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).

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-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).

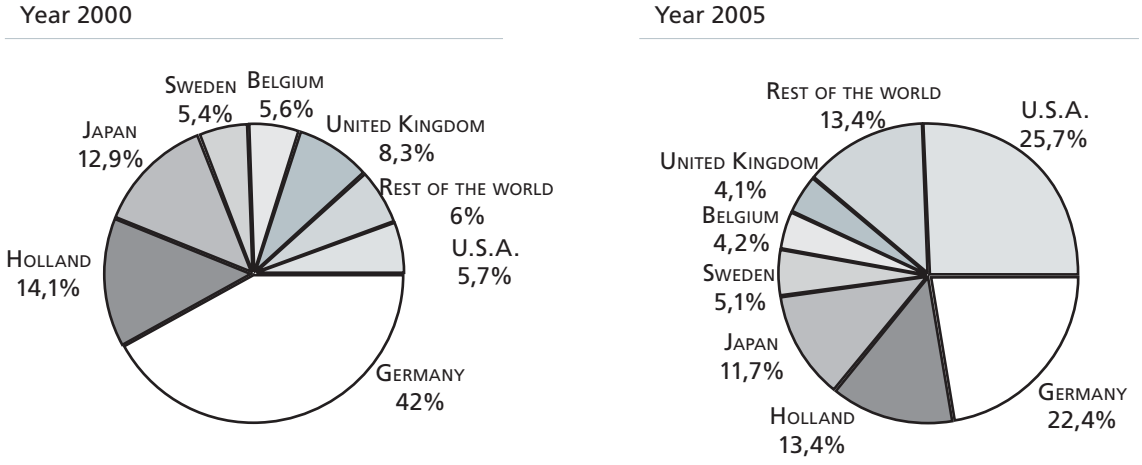
-Marketing systems

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.

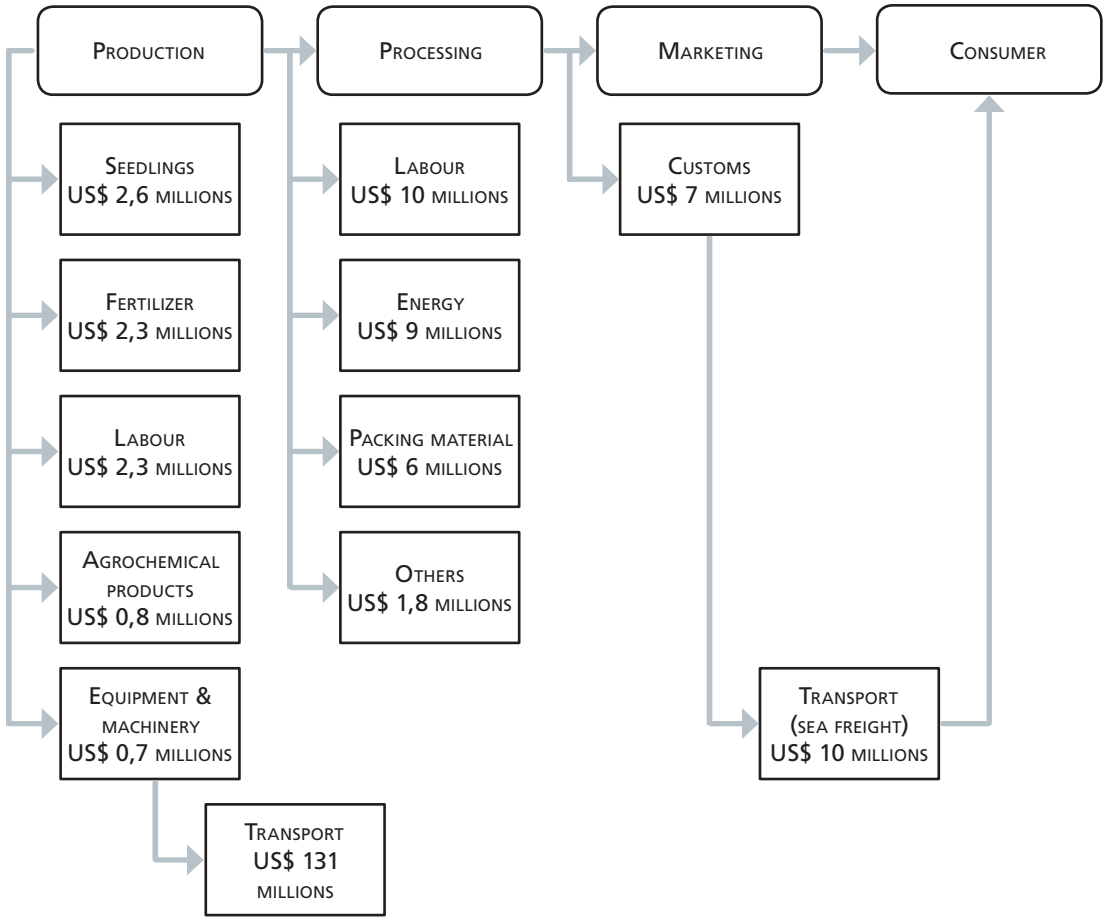
According to data from the Executive Secretariat for Agricultural and Livestock Sectoral Planning and the National Pineapple Programme, production has risen significantly. The average increase in metric tonnes between 1991 and 2005 was approximately 103 percent, rising from 600 000 to 1 483 200 t harvested. 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.

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