while medium and large producers cultivate not more than 10 hectares. The possible reason why there are no economies of scale for this crop, in terms of area, is related to the cost of infrastructure to support operations and the labour required for cultivation, together with the production risks (pest and disease). In the case of pineapple, small producers cultivate less than 3 hectares and, in the case of broccoli, small producers cultivate less than 10 hectares. The Huertos GZ producers belong to this category as individuals, but collectively run 60 hectares of cropland which gives them a competitive advantage over individual producers who are not organized. Another relative advantage of small producers in the broccoli and cape gooseberry sectors is that these sectors are labour intensive and therefore generate opportunities for household labour and community work.

Although there is close linkage between the production chains and small producers, total output is mainly from the medium and large producers. In the case of pineapple, the small producers account for 12.9 percent of total sown area, while the large producers with more than 100 hectares account for 76.8 percent. In the case of broccoli, the large producers with more than 100 hectares account for 65 percent of total output. In the case of cape gooseberry, 37 percent of producers are medium or large, with 2 to 10 hectares, and although there are no data on their contribution to total output, this is likely to be high.

The findings of the case studies on the pineapple and cape gooseberry sectors indicate that the application of practices to improve safety and quality and thus meet market requirements has mainly concerned the medium and large producers. For example, in Costa Rica 100 percent of medium and

large producers have certification or are in the process of obtaining it, while only 14 percent of small producers have initiated the process. The large producers are generally in a more competitive market position and have the technical, administrative and economic capacity to make the necessary adjustments to their production systems and product management.

The small producers in the three sectors have common characteristics that restrict implementation of safety and quality improvements. One such characteristic is their low level of education which limits their ability to maintain the documentation and records that are needed for safety and quality assurance programmes and that serve for farm management and planning. Similarly, small producers are generally located in marginal areas or areas far from collection centres, so must pay more for transport and run higher risks of quality loss. They are also technically ill-equipped to deal with pests and diseases and engage in other production practices, and although most have received training programmes in different aspects of good practices, their limited access to credit and investment, their low schooling and the deficiencies in training strategies have impeded the realization of expected changes.

The level of sophistication in safety and quality requirements varies considerably between the sectors. For example, the pineapple producers in the Costa Rica case study have a higher level of education than the small producers of broccoli and cape gooseberry. However, their main constraint is their inability to keep systematic computerized records.

In spite of the difficulties facing small producers, there are also situations in which they would appear to be at an advantage for implementation of safety and quality assurance programmes. For example, small producers of cape gooseberry have a comparative advantage over medium and large producers in that they produce on their own land, which would suggest that they would be more willing to invest in the safety and quality assurance of their product, investing for example in sanitary infrastructure. From the perspective of cost and benefit of making improvements to their production systems and commodity management to achieve safety and quality objectives, small producers should, to all appearances, benefit handsomely from such improvements.

-Are transition costs a barrier to implementation of change by small producers?

The level of sophistication in safety and quality requirements varies considerably between the sectors. In the case of Costa Rica, the very characteristics of the pineapple sector and the involvement of extensive capital resources in pineapple production for export have generated a series of requirements under the EurepGap protocol that call for significant investment (storage facilities, field sanitary facilities, traceability requirements, management of residues and containers, etc.).

In the case of cape gooseberry, although the purchasing/exporting companies require EurepGap certification, the level of sophistication and technical use in this sector is lower, so programmes to raise safety and quality to the standards of European purchasers focus on the implementation of simple documentation and registration systems and investment in basic sanitary infrastructure and infrastructure that is less sophisticated than in the case of pineapple. In the case of broccoli, purchasing companies require that their producers meet requirements that relate essentially to quality, while emphasis in safety targets pesticide residues. The results of cost analysis of actions to improve safety and quality and meet market requirements are presented below.

The results of the cost estimate

Significant differences exist in the approach adopted by the survey teams to analyse the costs of implementing practices to promote safety and quality improvements. This makes it difficult to compare their findings.

In the case of cape gooseberry and pineapple, the cost analysis focuses on the impact of recommended practices on production costs per hectare. In the case of broccoli, the analysis assesses all costs associated with implementation of the proposed intervention, including training costs.

In the case of cape gooseberry, the analysis indicates that producers would have to assume additional costs, mainly relating to administrative activities (keeping records, management of the holding, etc.), the construction of sanitary infrastructure and temporary storage facilities, the payment of technical advisory services, soil and water analysis and the procurement of equipment and tools. Analysis of the impact of these additional costs on total production costs indicates that savings from optimized input use and appropriate crop management practices offset the fixed costs for administrative activities, payment of services, construction of basic infrastructure, etc. There is therefore a reduction in variable costs (from efficiency in input use) and an increase in fixed costs for the construction of infrastructure, required technical assistance, etc. However, in general terms, the overall production cost structure is not significantly affected because of the balance between reduced variable costs and increased fixed costs resulting from the improvements.

In the case of pineapple, the analysis indicates an inverse relationship between cost of programme application and size and technology of holding. Large producers have to assume greater costs for water management, management of residues, workforce safety, etc.. Small producers incur higher costs for harvesting practices, management of soil and growth medium, initiatives to ensure traceability and crop protection.

In contrast to the analysis for cape gooseberry, the analysis for pineapple focused on estimating the costs of practices to be implemented but unfortunately failed to consider the positive impact that such practices might have on total cost structure. From this perspective, the study results suggest that the costs of applying good practices impact more dramatically on the net earnings of small producers (categories I and II), accounting for up to 47 percent of income. The safety components account for a significant proportion of total cost structure for all producer categories, ranging from 36 to 55 percent.

In the case of broccoli, the cost analysis was undertaken from a different perspective and considered the costs of all necessary activities, including training. For the purpose of analysis, all recommendations or good practices were grouped into those aimed at safety and quality and those recommended for environmental sustainability or improved worker welfare (e.g. reforestation of watersheds, building of canteens for workers, etc.). At the same time, the benefits from implementation of good practices were viewed as more gradual, with cost-benefit analysis extending over a horizon of four years. Another aspect to be highlighted is the scope of the analysis, as the recommendations directed towards the community rather than individual broccoli producers. It therefore considers the linkages and interactions that exist between broccoli production and the other agricultural activities of the producers.

A review of the costs of implementing the priority actions proposed for Huertos GZ clearly indicates that the transition costs do not apply only to the producers. Institutional support from the extension services is also required, for example training is estimated at US$1 124.55. The components impacting most heavily on the cost structure are those that relate to the management of agricultural inputs and associated cropping infrastructure (storage facilities, sanitary facilities and so forth). The first category includes annual analysis of soil and water, equipment to apply pesticides (annual provision) and the construction and annual maintenance of shelving to store agrochemicals. The main infrastructure cost is the construction of latrines and associated furnishings (about US$4 200 per year). The total cost for the first year of activities relating to safety and quality objectives amounts to US$24 499. This is a considerable sum if we consider the economic possibilities of GZ producers; for the first year alone, it represents approximately 31 percent of the resources deployed by the community annually to produce 60 tonnes of broccoli.

To conclude, the costs that producers in the case studies must assume to meet the safety and quality standards of their markets are significant. The answer to the question as to whether or not these act as a barrier to implementation of improvements depends on a number of factors, including:

- The access of small producers to economic resources (lines of credit, support from purchasers, etc.) to carry out the necessary adjustments;

- The public and private institutional infrastructure available to facilitate and support the implementation of programmes;

- The application of a detailed analysis of the benefits and drawbacks of the practices to be implemented, in the context of small producers. An analysis that only considers the drawbacks will most likely view the cost as a barrier to implementation of the necessary improvements.

-Analysis of the benefits of applying safety and quality assurance programmes in the sectors studied

Clearly, the key incentive for applying good practice programmes in the three sectors is compliance with importing market requisites. In other words, the economic benefits of being able to continue supplying a lucrative market are what drive public and private efforts.

Other economic benefits identified in the cape gooseberry and broccoli sectors relate to improvements in productivity (yield/ha) and quality of produce; and a reduction of variable costs. Given that small producers operate under traditional production systems, changes in the production process are clearly reflected in improvements in yields and productivity. These benefits are probably less evident for small producers engaged in production that already requires a degree of technology, such as pineapple, where changes will focus on support infrastructure and other investments to ensure product safety, including documentation of activities and processes of traceability, which have a less direct or obvious impact on production variables.

In the case of cape gooseberry, small producer transition towards production systems that are based on good practices provides a positive cost/benefit ratio because of the increased volume of fruit meeting export quality standards and therefore fetching higher prices.

In the case of pineapple, unfortunately no analysis was conducted on how good practices programmes could impact positively on production variables. Analysis was on the estimated costs of activities, without capturing the benefits of change on production variables and reduced production costs. The producers interviewed considered that the programmes incurred costs but few gains. Producers have little incentive to implement improvements in a context of falling prices.

There are other intangible benefits from good practices programmes that are difficult to define in economic terms. The sustainability of trade and the possibility of producers, especially small producers, participating in that trade would undoubtedly be seriously curtailed without greater human capacity and better environmental stewardship that result from improved farm management; reinforced administrative capacity of actors; change in producer perception of trade; social benefit from improved worker health and welfare, and environmental sustainability of production systems.

In this connection, the case studies highlight the threat of inappropriate production practices on sustainability, especially for cape gooseberry and pineapple. With regard to the former, the capacity of current production areas to maintain steady sustained output has been reduced. In the case of pineapple, monoculture, high use of agrochemicals and agricultural machinery and inappropriate management of cropping residues are causes of increasing concern.

The fostering of clear understanding among actors of the benefits of applying good practices, from an environmental and sustainability perspective, is something that needs to be reinforced in producer training programmes.

Whatever the situation, the opportunities for small producers to participate and/or continue as suppliers of raw materials for export markets will depend on their ability to adjust their production systems to the requirements of the purchasing companies. The favourable prices that exist for cape gooseberry and broccoli are undoubtedly an incentive for the producer to remain in the market. In the case of

pineapple, however, the market is becoming less remunerative because of low prices, so there are fewer incentives for small producers to apply safety and quality improvement programmes.

In this regard, the availability of an alternative market is an added advantage for small producers of cape gooseberry and pineapple. However, in a situation of low prices and stricter safety and quality requisites as in the case of pineapple, the fact that small producers have an alternative market for their product might discourage implementation of safety and quality assurance programmes, as they can target a market that is less lucrative but, at the same time, less exacting.

8.5 Implementation of the intervention proposal – support and roles of public and private institutions

FAO's proposed methodology also suggested the preparation of a plan to implement the recommendations, with an identification of the types of public and private institutional support required. The survey teams in Colombia and Ecuador included this aspect in their case studies. Their findings are discussed below.

A solid public and private institutional structure is needed to overcome the constraints and difficulties that small producers face in applying safety and quality improvement programmes, owing to their technical, administrative and financial capacity. The case studies identify clear institutional roles in the generation of an appropriate policy framework, research, advice and training.

In the case of cape gooseberry, the working group formulated a holistic approach to resolve the key problems that affect the sector as a whole and constitute bottlenecks to improved safety and quality. The proposed interventions include regulatory and non-regulatory actions in the pre-production, production, post-harvest and marketing stages. Prominent normative actions include initiatives to improve the quality of planting material by developing a regulatory protocol for the production of nursery seedlings and reviewing regulations for nursery registration; initiatives that are supplemented by non-regulatory actions such as training of nursery operators. Research and technology transfer actions are also suggested to resolve technological problems relating to the management of water resources, nutrition, methods of seedling support (stakes), phytosanitary management and standardization of the drying procedure. Key production support components include boosting the supply of services to conduct laboratory analysis, farm registration, etc. Also included are training components for technology, hygiene and business management. Responsibilities are assigned for each of these activities, in accordance with respective institutional functions and roles (see Annex 3).

In the case of cape gooseberry, safety and quality actions need to be accompanied by programmes to resolve the critical technological problems that affect the sector, i.e. bolstering linkages among actors – between exporters; between producers; and between producers and exporters. Clearly, close coordination between public and private institutions and market operators/exporters is also needed if the proposed initiatives are to be successful.

In the case of broccoli, the intervention proposal formulated by the working group concerns all 111 producers associated with Huertos GZ, so the intervention plan covers actions needed to achieve safety and quality at community level as detailed in Annex 5. The establishment of strategic partnerships between the community and different institutions is suggested for the necessary actions, taking institutional areas of competence into account. Also advocated are partnerships between the community and purchasing companies. The organizational structure of the community will facilitate the implementation of public and private institutional actions.

The intervention proposal for broccoli clearly embraces a series of activities that represent significant investment not only in economic resources but also in time on the part of producers and support institutions. *If the aim is to motivate producers to apply good practices, there will have to be a careful prioritization of the activities that have been identified and that will need to be implemented in the short, medium or*

long term. Although the cost/benefit analysis of implementation of the practices was conducted over a four-year horizon, many of the activities proposed for the development of technical and administrative capacity of small producers relate to the first year. Therefore and although the proposal includes a series of recommendations that are feasible in terms of cost/benefit ratio, their feasibility will need to be examined within the context of producer and institutional realities. For example, the training plan will have to strike a balance between time available to producers for learning and the need to avoid compromising or disrupting their production activities.

In the case of pineapple, no plan was drawn up to facilitate the implementation of good practices programmes by small producers in the study area. Workshops with producers revealed that most institutional actions have been directed towards training them in topic areas such as correct application of chemical products, calibration of equipment, etc. The fact that the training has been oriented towards requirements for certification has prevented the producer from acquiring a broader awareness of the benefits of the programmes. Nor have actions been taken to identify the potential benefits of the programmes, which would highlight their importance in terms of consumer health, efficient use of production resources, environmental protection and so forth.

In conclusion, the analytical approach to promoting safety and quality improvements in the sector should clearly be holistic in perspective. As illustrated in the case studies, the possibilities of producers meeting market safety and quality standards depend on many factors, including technological factors, structure of the sector, interplay between actors, global and national competition, economic benefits and so forth. Public and private institutional activities in the three sectors studied have focused mainly on: i) strengthening the body of "external resources" in terms of generating an appropriate policy framework, support to research, promotion of coordination between actors, etc. and ii) building the technical and administrative capacity of small producers through training and advisory services. However, if small producers are to capture the benefits of implementing practices to improve safety and quality, they must have the financial capacity to conduct the necessary actions and investments. Therefore, public and private interventions that combine the above components with the generation of incentives, through the enhanced financial capacity of producers, will have a greater chance of being successful. Examples of such incentives are subsidies for selected services (e.g. low prices for soil and water analysis); financial support for the payment of certification, the building of infrastructure and the purchase of equipment; the provision of advice and supervision. These aspects represent the major costs associated with implementation of safety programmes and have a significant impact on total production costs, as the case studies illustrated

9. Conclusions

While many countries are actively engaged in developing competitive advantages to consolidate their participation in the global market for fruits and vegetables, increasingly stringent safety and quality assurance requirements of importing markets signify new challenges in making the production and marketing adjustments needed to meet those requirements.

Although safety requirements emerged a few decades ago, for example in the meat and fishery sectors, they are relatively recent in the case of fresh fruits and vegetables and have led to a series of protocols and standards in primary production that have important consequences for production systems and sectoral structures.

Most institutional efforts focus on developing and strengthening the technical and sometimes managerial capacities of public and private actors to facilitate implementation of safety and quality assurance programmes to meet the standards and protocols of governments and/or purchasers in the markets of destination. Such efforts include the provision of advice, training, support in building laboratory infrastructure, and other actions geared towards overcoming identified technical obstacles. With few exceptions, these strategies are accompanied by actions to capture the impact, in terms of benefits and drawbacks, of the recommendations and proposed changes.

A widely held negative perception of safety and quality programmes, which therefore limits their implementation, is the high costs that they incur in return for limited benefits, because in some cases (e.g. investment to improve hygiene) they do not impact directly on prices or production variables and therefore undermine the competitiveness of the sector, especially in the context of small-scale horticulture.

This negative perception is due to the limited understanding that exists in institutions and among sectoral actors of the costs and benefits that are associated with the implementation of safety and quality improvement programmes. FAO's proposed exercise, developed by institutional teams in each country, represents an effort to correct that perception.

Clearly, the adjustments that are required to improve safety and quality, in compliance with the regulations and standards of markets of destination, call for significant producer investment in economic resources and time, as is described in detail in the case studies. Assuming that the producer has access to the economic resources needed to implement those improvements, in most cases he will also need advice and training to help him strengthen and/or develop the technical and administrative capacity to implement the required practices successfully. Small producers are up against significant technical, administrative, but also financial constraints as they seek to implement the safety and quality improvements required by export markets.

However, as the case studies show, there are varying points of departure in the small producer categories. Different levels of support and intervention are therefore required to transpose current systems towards good practices to achieve safety and quality improvements. This consideration is very important for determining the type of intervention and project that is most appropriate for each transition.

From the perspective of strengthening the economic capacity of actors to make the necessary changes, the case studies show that interventions to facilitate access to resources to conduct investment in infrastructure, payment of laboratory analysis and certification services are fundamental for facilitating the transition process.

At the same time, interventions aimed at strengthening and/or generating technical and administrative capacity of actors, and thus helping them meet market standards and requirements, need to consider the level of public and private action that needs to be committed, and the body of resulting benefits. In the case of broccoli, significant differences exist between producer categories in the capacity needed to adjust production systems to safety and quality objectives. The level of institutional effort will be greater for producers in categories II and III.

Clearly, small producers cannot participate in high-value commodity chains at any price. Initiatives

to facilitate their participation in export activities that have very high safety and quality standards will require a clear assessment of the costs and benefits of implementing the necessary changes within the context of producer possibilities. In the case of broccoli, the level of action needed from institutions and producers, to implement a series of practices identified as necessary to achieve safety and quality objectives, is high and therefore not very feasible in the short term. This gives us two cardinal lessons for institutional support to the sectors: the importance of **prioritizing actions** and the perception of transition as a **gradual process** that considers the capacities and possibilities of actors. Hence the need to define objectives that are feasible in the short, medium or the long term. Although the proposed plan is comprehensive and ideal from the perspective of achieving objectives of safety, quality, environmental protection and worker health, if it is to be feasible, its implementation has to match the economic and technical realities and possibilities of the producers and support institutions.

Benefits from applying programmes to improve safety and quality in primary production relate to the provision of public goods such as protection of consumer health and safeguarding of the environment, in addition to those resulting from the modernization of production systems and efficiencies in use of production resources which translate into higher yields, better quality of fruit for export, reduction in variable costs from efficiencies in crop protection systems, fertilization, etc., as illustrated in the case studies.

Along the same lines as costs, the scale of benefits from applying safety and quality programmes will largely depend on producer point of departure in terms of technology and technical and administrative skills. In the case of small producers using little technology, adjustments in their production systems to achieve safety and quality objectives will be more easily reflected in improved yield and quality of product and therefore income, as illustrated in the case of cape gooseberry and broccoli.

For producers employing technologically more advanced systems, the benefits from applying programmes to improve safety will probably have less direct consequences on yield and quality, but by their very nature, those programmes will produce intangible benefits associated with improved farm management, environmental benefits, greater worker productivity and so forth. Actions to identify and quantify such benefits are clearly needed if actors are to be motivated to apply those programmes.

Given this situation, the challenge for cooperation agencies and public and private bodies at local, national and international level is to generate **appropriate support mechanisms and incentives** that will enable small producers to capture the benefits from adjusting their production systems to achieve the safety and quality objectives required by the market. However, the factors limiting the application of the necessary adjustments are multiple and vary according to sector and type of actor, as illustrated in the case studies. The proposed solutions include a series of disciplines and roles. Perhaps the most important challenge for organizations providing support to individual sectors is to achieve the synergy needed to identify and apply solutions that correspond to the critical problems that have been identified. This can be done by defining the point of departure and determining the gap that needs to be bridged regarding the capacities of institutions and of the sector (producers, exporters, etc.) to effect the necessary changes; changes whose benefits exceed the costs and resources that need to be committed for their implementation.

-Appropriate support mechanisms to overcome the identified bottlenecks

The case studies emphasize **training** as a fundamental strategy to create and strengthen actor capacity to implement safety and quality improvement programmes. However, if they are to be effective, training programmes need to be viewed as an ongoing process and based on local, regional and/or national realities. These realities are obviously different in many regards but similar in others, as is illustrated in the case studies.

There is a risk of overburdening producers with training that is geared towards all the recommendations to achieve safety and quality objectives but that fails to consider the competitive and organizational context of the sectors and the possibilities of the actors. The challenge is to orient training towards

identified needs while not significantly compromising the time that producers have to carry out their production activities.

At the same time, the opportunities for small producers to participate in highly competitive and concentrated commodity chains is determined by their ability to achieve economies of scale that will permit a regular supply of produce with the necessary quantity and quality. Initiatives to strengthen coordination between small producers and to promote interlinkages between small producers and markets[1] provide a point of departure for the more effective delivery of public and private international efforts to support the implementation of safety and quality programmes (including initiatives carried out by purchasers in the form of provision of seeds, technical assistance, etc.).

Also fundamental to any proposed intervention to achieve safety and quality improvements is consideration of the administrative and financial capacity of producers to carry out the intended changes. In the case of cape gooseberry, the transition from traditional production to systems based on good practices does not apparently generate significant additional costs. The technical, administrative and managerial capacity of producers to carry out the required changes in an orderly and gradual manner is undoubtedly a key factor for successful transition. In the case of Huertos GZ, the proposed intervention covers a large number of areas requiring improvement; the prioritization of proposed activities in the light of producer capacity and market requirements is essential to ensure sustainable results.

There is unquestionably a need to promote actor awareness of market requirements and prevailing safety and quality standards. However, training based on recommendations as to what needs to be done to meet those standards restricts producer possibilities. A training approach that is geared towards understanding the factors of risk that are linked to product safety and quality is essential for long-term results. In this regard, the focus or emphasis of training should be broadened to cover not only the recommendations that need to be applied *(what needs to be done)*, but also the determination with producers and exporters of cost-effective methods of implementing those recommendations *(how to do it and how much it will cost)*.

In this connection, the case studies clearly illustrate the implications that the general recommendations in the codes of practice and standards have on the producer decision-making process. For example, the general recommendation to apply integrated pest and disease management to reduce chemical contamination hazards is premised on a thorough scientific understanding of the crop pest and disease cycle, of economic damage thresholds and of levels of damage, which makes it possible to develop effective prevention and control methods. Without such understanding the producers will have to base their decisions on trial and error.

At the same time, if training is to serve as an instrument to develop capacity in the area of safety and quality of primary production, efforts will need to be directed towards strategies that will reduce training costs, given the mobility of labour hired for harvesting and other cultivation activities. The specialized training of rural workers is one possibility. Such initiatives have been carried out in Mexico and Colombia[2], with workers certified in specific skills in accordance with national standards. For example, a trained worker with proven ability and know-how in harvesting a specific crop receives a certificate attesting to that competence. Such a process serves to differentiate the workforce and optimizes the effectiveness of training.

Finally, training programmes that are not accompanied by integrated solutions to the technical, managerial and financial problems of a sector and its producers will undoubtedly have a limited impact.

[1] An example is the law implemented in Rio de Janeiro in 2003 whereby producers and purchasers entering into written contracts have the right to a 10 percent discount on property tax (UNCTAD 2007).

[2] In Mexico, the Association for the Assurance of Vocational Quality and Competence (ACERTAR) is charged with certifying work competence; in Colombia, the National Agricultural Service sets vocational proficiency standards.

Towards a constructive small producer perception of safety and quality programmes

The increased demand for safety and quality assurances for fresh fruit and vegetable imports has raised growing concern over its impact on the competitiveness of exporting countries and the possibilities of small farmer involvement. The debate has focused on the costs and obstacles of increasingly stringent safety and quality requirements with little emphasis placed on analysing the benefits of such initiatives in the public domain, such as consumer protection in the countries of destination or the home country.

The approach adopted in the case study on pineapple clearly illustrates this perspective. The application of safety and quality assurance programmes clearly affects the cost structure, but the analysis would fall short without efforts to capture benefits in terms of improved quality, efficiency of use of production resources and sustainability of production systems. This is where real opportunities lie for generating incentives for export and domestic market producers to implement safety and quality improvements.

The case studies show how difficult it is to understand impacts in terms of costs and benefits. Analysis is compounded by differences in production systems and points of departure. However, analysis of such aspects provides key elements for raising small producer understanding of the implications of implementing the programmes and for defining areas of support and identifying incentives.

There is no doubt that small producers face enormous changes and challenges in applying safety and quality assurance programmes, but this is also the group in which the benefits are most apparent. Given that their point of departure is less advanced, gradual improvements introduced into their production systems will translate more easily into higher quality and yield. The application of practices relating to safety, mainly the prevention of microbiological contamination, through programmes focusing on the cleaning of equipment and tools, field hygiene and the building of infrastructure, have less direct impacts on production variables. Cooperation from purchasing/exporting companies in these areas is essential. Interventions such as the provision of clean transport and packing services by pineapple and broccoli purchasing companies help alleviate some of the constraints in making improvements. Similarly, financial support for temporary storage infrastructure, sanitary services and other aspects are incentives for producers to implement practices that have less direct economic benefits.

There is also a need to anticipate rather than react to change in order to channel the benefits of programme implementation. The best time for companies to envisage change is when everything seems to be functioning well; the case of pineapple is a clear example. High international prices have motivated a large number of producers to enter this sector in recent years, and the producers who have gradually implemented change will be better prepared to deal with the challenge of EurepGap certification in a context of less favourable prices.

Marked differences exist among small producers in terms of ability to apply safety and quality improvement programmes. Institutional efforts could thus have a stronger impact if they focused on identifying and resolving the specific constraints of producer categories, focusing first on boosting the opportunities of those small producers who are in a better position to carry the necessary changes forward.

Generation of incentives in domestic markets

While, pressure to satisfy export market demands has encouraged implementation of safety and quality programmes in the horticultural sector, progress has been much slower for the domestic market which is less demanding in terms of safety and quality.

There are three key actors in the promotion of initiatives for food safety and quality: the consumer, the purchaser (reacting to consumer demand) and the government seeking to protect consumer health and ensure sustainable food production.

In developing countries, progress in safety and quality for consumers has not been sufficient to drive safety requirements; there is no market impetus promoting significant change.

From a standards perspective, interventions to promote such programmes have generally been voluntary. Other non-normative initiatives undertaken by developing country governments, as in the case of cape gooseberry, have focused on defining a global framework for implementation of good practices in production systems, embracing policy actions, reworking institutional roles and providing incentives for implementation through the financing of projects.

Although such initiatives are necessary, their impact will be determined by their ability to generate demand for safe and quality products on domestic markets. Coordination is needed with supermarkets, agroindustry and the institutional market to promote price, contract procurement and other incentives that will motivate producers to implement good practices.

At the same time, consumer awareness and coordination between support institutions and the private sector are needed to promote change in safety and quality for domestic markets.

The institutional impact of safety and quality developments

Increasing demands for safety and quality have spurred significant changes in sectoral structure, almost always leading to greater coordination between suppliers and purchasers. However, coordination and integration are needed not only in the industry. Coordination and integration of actions among support institutions and international cooperation agencies are also fundamental if integrated solutions are to be found with the desired impact. Safety and quality standards, codes of practice and protocols cover many disciplines and constitute a huge challenge for producers, exporters and support institutions as they seek to adjust to the new conditions.

The impact of safety and quality developments extends to local, national and international cooperation and support agencies. The new scenario calls for a reorganization of institutional efforts in the definition, planning and implementation of coordinated activities, within and between organizations, that will integrate roles, capacities and experiences. The aim is to define the strategies and actions that are required to achieve the necessary synergy to provide comprehensive support to commodity chains and countries as they strive to implement safety and quality improvements.

B.

Bibliography

Acuña, G. 2005. La actividad piñera en Costa Rica- Impactos, consecuencias y desafíos. Publicado por la Secretaría Regional Latinoamericana de UITA – Montevideo, Uruguay. Septiembre, 2005. http://www.rel-uita.org/agricultura/actividad-pinera_costa-rica/index.htm

CCI. 2002. Inteligencia de Mercados para Mango Común, Mora, Lulo, Pitahaya y Uchuva. Uchuva. Acuerdo Temporal Corporación Colombia Internacional-Proexport. Bogotá, Colombia.

CCI. 2005. Sistema de Información de Precios del Sector Agropecuario (SIPSA). Corporación Colombia Internacional. Bogotá, Colombia. 2005.

CODEX.2003. Code of Hygienic Practice for Fresh Fruits and Vegetables. http://www.codexalimentarius.net/download/standards/10200/cxp_053e.pdf

CONPES. 2005. Documento CONPES 3375: Política Nacional de Sanidad Agropecuaria e Inocuidad de Alimentos para el Sistema de Medidas Sanitarias y Fitosanitarias Consejo Nacional de Política Económica y Social, República de Colombia. Departamento Nacional de Planeación. 2005. Bogotá, Colombia.

CORPEI. 2006. Perfiles de Producto- Brócoli. Centro de Inteligencia Comercial-CICO. Corporación de Promoción de Exportaciones e Inversiones. CORPEI. Febrero, 2006.

CORPEI. 2003. Perfiles de Producto- Brócoli. Centro de Inteligencia Comercial-CICO. Corporación de Promoción de Exportaciones e Inversiones. CORPEI. 2003.

CORPOICA. 2001. Estudio de Mapificación de frutales de Clima Frío Moderado. Corporación Colombiana de Investigación Agropecuaria,-CORPOICA. Bogotá, Colombia. 2001.

Díaz, L. 2006. Appraisal of sector and farm diversification: asparagus in Peru. Food and Agriculture Organization of the United Nations. FAO. Working Paper, September 2006.

Espinal, C.F.Martínez, H.J.Peña,Y. 2005. La Cadena de los Frutales de Exportación en Colombia. una Mirada Global de su Estructura y Dinámica. 1991-2005 Documento de Trabajo No. 67. Ministerio de Agricultura y Desarrollo Rural. Observatorio de Agro-cadenas. Bogotá, Colombia.

FAO. 2005a. FAO's Strategy for a Safe and Nutritious Food Supply Committee on Agriculture, Nineteenth Session, Rome, 13-16 April 2005. http://www.fao.org/documents/pub_dett.asp?lang=en&pub_id=195694

FAO. 2005b. Informe Final del Proyecto: Mejoramiento de la Calidad e Inocuidad de las Frutas y Hortalizas Frescas a través de la Realización de un Inventario Global de Materiales de Capacitación y de Referencia y del Desarrollo de un Programa de Capacitación en Inocuidad Alimentaria. FAO, 2005. http://www.fao.org/ag/agn/ffvfr_Spanish/index.html

FAO. 2005b. Strengthening agribusiness linkages with small-scale farmers-Case studies in Latin America and the Caribbean. Food and Agriculture Organization of the United Nations, FAO. 2005. Rome.

FAO. 2004. Improving the Quality and Safety of Fresh Fruits and Vegetables: A Practical Approach. Manual for Trainers. Food and Agriculture Organization of the United Nations, FAO. 2004. Rome. http://www.fao.org/ag/agn/food/food_fruits_en.stm

FAO, 2003. A Framework for Good Agricultural Practices. Committee on Seventeenth Session. Food and Agriculture Organization of the United Nations. FAO 31 March - 4 April 2003.

Jaffee, S. (2003). From Challenge to Opportunity: Transforming Kenya's Fresh Vegetable Trade in the Context of Emerging Food Safety and Other Standards in Europe, The World Bank, Washington DC. 2003.

Josling, T. Roberts, D. Orden, David. O. 2004. Food Regulation and Trade: Toward a Safe and Open Global System. Institute for International Economics. Washington, D.C., U.S.A. 2004.

Ministerio de Agricultura y Desarrollo Rural. 2004. Censo Nacional de 10 Frutas Agroindustriales. Ministerio de Agricultura y Desarrollo Rural, en cooperación con el Departamento Administrativo Nacional de Estadísticas (DANE), el Fondo Nacional Hortofrutícola y la Asociación Hortofrutícola de Colombia-Asohofrucol.

Ministerio de Agricultura y Desarrollo Rural. 2004. Plan Nacional para la Implementación de Buenas Prácticas Agrícolas (BPA). Bogotá, Colombia.

Ministerio de Agricultura y Ganadería. 2000. III Censo Nacional Agropecuario. Quito, Ecuador. 2000.

Ministerio de Agricultura y Ganadería. 2005. Censo Regional de Frutas y Raíces Tropicales, Ministerio

de Agricultura y Ganadería (MAG). San José. Costa, Rica. 2005.

PROCOMER. 2005. Estadísticas de Exportación. Promotora del Comercio Exterior de Costa Rica. San José. Costa, Rica. 2005.

PROEXPORT. 2005. Estadísticas de Exportación. Agencia de Promoción de las Exportaciones en Colombia. PROEXPORT. Bogotá, Colombia. 2005.

Quintero, L.E. Salazar, M. Acevedo, X. 2004. Costos de producción de la uchuva y el tomate de árbol en Colombia. Ministerio de Agricultura y Desarrollo Rural. Observatorio de Agrocadenas. Bogotá, Colombia.

Renou, C. 2002. Estructura de la Empresa Comercializadora Huertos GZ: una empresa o un servicio comunitario, Propuesta de Estrategias de Comercialización relativas a su entorno económico. Consorcio IICA – MCCH, 2002. Quito, Ecuador.

UNCTAD. Codes for Good Agricultural Practices: Opportunities and Challenges for Fruit and Vegetable Exports from Latin American Developing Countries. Experiences from Argentina, Brazil and Costa Rica. UNCTAD Consultative Task Force on Environmental Requirements and Market Access for Developing Countries. Draft document, unpublished.

Secretaría Ejecutiva de Planificación Sectorial Agropecuaria (SEPSA). Estadísticas. Costa Rica

Zink, L. 2006. Opportunities for Food CGMP Modernization. Centre for Food Safety and Applied Nutrition-CFSAN. FDA. Published in Food Safety Magazine. Issue August-September 2006.

Links

Vocational competence

-ACERTAR http://www.acertar.com/

-Servicio Nacional de Aprendizaje SENA, Colombia. http://www.sena.edu.co/

B

A.

Annexes

Annex 1. Status of traditional cape gooseberry production in relation to good practices - Granada (Colombia)

Stage of the process	Status	Recommendation
	1. Location of production and growing zone	
	Granada has the advantage of being close to Bogota and to the main airport for the export of cape gooseberry.	Design a simple farm map or plan indicating neighbouring crops and production systems, potential sources of contamination from animals, human faeces and chemical deposits.
	The farmers do not pre-assess the cropping area or associated risks of contamination.	
	There is no examination of plot cropping history.	Identify risks from previous land use and impact.
	The absence of appropriate crop rotation programmes has favoured the survival of pests and diseases, which are restricting cropping possibilities in local lowland areas.	Determine corrective actions to reduce identified risks.
		Implement crop rotation.
	2. Agricultural inputs	
Seeds	Propagation is by planting material that the farmer selects and propagates on-farm or acquires from local nurseries. The sowing materials were not identified. There is no basic seed. There is no quality assurance system for seedlings or documentation of seedbed and nursery treatments. There is no standard selection or disinfection of growth medium or planting material.	There is a need to raise awareness of the importance of purchasing seedlings from ICA-registered nurseries and requesting a guarantee of the phytosanitary quality of material acquired.
Soil	There is no pre-planting assessment of soil contamination hazards. Nor are prior analyses conducted to determine the physical and chemical characterization of the soil or to assess its suitability for the crop or its nutrient requirements. This results in excessive and unnecessary application of fertilizers and soil conditioners.	Conduct soil analysis before deciding to plant.

Water	There is no assessment of the microbiological and chemical quality of the water used for pest and disease control practices and for cleaning machinery, equipment and containers, etc. The source of water for agricultural operations is generally the same as for human consumption.	Examine the provenance of farm water and periodically examine possible risks of contamination. Conduct a microbiological analysis at least once a year (total coliform, faecal coliform and E. Coli counts) for technical support in determining the measures to be applied.
Organic fertilizer	The production of organic fertilizer is not a very common practice. Commercial products are generally bought from local suppliers. There is no record of the type of product applied.	Keep a record of applications, indicating type of product, dosage and source.
Agro-chemicals	No records are kept of the type of product applied or of the problem that needs to be controlled, the frequency, dosages, etc. Farmers have little understanding of the active ingredients or specificity of the chemical products and there are no programmes of maintenance and calibration of application equipment. There is no collection of empty containers or recording of stored products.	Keep a daily register of farm activities and their purpose, including agro-chemical applications, specifying dosages, products, withholding periods, etc.. Organize farmer field days to train in the proper use and handling of agrochemicals and the maintenance and calibration of equipment.
	3. Cultivation practices	
Preparation of the soil	The soil is prepared only where each plant will be located with minimum tillage.	
Sowing	In most cases the farmers do not respect the recommended planting distances. Cape gooseberry is sown with companion crops, such as sweet potato, pea or maize during the first 3 to 4 months of crop establishment.	Adopt appropriate distances and planting systems to reduce the incidence of disease. Association with other crops is not recommended because of possible contamination of the fruit from applications of chemical products for the phytosanitary control of companion crops.
Staking	The farmer receives little technical support in deciding the most appropriate form of plant support in accordance with environmental conditions and topography of the holding. There is also relatively infrequent stake maintenance, shape pruning and bunch care.	Use staking appropriate to the conditions of the holding. Seek the advice of a technician to ensure aeration and luminosity and to facilitate harvesting, maintenance and phytosanitary pruning and application of pesticides.
Pruning	This is done by hand and sometimes with a pruning knife. Tools are generally not disinfected between plants. The cuttings are removed from the plot and burnt.	Disinfect pruning tools before moving on to the next plant. Implement a programme of pruned branch management, especially for sanitary pruning.

Fertilization programme	Fertilization is generally without prior analysis of the soil and therefore without evaluation of nutrient needs. The farmer follows traditional practice. No records are kept of fertilizer application (type, quantities, method, operator). Organic fertilizers in the form of chicken and pig droppings are used.	Conduct soil analysis to devise a fertilization programme that corresponds to crop needs, designed with technical assistance. Use ICA-registered products and keep records of applications.
Control of weeds	Weeds are generally removed manually in areas close to the plants, otherwise with handtools along pathways. Herbicides are used during presowing when necessary.	Keep records of any herbicide applications.
Control of pests and diseases	Several products are used with little or no information on their active ingredients, specificities or restrictions in markets of destination. There is limited product rotation and high dosages are applied. Applications are done as routine prevention without assessing the damage thresholds or understanding the pests and diseases involved. Handspraying equipment is used but serviced infrequently. There is no integrated pest management.	Implement integrated pest management to pesticide use. Employ ICA-registered products under the Recommendation of a technician, with the dosages and methods indicated on the labelling, which also states the specificity of the active ingredient. Records of applications should be kept and withholding periods observed, as should restrictions in terminal markets.
Harvesting	This is done manually without clippers with a high level of female labour. Recipients of different sizes and provenance are used. The workers do not use gloves and the fruit is transferred to holding baskets placed directly on the ground without protection. No harvest records are generally kept. There is no periodic cleaning of harvesting and storage recipients. The state of health of the workers is not noted. Sanitary infrastructure is relatively basic so hygienic practices are not adequate. There is no post-harvest activity (sorting, grading or washing).	Design and implement a programme of cleaning and disinfection of holding baskets, harvest recipients and clippers. An on-farm fruit storage area needs to be organized, sheltered from sunlight and possible contamination. The holding baskets should bear the farm name and lot number for purposes of traceability. Hygienic practices should be improved through training and infrastructure. Harvest and hygiene records should be kept.
Transport to the collection centre	The distances are short. There is no regular cleaning of vehicles and tarpaulin or other protection against contamination is rarely used.	Clean the transport vehicles before loading the fruit and cover the holding baskets with plastic, canvas, etc.

4. Equipment, tools and implements

There is no regular cleaning, maintenance or calibration of the equipment and tools used for phytosanitary control, harvesting or pruning.	A programme of maintenance, calibration and cleaning of equipment, tools and implemnts should be designed in accordance with respective requirements.

5. Associated facilities

Farms do not generally have facilities to hold the fruit which is left in the open (in the shade) for a few hours. The condition of sanitary facilities varies, with only one toilet for the family and workers.	There should be an appropriate area to hold the fruit on the farm, sheltered from sunlight and possible contamination to ensure safety for consumption. The toilet should have proper lighting, marked surfaces that are easy to clean and the necessary sanitary components. It should not contaminate the soil or water sources, for example through leakage.

6. Staff hygiene

There are no programmes to check the state of health of farm workers, their behaviour or personal hygiene.	Set up health teams and use protection to avoid contamination.
The workers do not receive periodic instructions or training on hygienic fruit handling.	Provide regular training in hygienic practices and careful handling of produce in the field.

7. Health, safety and welfare of the workforce

There is no risk assessment or plan of action to safeguard health and promote safety in the work place. No staff are trained in first aid and there are not sufficient notices warning workers of hazards. They are not given appropriate protective clothing to minimize the risk of intoxication from pesticides, nor do they use protective goggles, masks or gloves.	Train one worker in first aid and set up a team to communicate and indicate critical points in the production process. Invest in protective equipment for the workers.

8. Management of waste

Waste and potential sources of crop contamination are not identified. There is no management plan to reduce them.	Evaluate and identify waste and its source to implement management and reduction plans.

9. Traceability and records

There is no documented traceability system to track a product, its management or its final purchaser. There are no records of production practices, inputs, dosages, pests or worker responsible.	Design and implement a traceability system with the identification of the holding and a daily register of cropping activities carried out to packing house specifications.

Annex 2. Status of post-harvest cape gooseberry processing in relation to good practices. Granada, Colombia

Stage of the process	Status	Recommendation
	1. Facilities	
	The facilities are generally adapted storage areas and therefore not sufficiently large for proper continuous flow of produce. The fruit reception areas are generally small for the volumes delivered and are sometimes in the open. The lighting is inappropriate and there is no adequate protection against pests, e.g. wire netting. The plant does not have sufficient or clear signs. Most packing plants have appropriate sanitary facilities that are well positioned and equipped with liquid soap.	The plant needs to be reorganized for continuous flow of produce, with separated well lit areas and protection against pests. Adjustments should be in accordance with Decree 3075.
	2. Inputs	
Water for washing	The fruit is not washed or disinfected so there is no direct contact with water. Possible risks of contamination appear to be from water used to clean the facilities and water by workers to clean their hands and for other personal nl needs. However, the water is clean as most of the plants are located in Bogota.	The plant located in Granada should check the quality of water used by staff and for cleaning operations. The municipal water supplier should provide a document certifying the quality and provenance of the water.
	3. Processing	
Reception and weighing	The baskets are weighed and the batch coded. The name of supplier and quantity of produce is recorded but very often the registered information is insufficient for product traceability. There is no verification of cleanliness of field containers or delivery vehicles.	The market operator should require suppliers to proved field records of traceability from primary production, in addition to records of cleaning of holding baskets and delivery vehicles.
Sorting and grading	Sorting and grading is done manually by female workers trained to grade the fruit according to stage of maturity, size, physical damage, state of calyx, etc. and with some training in hygienic practices. The tables and floors are periodically cleaned but there is no documentation for this. There is no special area for discarded fruit.	Programmes of hygiene should be implented for fruit handlers and for the cleaning and disinfection of facilities and baskets. Individuals should be designated to oversee and check implementation.

Drying	Systems of fruit drying vary and conditions are not standardized in terms of temperature, relative humidity and duration. There are no registers for the cleaning of facilities or equipment.	Drying temperature, duration and relative humidity should be checked and registered and as far as possible standardized. There should also be programmes for the cleaning of facilities and implements used.
Packing	Packing plants generally have sufficient baskets and cartons for the appropriate dispatch of fruit for export. Fruit for the domestic market is generally returned to the holding baskets without proper cleaning.	A register should be kept of suppliers of packing materials and a periodic verification made of their storage conditions and thus hygiene. Baskets for the domestic market should be included in washing programmes.
4. Cleaning and disinfection		
	There is no documentation on the cleaning of facilities (walls, work tables and storage rooms), equipment, tools and implements in the plant and on the control of surrounding areas. The flooring is rough so difficult to clean.	All possible sources of contamination in the packing plant and its surrounding area should be identified. These should be documented as the basis for a programme of cleaning and disinfection of facilities, equipment, implements and tools. There should also be a waste management programme.
5. Hygiene and health of workers		
	All workers have overalls and protective gear: hat, gloves, boots, jackets, etc. They are not allowed to wear rings, earrings, nail varnish or make-up. There are no records of staff sickness and the plants display no hygiene signs.	There needs to be tighter control of personal hygiene. Workers should have a medical examination before recruitment, with periodic check-ups.
6. Training		
	The workers have a food handling permit. The packing house holds talks to provide further information and periodic training on themes of interest to the company.	A staff training programme on general principles of product hygiene and recommended practices should be implemented.
7. Documentation and registers		
	The packing houses generally have an appropriate system of identification but do not maintain registers for traceability.	Implement a traceability programme.
8. Withdrawal of products and monitoring		
	Rejected fruit is generally returned to the producer. The holding areas for rejected fruit are often not isolated because of space constraints.	Document complaints received and corrective actions taken when non-conformities occur.

Annex 3. Plan of action to improve safety and quality in cape gooseberry production in Colombia

Pre-production

Area	Sub-Area	Activity	Time			Responsibility	Co-executors
			s	m	l		
Institutional coordination		Consolidate institutional work on National Plan for GAPs to develop support strategies for cape gooseberry production	x			Ministry of Agriculture and public and private bodies linked to the Inter-institutional Committee on GAPs	Producers and market operators
Company and sector organization		Agreements between producers and market operators	x			Producers and market operators	Ministry of Agriculture, INCODER, SENA
		Formation and strengthening of producer and market operator associations through Provincial Centre programmes		x		Provincial Centres, ALALDEX, SENA, SAC	Ministry of Agriculture, Secretariat of Agriculture
		Strengthening of the agricultural production chain	x			Ministry of Agriculture, producers and market operators	ASOHOFRUCOL, ANALDEX
		Development of projects with production interlinkages	x			SENA, Ministry of Agriculture	Fondo Hortofrutícola, ICA, CORPOICA, Universities
Training and skills development	Selection of cropping sites	Announcement of areas suitable for production	x			SENA, CORPOICA	Secretariat of Agriculture, Provincial Centres
Research and transfer	Genetic resources	Genetic identification		x		CORPOICA, Universities, ICTA	SENA, ASOHOFRUCOL
		Assessment of planting materials		x			
Support to production		Genetic enhancement			x		
		Establishment of foundation seed gardens, production of basic and registered commercial seed		x		CORPOICA, Universities, individuals	Secretariat of Agriculture, Provincial Centres, producers

Area	Sub-Area	Activity	Time			Responsibility	Co-executors
			s	m	l		
Research and transfer	Nursery	Development of protocol on clean production of seedlings	x			CORPOICA	ICA, SENA, ASOHOFRUCOL
Regulations		Implementation rules for the protocol on clean production of seedlings	x			ICA	CORPOICA, producers, nursery operators
		Review of nursery registration regulation and its application	x			ICA	Producers, nursery operators
		Regulation on production of technical information sheets		x		ICA	
Support to production		Establishment of legally registered companies for the production of high-quality commercial planting material		x		Provincial centres, chambers of commerce	SENA, INCODER, Secretariat of Agriculture
Dissemination and promotion		Dissemination and application of the regulation	x			ICA	SENA
Training and skills development		Training in seed nursery skills	x			SENA	CORPOICA, ICA, entrepreneurs

PRODUCTION

Research and transfer	Water resources	Water requirements		x		CAR, CORPOICA Universities	
		Systems of water capture and delivery, irrigation and water quality	x				
		Management and conservation of natural, especially water, resources	x				
Support to production	Selection and registration of sowing plots	Review farm land register regulation	x			ICA	Producers, Market operators
		Improvement of laboratory services for the physical, chemical and microbiological analysis of water, soil and pesticide residues		x		MINAGRICULTURA, ICA, CORPOICA, Universities	CAR, Secretariat of Health
Training	Soil management	Minimum tillage	x			CORPOICA	SENA

Area	Sub-Area	Activity	Time			Responsibility	Co-executors
			s	m	l		
Research and transfer	Nutrients	Nutrient requirements	x			CORPOICA, Universities	SENA, ASOHOFRUCOL
		Fertilization plans	x				
Training and skills development		Production and management of organic fertilizers	x				
		Management of organic fertilizers and fertilization plans	x			CORPOICA, SENA	
Research and transfer	Stakes	Alternative materials			x	CAR	Secretariat of Agriculture
		Reforestation plans			x		

Area	Sub-Area	Activity	Time			Responsibility	Co-executors
			s	m	l		
Support to production	Phytosanitary management	Creation of service companies (overhead irrigation, pruning, washing of containers, staking)	x			Provincial Centres, Chambers of Commerce	SENA, INCODER, Secretariat of Agriculture
		Application of traceability systems	x			ICA, CCI	ICONTEC
Research		Identification of insect pest species and diseases	x			Universities, CIAT, CORPOICA	ICA, SENA, ASOHOFRUCOL
		Biological studies		x			
		Determination of action thresholds		x			
		Development of IPM components (biological, physical, ethological, cultural, chemical, genetic, legal)		x			
		IPM strategy		x			
Regulations		Standard for the land-based application of pesticides		x		ICA	ANDI
		Surveillance of agro-chemical management service providers		x		ICA, Secretariat of Health and CAR	
		Review current regulation on the management of agrochemicals in primary food production and extend its scope (companies and individual producers) and oversight.		x		ICA, INVIMA, Ministry of Public Health	Ministry of Agriculture

Area	Sub-Area	Activity	Time			Responsibility	Co-executors
			s	m	l		
Training and skills development	Phytosanitary management	Maintenance and calibration of application equipment Safe pesticide management Use of protection equipment	x			SENA, ANDI	ICA, CORPOICA
		Integrated crop management	x			SENA, ICA, CORPOICA, Universities	PROVINCIAL CENTRES
		Hygiene standards, medical background and protection equipment	x			Secretariat of Health and CAR	
POST-HARVEST							
Research and transfer	Quality	Validate the index of maturity adjusted to region and terminal market		x		CORPOICA, Universities	SENA, ASOHOFRUCOL
	Drying	Drying management and alternatives		x			
Training and skills development	Transport	Hygiene of transport and holding baskets	x			SENA, Market Operators, ASOHOFRUCOL	Secretariat of Agriculture
	Quality	Training in collection criteria according to post-harvest management and markets	x				
		Post-harvest management; importance, hygiene, post-harvest pest management, management of secondary packing	x				
		Waste management in marketing operations	x			Secretariat of Health and CAR	
Marketing							

A

Area	Sub-Area	Activity	Time			Responsibility	Co-executors
			s	m	l		
Support to production		Marketing agreements	x			Producers, Market operators, ANALDEX	
		Formulation of programmes that concentrate on product health benefits as strategy to open new markets		x		CCI, ANALDEX	SENA
Regulations		Certification requirements		x		INVIMA, ICA, CCI	Superintendence of Industry and Trade, National Committee on GAPs
		Regulation and surveillance of certifying bodies		x		Ministry of Agriculture	
Markets and distinctiveness		Creation of Colombia Seal		x		Ministry of Agriculture	

Annex 4. Status of broccoli production in relation to good practices

Stage of the process	Status
	1. Location of production and growing zone
	General problems of hygiene of broccoli plots.
	2. Agricultural inputs
Seeds	The seedlings planted are from non-transgenic hybrid seeds grown in nurseries. Huertas GZ distributes seedlings to members intending to grow broccoli. Guaranteed seedlings (disinfection and fumigation) are normally provided by the IQF corporation. 95% of Huertas GZ producers obtain their seedlings directly from the company, only 5% from Pilvicsa or through other minor suppliers.
Soil	There is no pre-sowing evaluation of the soil for contamination hazards. There is no prior examination of the physical or chemical profile of the soil; there is therefore no evaluation of the suitability of the soil for the crop nor of its nutrient requirements. This results in excessive applications of unnecessary fertilizer and soil conditioners. The cropping rotation is broccoli (3 months) – beet (4 months) – pea (4 months) – broccoli (3 months). Producers carry out a maximum of two broccoli cycles then rotate with two other species, before returning to broccoli. Rotation can include lettuce, parsley, cauliflower, bean, carrot, camomile, ryegrass and vetch, among the main crops.
Water	The water channels to plots and vegetable storage and washing facilities are subject to high contamination from the presence of waste, empty pesticide containers, sale of food near water points, presence of animals and so forth. Irrigation is by flooding and is generally weekly. It usually takes one hour per holding. Water for human consumption is treated. Other activities use irrigation water.
Organic fertilizers	Few individuals allow their animals to graze on broccoli stubble after the growing cycle. Most plough the plant residue into the soil. Biosolids such as chicken droppings from the coast and cattle manure from the moorlands are used, but without certificates of quality and purity.
Agrochemicals	Agrochemicals indicated and allowed for broccoli are used to some degree. All the agrochemicals used in the study area come from local outlets or the town of Riobamba. In most cases, the growers apply the products sold to them without questioning the store assistant's experience in growing broccoli. All agrochemicals are applied manually.
	3. Preparation of the soil
Preparation of the soil	Ploughing is mechanized, using hired machinery belonging to the community.
Sowing	The farmers respect the sowing distances recommended by the company buying their produce. The labour for this and other activities is from family, neighbours and friends under a 'lending hand' system.
Irrigation	The first irrigation after transplanting is crucial. As the water is distributed in turns, producers have to coincide their turn with the day of transplanting, given that a plant can remain up to 5 days in its pot after removal from the nursery, despite possible sanitary and phytosanitary problems. Irrigation is by flooding and is generally weekly. It requires approximately one hour of work per holding.
Fertilization programme	All broccoli producers use chemical fertilization. Received information indicates that half the farmers do not analyse their soil before fertilization, but field observations suggest that the percentage is much higher. The reason could be that many farmers consider "analysis before fertilization" to simply mean asking the input supplier what their plot requires, without the supplier actually analysing their field.

Control of weeds	There is weeding and ridging. Weeding means surface raking while ridging removes weeds but also packs soil around plants for added support.
Control of pests and diseases	Very few farmers use appropriate protection equipment. Most only use some form of protection (masks, boots, etc.) or simply no protection at all. The Huertas GZ producers use protective equipment when they remember to or when someone is observing them. They do not usually use it as they consider it hampers their work. There is little distinction between producer categories in this regard. There is no IPM, with pesticides applied at the first hint of pest or disease. A reported 87.5% of producers monitor pests and diseases, but their action is insufficient and fails to quantify the damage.
Harvesting	Harvesting begins after 12 weeks on average (84 days, give or take 4 days), depending on climatic conditions, especially temperature. Producers generally start very early to avoid sun damage to their produce (mainly from dehydration). They use kitchen knives and, on the basis of an 8 hour day, can harvest approximately 750 kg. Caps are used to avoid contamination from hair, but no precaution is taken regarding hands (washing and disinfection). Plastic crates are used for field harvesting and for bulk loading of pick-ups parked beside plots. As a minimum of plastic crates are used, these do not come into direct contact with the soil. Hygiene of plastic crates – these are washed communally at the end of the week with running water only. About 5 percent of the harvest is sold to intermediaries marketing in Guayaquil. The broccoli is placed in sacks, each containing some 30 heads and transported by mule. On 4 November 2005 the farmgate price was US$ 3/sack, transport to Guayaquil cost US$ 0.60/sack, the price in Guayaquil was US$ 5/sack and stowage was US$ 0.08/sack.
Temporary storage	The storage centre operates on harvest days (Sunday to Friday) and is where the Huertas GZ produce is delivered. It is weighed and inspected for quality before dispatch to Machachi, with a close look at compaction of head, flowering, presence of pests, chemical contaminants, etc. If it cannot be transported the same day, it is left until the next day in the shade and with constant watering. There are sanitary facilities close to the storage centre and a clean water point.
Transport to purchasing company	The distances are short. There is no regular cleaning of vehicles. The product is taken in bulk from field to storage centre by pick-up under jute or other cover (guangochas). The produce is placed in bins or crates for weighing and a sample is taken for quality control by IQF personnel.

4. Equipment, implements and tools

There is regular cleaning, maintenance or calibration of the equipment and tools used for phytosanitary control or harvesting.

5. Related facilities

With regard to storage of agrochemicals, producers purchase quantities for immediate use and any excess inputs are kept in parts of the home reserved for tools and fertilizers, a small storage area that generally fails to meet minimum safety characteristics. There are no facilities on the holdings or on the access roads apart from the occasional hut in isolated fields. These huts serve mainly to provide shelter from the cold to workers irrigating fields at night or in the early morning. There are no sanitary facilities in the Huertas GZ fields. Personal needs are best attended to in secluded spots or gully areas.

6. Staff hygiene

The cooperative members do not observe appropriate health standards. They do not protect themselves from chemical products; they contaminate water sources; they do not wash their hands after field work; and the lack of sanitary facilities in the fields makes it difficult to maintain basic hygiene.

7. Health, safety and welfare of workforce

There is no risk assessment or plan of action to promote health and safety at work. No staff are trained in first aid and there are not enough hazard warning signs. Farm workers do not have the clothing to minimize the risk of intoxication from pesticides, nor protective goggles, masks, gloves, etc.

8. Management of waste

There is no identification of waste or sources of crop contamination or management plan to reduce the level. Persons more aware add their plastic waste and containers to their domestic refuse (34%), others burn (28%) throw them in gullies, streams or rivers (31%) without the risk of sanction. There is no integrated waste management.

9. Traceability of records

The harvest delivered to the collection centre has a record of pesticides applied to each plot with: name of owner, number of plants, variety, date of transplant, dates of application, name of products, percentage dissolution in water, name of operative, signatures of persons responsible, beginning and end of harvesting. This information goes to the IQF for its internal administration and is essential for subsequent traceability needs.

Although a register exists, farmers do not always fill it in properly, even when this is a company requisite. One reason is the low level of education in the area. Except for the pesticide register, it is unusual to maintain any other register or documentation such as field logbook with details of expenses, inputs, labour. Invoices for chemical products are only kept for the time needed to recall the name of the product should it prove effective.

Annex 5. Status of post-harvest broccoli processing in relation to good practices

Stage of the process	Status
	1. Facilities
	The installations of all plants were designed to facilitate cleaning and disinfection and all buildings have protection barriers against parasites, animals and insects. However, 25% of plants have floors, walls or ceilings that are not in good condition and therefore more difficult to clean. All processing plants have sloped flooring to avoid the accumulation of water in packing and storage areas, which are kept separate. Only authorized personnel handle chemical agents, running constant sanitary and maintenance procedures and systems of pest control and monitoring. The workers are trained to report any equipment failure to the person responsible in the plant. Despite this, only 75% of plants keep their windows closed and covered with wire netting, cover their lighting, have drainage systems that prevent the accumulation of water in packing and storage areas, keep their chemical agents properly packaged and labelled and separate from packaging materials and food products, run comprehensive cleaning and maintenance programmes, and have a person responsible for each piece of equipment. All plants have a specific, secured and fenced area for the temporary storage of residues and waste, located beyond the company's production area. These materials are collected on a regular basis. Despite this, only 75% of such areas have been designed to facilitate cleaning and avoid build-up of waste and bad smells. Only 50% keep their waste and residue containers closed to avoid bad smells.
	2. Inputs
Water for washing	The broccoli is not washed or disinfected so does not come into direct contact with water. Possible risks of contamination appear to be from water used for cleaning facilities and personal hygiene. However, as most plants are located in Bogota, the water used is safe.
	3. Process
Delivery and weighing	Only one plant reports broccoli delivery in refrigerated vehicles. This may be true for certain types of producer, but not for all and especially not for small producers. For the other plants, the produce normally arrives in trucks that are fully laden and only covered with canvas or sheeting to prevent dehydration from the sun and contamination. All processing plants have rapid and effective reception systems that are operated by trained personnel. Upon delivery, the broccoli is immediately placed in an appropriate clean location for quality control. Accepted produce is then held in cold chambers that are relatively small because the holding period before processing is short.

Cleaning and washing	Only 50% of plants report initial cleaning of produce surface. This is mainly done in the field ensuring that good agricultural practices are applied during the harvesting phase to remove surface dirt from the raw material. The initial cleaning usually means dipping the raw material in water that is almost always safe. Only one company uses raw water, but this is treated and boron is also applied. Only one plant uses hot water; 75% use cold water. For washing the raw material, 75% of plants use conveyor belts with sprinklers and only 25% have fitted revolving washing mechanisms. With regard to washing with disinfectants, 75% of plants have processes to check the removal of surface dirt with the disinfectant in direct contact with microorganisms and to control water temperature in order to prevent the back suction of contaminants towards the produce. The chemical agent used as disinfectant in all processing plants is chlorine.
Storage	All plants have packing material storerooms that are dry, clean and without waste or animals. However one of them has drips from the ceiling. All packing materials are kept separate from chemical agents or dangerous materials and are not in direct contact with the ground. All plants have storage areas in which produce is not in contact with the ground (however only 75% of plants observe the recommended spacing of 45 cm from walls and 10 cm above the ground). The storage areas are separated from areas with chemical products and waste. They are kept clean and operate by inventory rotation to minimize holding times. All storage chambers have precise temperature and relative humidity controls and gauges to eliminate microbes but only 75% of plants regularly clean the walls, floors and ceilings.
Transport to port	The containers used for transportation are made from non-toxic materials that are easy to clean and disinfect. The companies report that deteriorated containers are not discarded immediately, but pest control processes are always applied when inspecting containers. A reported 66.7% of companies clean their containers after each use; the same percentage cleans containers that have been in direct contact with earth, mud or animal dung when used for packing or reception. The containers are labelled before and after washing to prevent contamination. There is virtually full adherence to broccoli transportation standards. Detailed registers are kept of previous loads, which is why containers that have carried fish, raw meat or eggs are never used. Containers are always disinfected and thoroughly inspected before loading. This requirement serves to ensure that they are free of dirt, odour and bits of food and that they are completely dry, without condensation. Companies report that 75% of containers are hermetically sealed against pests and contamination. All containers used for transportation have refrigeration units that are in good condition and fitted with instruments to check their functioning. The refrigeration units are constantly inspected, with regular servicing avoid malfunction. The usual practice is to turn the refrigeration unit on before loading so that an appropriate temperature is reached. The containers are loaded in such a way that air circulates around the produce. The whole transport system has refrigeration in good condition and unit temperature gauges that are properly calibrated and tamperproof.

4. Cleaning and disinfection

Cleaning is for all equipment, containers and implements by means of sponge, brush, scourer, etc. and a combination of physical and chemical methods. Equipment is also disinfected with chlorine, chlorination agents and quaternary ammonium compounds. Only one plant uses raw water for preparing solutions, but this is treated. All plants emphasize security in handling alkaline and acid substances, with the workers seen to use protective equipment when handling these substances. They carefully follow the handling instructions for each product and the products used comply with respective national regulations. All disinfectants are stored in special areas at a distance from fresh produce and packing materials.

5. Hygiene and health of workforce

75% of processing plants have trained their workforce in proper handling of products which is why 75% report that their workforce understands the importance of food safety.

With regard to worker practices on company premises, only 75% cover their head or beard and only wear uniforms within company facilities. No one is allowed to wear jewellery or articles that might contaminate the produce (all plants require gloves if a worker has hand wounds). All workers keep their uniforms clean and only eat in designated areas.

Only 75% of plants have signs in sanitary facilities reminding staff of cleanliness and hygiene standards. However, all these facilities are clean and regularly disinfected.

6. Training

75% of processing plants have trained their workforce in the proper handling of products which is why 75% report that their workforce understands the importance of food safety.

7. Documentation and registers

The packing plants generally have an adequate system of identification, but not the registers needed for traceability.

Annex 6. Breakdown of estimated costs of the intervention proposal. Gatazo Zambrano Community

Priority actions

Recommended actions

Total cost per component

Detail	Section	Activities	Articles	Unit	Qty..	Unit Cost	Total Cost	Cost Year 0	Cost Year 1	Cost Year 2	Cost Year 3
Location of production and growing zone	Management of Community Waste	Signposting of deposits	Stencils for signs	set	1	20,00	20,00	20,00			
			Spray paint	unit	5	1,90	9,50	9,50	10,45	11,50	12,64
		Construction of waste deposits		unit	4	88,86	355,44	355,44			
			Eternit panels	unit	2	11,09	22,18				
			Struts	unit	9	0,80	7,20				
			Accessories (joints, bolts, screws)	unit	1	20,00	20,00				
			Chains	metres	2	1,24	2,48				
			Padlock	unit	1	9,00	9,00				
			55 gallon tanks	unit	3	6,00	18,00				
			Labour	day	2	5,00	10,00				
		General cleaning of GZ Community		time/ year	2	693,75	1.387,50	1.387,50			
			Food	lunch	111	1,25	138,75				
			Labour	day	111	5,00	555,00				
		Maintenance of deposits							35,54	39,10	43,01
Total Location of the zone							1.772,44	1.772,44	45,99	50,59	55,65
Cultivation	Control of pests, diseases and weeds	Programmes of exchange and training on agroecological farms	Strategic partnerships				0,00	0,00			
		Programme of reforestation of 5 ha of hillside each year			1	7.991,00	7.991,00	7.991,00	8.790,10	9.669,11	10.636,02
			Plants of native species	unit	4082	1,50	6.123,00				
			Labour	day	28	5,00	140,00				
			Supervision	hour/ year	288	6,00	1.728,00				
Total Cultivation							7.991,00	7.991,00	8.790,10	9.669,11	10.636,02
Equipment, implements and tools											
Total Equipment, implements and tools							0,00	0,00	0,00	0,00	0,00

A

Detail	Section	Activities	Articles	Unit	Qty..	Unit Cost	Total Cost	Cost Year 0	Cost Year 1	Cost Year 2	Cost Year 3
Related facilities	Associated production facilities	Cleaning and disinfection of collection centre	Labour	hour/ year	192	6,00	1.152,00	1.152,00	1.267,20	1.393,92	1.533,31
		Sign painting			1	60,00	60,00	60,00			
			Signs with rules of behaviour	unit	2	15,00	30,00				
			Signs with sanitary standards	unit	2	15,00	30,00				
		Control of visitor entry			1	240,00	240,00	240,00	264,00	290,40	319,44
		Protective equipment for visitors	Caps	unit	100	1,20	120,00				
			Masks	unit	100	0,30	30,00				
			Aprons	unit	10	5,00	50,00				
			Boots	pair	10	4,00	40,00				
		Inventory of tools and equipment	Designated worker	hour/ year	72	6,00	432,00	432,00	475,20	522,72	574,99
		Cleaning and disinfection of sanitary facilities in collection centre	Labour	hour/ year	96	6,00	576,00	576,00	633,60	696,96	766,66
		Cleaning and disinfection of the produce washing area	Labour	hour/ year	72	6,00	432,00	432,00	475,20	522,72	574,99
		Building of latrines in the Community			10	110,00	1.100,00	1.100,00			
			Labour, materials	unit	1	110,00	110,00				
			Articles for latrines		1	3.857,70	3.857,70	3.857,70	4.243,47	4.667,82	5.134,60
			lime/sawdust	sack (45Kg)	480	2,00	960,00				
			Toilet paper	dozen	100	5,75	575,00				
			55 gallon tanks	unit	20	6,00	120,00				
			Soap dispensers (without water)	unit	10	4,27	42,70				
			Soap (with water)	gallon	240	9,00	2.160,00				
		Maintenance of facilities and latrines							110,00	121,00	133,10
Total Facilities							7.849,70	7.849,70	7.468,67	8.215,54	9.037,09
Agricultural inputs	Soil	Soil analysis		analysis/ year	111	8,00	888,00	888,00	976,80	1.074,48	1.181,93
		Use of organic fertilizers			1	9.999,99	9.999,99	9.999,99	10.999,99	12.099,99	13.309,99
			Organic fertilizer (Ecoabonaza)	tonne	2222,2	4,50	9.999,99				
	Water	Water analysis		analysis/ year	2	50,40	100,80	100,80	110,88	121,97	134,16
		Cleaning of water sources		time/ year	2	693,75	1.387,50	1.387,50			
			Food	lunch	111	1,25	138,75				
			Labour	day	111	5,00	555,00				

Detail	Section	Activities	Articles	Unit	Qty..	Unit Cost	Total Cost	Cost Year 0	Cost Year 1	Cost Year 2	Cost Year 3
	Natural Fertilizers	Construction of manure composting system			1	911,35	911,35	911,35	1.002,49	1.102,73	1.213,01
			Plot of 100 m2 labour	transfer	1	47,35	47,35				
			Labour	hour/ year	144	6,00	864,00				
	Agro-chemicals	Building of shelving		unit	111	33,50	3.718,50	3.718,50			
			Wood slats	unit	11	1,60	17,60				
			2"screws	unit	30	0,08	2,40				
			Planed boards	unit	4	2,00	8,00				
			1,5" nails	pound	1	0,50	0,50				
			Labour	day	1	5,00	5,00				
		Maintenance of shelving							371,85	409,04	449,94
		Protection			111	43,80	4.861,80	4.861,80	5.347,98	5.882,78	6.471,06
			Overalls (waterproof top and trousers)	unit	1	20,00	20,00				
			Head cover	unit	1	1,20	1,20				
			Mask	unit	12	0,30	3,60				
			Eye protectors	unit	1	3,00	3,00				
			Gloves	unit	12	1,00	12,00				
			Boots	pair	1	4,00	4,00				
		Outfitting of small meteoro-logical station	Temperature gauges	unit	1	22,40	22,40	22,40			
			Relative humid-ity gauges	unit	1	16,80	16,80	16,80			
		Maintenance of station equipment							3,92	4,31	4,74
Total Agricultural inputs							21.907,14	21.907,14	18.813,90	20.695,29	22.764,82
Staff hygiene	Hygiene and Health	General health check-ups and blood test	Health Centre	freq./ year	111	10,00	1.110,00	1.110,00	1.221,00	1.343,10	1.477,41
		Establishment of first aid facilities		unit	111	26,60	2.952,60	2.952,60	3.247,86	3.572,65	3.929,91
			Alcohol antiseptic (1/2 litre)	unit	1	1,40	1,40				
			Disinfectant (30cc)	unit	1	0,40	0,40				
			Gauze (1 yard)	unit	1	0,50	0,50				
			Bandages (box of 100)	unit	1	1,20	1,20				
			Adhesive tape (5 yards)	unit	1	5,86	5,86				
			Tablet for headache (20 units)	unit	1	5,34	5,34				
			Tables for stomach ache (20 units)	unit	1	4,00	4,00				
			Pain killers (box 20 units)	unit	1	6,90	6,90				
			Scissors	unit	1	1,00	1,00				
		Construction of field canteens	Labour materials	unit	10	60,00	600,00	600,00			
			Drinking water dispensers		10	475,00	4.750,00	4.750,00			
			Water tank plus base	unit	1	25,00	25,00				
			Water bottle	unit	200	2,25	450,00				
		Maintenance of canteen facilities							60,00	66,00	72,60

Detail	Section	Activities	Articles	Unit	Qty..	Unit Cost	Total Cost	Cost Year 0	Cost Year 1	Cost Year 2	Cost Year 3
Staff hygiene total							9.412,60	9.412,60	4.528,86	4.981,75	5.479,92
Training	Layout of production and growing zone	Training: Consequences of contamination	Instructor	hour	2	8,33	16,66	16,66			
		Training: Recycling	Instructor	hour	2	8,33	16,66	16,66			
	Agricultural inputs	Training: Soil analysis, interpretation and use	Instructor	hour	10	8,33	83,30	83,30			
		Training: Sowing plans and importance of crop rotation	Instructor	hour	10	8,33	83,30	83,30			
		Training: How and when to apply fertilizers	Instructor	hour	10	8,33	83,30	83,30			
		Training: Details for the formulation of a fertilization programme	Instructor	hour	10	8,33	83,30	83,30			
		Training: Appropriate use of organic fertilizers	Instructor	hour	10	8,33	83,30	83,30			
		Training: Theoretical understanding of crop pests	Instructor	hour	3	8,33	24,99	24,99			
		Training: Theoretical understanding of crop diseases	Instructor	hour	3	8,33	24,99	24,99			
		Practical training	Instructor	hour	6	8,33	49,98	49,98			
		Training in monitoring	Instructor	hour	6	8,33	49,98	49,98			
		Training: Appropriate doses and solutions	Instructor	hour	5	8,33	41,65	41,65			
		Training: How and when to apply agrochemicals	Instructor	hour	5	8,33	41,65	41,65			
		Training: Use of protective equipment when applying agrochemicals	Instructor	hour	2	8,33	16,66	16,66			
		Training: Storage of agrochemical, phytosanitary and fertilizer products	Instructor	hour	3	8,33	24,99	24,99			
		Training: Use of instruments	Instructor	hour	3	8,33	24,99	24,99			

Detail	Section	Activities	Articles	Unit	Qty..	Unit Cost	Total Cost	Cost Year 0	Cost Year 1	Cost Year 2	Cost Year 3
	Cultivation	Training: Improved pruning practices	Instructor	hour	3	8,33	24,99	24,99			
		Training: Agroecology	Instructor	hour	3	8,33	24,99	24,99			
		Training: IPS	Instructor	hour	3	8,33	24,99	24,99			
		Training: Appropriate product harvesting	Instructor	hour	3	8,33	24,99	24,99			
		Training: Appropriate transport practices	Instructor	hour	3	8,33	24,99	24,99			
	Equipment, implements and tools	Training: Appropriate management of equipment, utensils and tools	Instructor	hour	3	8,33	24,99	24,99			
	Staff hygiene	Training: Importance of personal hygiene	Instructors	hour	3	8,33	24,99	24,99			
	Registers	Training: Use of field logbook	Instructor	hour	10	8,33	83,30	83,30			
		Training: Keeping of field logbook	Instructor	hour	20	8,33	166,60	166,60			
Total Training							1.174,53	1.174,53	0,00	0,00	0,00
Monitoring		Monitoring first month	Instructor	hour	32	6,00	192,00	192,00			
		Monitoring second month	Instructor	hour	24	6,00	144,00	144,00			
		Monitoring third month	Instructor	hour	16	6,00	96,00	96,00			
		Monitoring fourth month	Instructor	hour	8	6,00	48,00	48,00			
Monitoring total							480,00	480,00	0,00	0,00	0,00
Contin-gencies							2.529,37	2.529,37	1.982,38	2.180,61	2.398,68
Total Contin-gencies							2.529,37	2.529,37	1.982,38	2.180,61	2.398,68
TOTAL GAP INVESTMENT							53.116,78	53.116,78	41.629,90	45.792,89	50.372,18

Annex 7. List of variables/activities relating to safety objectives within total variables analysed (Good practices-Eurepgap)

	Variable	Gap	Safety		Variable	Gap	Safety
1	Traceability	x		29	Field packing	x	x
2	Registers	x		30	Analysis of hygiene risk	x	x
3	Seed quality	x		31	Plant sanitary facilities	x	x
4	Sanitary certification	x		32	Training	x	x
5	Risk assessment	x	x	33	Quality of processing water	x	x
6	Visual identification	x		34	Use of post-harvest products	x	x
7	Profiling of soil	x		35	Management of plant residues	x	x
8	Improvement of soil	x		36	Storage of chemicals	x	
9	Reduction of erosion	x		37	Lighting protection	x	x
10	Fertilizer calculation	x		38	Animal entry	x	x
11	Calibration of equipment	x	x	39	Pest control	x	x
12	Fertilizer storage	x		40	Recycling plan	x	
13	Quality of organic fertilizer	x	x	41	Waste collection facilities	x	x
14	Quality of irrigation water	x	x	42	Analysis of work risk	x	
15	IPM consultation	x	x	43	Assessment of risks	x	
16	IPM training	x	x	44	Programme of work safety	x	
17	Pesticide training	x	x	45	Staff instructions	x	
18	Cost adviser	x	x	46	First aid	x	
19	Field signposting	x	x	47	Signposting of risks	x	x
20	Calibration consultation	x	x	48	Marking of areas	x	
21	Equipment	x		49	Equipment for workers	x	
22	Waste plan and deposit	x		50	Cleaning of clothing	x	x
23	Waste analysis	x	x	51	Storage of phytosanitary products	x	x
24	Pesticide storage	x		52	Coordinator of work safety	x	
25	Management of containers	x		53	Worker housing	x	
26	Analysis of risk to produce	x	x	54	Training new staff	x	
27	27. Hand washing equipment	x	x	55	Environmental protection	x	
28	28. Field toilets	x	x				

Source: Survey team. Costa Rica.

Latin American case studies on "Implementing programmes to improve safety and quality in fruit and vegetable supply chains: benefits and drawbacks" provide guidelines to improve understanding of the factors that facilitate and/or hamper the implementation of safety and quality improvements on the part of fruit and vegetable producers, especially small-scale ones, and also of the need to propose integrated solutions that take account of the producers' technical, administrative and economic capacities, together with the amount of institutional support needed in order to develop and/or strengthen these capacities.

ISBN 978-92-5-105901-2

9 789251 059012

TC/M/A1505E/1/11.07/1200