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LINKS

Vocational competence

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

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

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Annexes

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

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

Water	There is no assessment of the microbiological and chemical quality of the water used for pest and disease control practices and for cleaning machinery, equipment and containers, etc. The source of water for agricultural operations is generally the same as for human consumption.	Examine the provenance of farm water and periodically examine possible risks of contamination. Conduct a microbiological analysis at least once a year (total coliform, faecal coliform and E. Coli counts) for technical support in determining the measures to be applied.
Organic fertilizer	The production of organic fertilizer is not a very common practice. Commercial products are generally bought from local suppliers. There is no record of the type of product applied.	Keep a record of applications, indicating type of product, dosage and source.
Agro-chemicals	No records are kept of the type of product applied or of the problem that needs to be controlled, the frequency, dosages, etc. Farmers have little understanding of the active ingredients or specificity of the chemical products and there are no programmes of maintenance and calibration of application equipment. There is no collection of empty containers or recording of stored products.	Keep a daily register of farm activities and their purpose, including agro-chemical applications, specifying dosages, products, withholding periods, etc.. Organize farmer field days to train in the proper use and handling of agrochemicals and the maintenance and calibration of equipment.

3. CULTIVATION PRACTICES

Preparation of the soil	The soil is prepared only where each plant will be located with minimum tillage.	
Sowing	In most cases the farmers do not respect the recommended planting distances. Cape gooseberry is sown with companion crops, such as sweet potato, pea or maize during the first 3 to 4 months of crop establishment.	Adopt appropriate distances and planting systems to reduce the incidence of disease. Association with other crops is not recommended because of possible contamination of the fruit from applications of chemical products for the phytosanitary control of companion crops.
Staking	The farmer receives little technical support in deciding the most appropriate form of plant support in accordance with environmental conditions and topography of the holding. There is also relatively infrequent stake maintenance, shape pruning and bunch care.	Use staking appropriate to the conditions of the holding. Seek the advice of a technician to ensure aeration and luminosity and to facilitate harvesting, maintenance and phytosanitary pruning and application of pesticides.
Pruning	This is done by hand and sometimes with a pruning knife. Tools are generally not disinfected between plants. The cuttings are removed from the plot and burnt.	Disinfect pruning tools before moving on to the next plant. Implement a programme of pruned branch management, especially for sanitary pruning.

Fertilization programme

Fertilization is generally without prior analysis of the soil and therefore without evaluation of nutrient needs. The farmer follows traditional practice. No records are kept of fertilizer application (type, quantities, method, operator). Organic fertilizers in the form of chicken and pig droppings are used.

Conduct soil analysis to devise a fertilization programme that corresponds to crop needs, designed with technical assistance. Use ICA-registered products and keep records of applications.

Control of weeds

Weeds are generally removed manually in areas close to the plants, otherwise with handtools along pathways. Herbicides are used during presowing when necessary.

Keep records of any herbicide applications.

Control of pests and diseases

Several products are used with little or no information on their active ingredients, specificities or restrictions in markets of destination. There is limited product rotation and high dosages are applied.

Applications are done as routine prevention without assessing the damage thresholds or understanding the pests and diseases involved. Handspraying equipment is used but serviced infrequently.

There is no integrated pest management.

Implement integrated pest management to pesticide use. Employ ICA-registered products under the Recommendation of a technician, with the dosages and methods indicated on the labelling, which also states the specificity of the active ingredient. Records of applications should be kept and withholding periods observed, as should restrictions in terminal markets.

Harvesting

This is done manually without clipper with a high level of female labour. Recipients of different sizes and provenance are used. The workers do not use gloves and the fruit is transferred to holding baskets placed directly on the ground without protection. No harvest records are generally kept. There is no periodic cleaning of harvesting and storage recipients. The state of health of the workers is not noted. Sanitary infrastructure is relatively basic so hygienic practices are not adequate. There is no post-harvest activity (sorting, grading or washing).

Design and implement a programme of cleaning and disinfection of holding baskets, harvest recipients and clippers. An on-farm fruit storage area needs to be organized, sheltered from sunlight and possible contamination. The holding baskets should bear the farm name and lot number for purposes of traceability.

Hygienic practices should be improved through training and infrastructure. Harvest and hygiene records should be kept.

Transport to the collection centre

The distances are short. There is no regular cleaning of vehicles and tarpaulin or other protection against contamination is rarely used.

Clean the transport vehicles before loading the fruit and cover the holding baskets with plastic, canvas, etc.

4. EQUIPMENT, TOOLS AND IMPLEMENTS

There is no regular cleaning, maintenance or calibration of the equipment and tools used for phytosanitary control, harvesting or pruning.

A programme of maintenance, calibration and cleaning of equipment, tools and implements should be designed in accordance with respective requirements.

5. ASSOCIATED FACILITIES

Farms do not generally have facilities to hold the fruit which is left in the open (in the shade) for a few hours. The condition of sanitary facilities varies, with only one toilet for the family and workers.

There should be an appropriate area to hold the fruit on the farm, sheltered from sunlight and possible contamination to ensure safety for consumption. The toilet should have proper lighting, marked surfaces that are easy to clean and the necessary sanitary components. It should not contaminate the soil or water sources, for example through leakage.

6. STAFF HYGIENE

There are no programmes to check the state of health of farm workers, their behaviour or personal hygiene.

Set up health teams and use protection to avoid contamination.

The workers do not receive periodic instructions or training on hygienic fruit handling.

Provide regular training in hygienic practices and careful handling of produce in the field.

7. HEALTH, SAFETY AND WELFARE OF THE WORKFORCE

There is no risk assessment or plan of action to safeguard health and promote safety in the work place. No staff are trained in first aid and there are not sufficient notices warning workers of hazards. They are not given appropriate protective clothing to minimize the risk of intoxication from pesticides, nor do they use protective goggles, masks or gloves.

Train one worker in first aid and set up a team to communicate and indicate critical points in the production process.

Invest in protective equipment for the workers.

8. MANAGEMENT OF WASTE

Waste and potential sources of crop contamination are not identified. There is no management plan to reduce them.

Evaluate and identify waste and its source to implement management and reduction plans.

9. TRACEABILITY AND RECORDS

There is no documented traceability system to track a product, its management or its final purchaser. There are no records of production practices, inputs, dosages, pests or worker responsible.

Design and implement a traceability system with the identification of the holding and a daily register of cropping activities carried out to packing house specifications.

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

Stage of the process	Status	Recommendation
<h3>1. FACILITIES</h3>		
	<p>The facilities are generally adapted storage areas and therefore not sufficiently large for proper continuous flow of produce. The fruit reception areas are generally small for the volumes delivered and are sometimes in the open. The lighting is inappropriate and there is no adequate protection against pests, e.g. wire netting.</p>	<p>The plant needs to be reorganized for continuous flow of produce, with separated well lit areas and protection against pests.</p>
	<p>The plant does not have sufficient or clear signs. Most packing plants have appropriate sanitary facilities that are well positioned and equipped with liquid soap.</p>	<p>Adjustments should be in accordance with Decree 3075.</p>
<h3>2. INPUTS</h3>		
<p>Water for washing</p>	<p>The fruit is not washed or disinfected so there is no direct contact with water. Possible risks of contamination appear to be from water used to clean the facilities and water by workers to clean their hands and for other personal needs. However, the water is clean as most of the plants are located in Bogota.</p>	<p>The plant located in Granada should check the quality of water used by staff and for cleaning operations.</p> <p>The municipal water supplier should provide a document certifying the quality and provenance of the water.</p>
<h3>3. PROCESSING</h3>		
<p>Reception and weighing</p>	<p>The baskets are weighed and the batch coded. The name of supplier and quantity of produce is recorded but very often the registered information is insufficient for product traceability. There is no verification of cleanliness of field containers or delivery vehicles.</p>	<p>The market operator should require suppliers to provide field records of traceability from primary production, in addition to records of cleaning of holding baskets and delivery vehicles.</p>
<p>Sorting and grading</p>	<p>Sorting and grading is done manually by female workers trained to grade the fruit according to stage of maturity, size, physical damage, state of calyx, etc. and with some training in hygienic practices. The tables and floors are periodically cleaned but there is no documentation for this. There is no special area for discarded fruit.</p>	<p>Programmes of hygiene should be implemented for fruit handlers and for the cleaning and disinfection of facilities and baskets. Individuals should be designated to oversee and check implementation.</p>

Drying	Systems of fruit drying vary and conditions are not standardized in terms of temperature, relative humidity and duration. There are no registers for the cleaning of facilities or equipment.	Drying temperature, duration and relative humidity should be checked and registered and as far as possible standardized. There should also be programmes for the cleaning of facilities and implements used.
Packing	Packing plants generally have sufficient baskets and cartons for the appropriate dispatch of fruit for export. Fruit for the domestic market is generally returned to the holding baskets without proper cleaning.	A register should be kept of suppliers of packing materials and a periodic verification made of their storage conditions and thus hygiene. Baskets for the domestic market should be included in washing programmes.

4. CLEANING AND DISINFECTION

There is no documentation on the cleaning of facilities (walls, work tables and storage rooms), equipment, tools and implements in the plant and on the control of surrounding areas. The flooring is rough so difficult to clean.	All possible sources of contamination in the packing plant and its surrounding area should be identified. These should be documented as the basis for a programme of cleaning and disinfection of facilities, equipment, implements and tools. There should also be a waste management programme.
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5. HYGIENE AND HEALTH OF WORKERS

All workers have overalls and protective gear: hat, gloves, boots, jackets, etc. They are not allowed to wear rings, earrings, nail varnish or make-up. There are no records of staff sickness and the plants display no hygiene signs.	There needs to be tighter control of personal hygiene. Workers should have a medical examination before recruitment, with periodic check-ups.
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6. TRAINING

The workers have a food handling permit. The packing house holds talks to provide further information and periodic training on themes of interest to the company.	A staff training programme on general principles of product hygiene and recommended practices should be implemented.
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7. DOCUMENTATION AND REGISTERS

The packing houses generally have an appropriate system of identification but do not maintain registers for traceability.	Implement a traceability programme.
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8. WITHDRAWAL OF PRODUCTS AND MONITORING

Rejected fruit is generally returned to the producer. The holding areas for rejected fruit are often not isolated because of space constraints.	Document complaints received and corrective actions taken when non-conformities occur.
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Annex 3. Plan of action to improve safety and quality in cape gooseberry production in Colombia

PRE-PRODUCTION

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

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

PRODUCTION

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

Area	Sub-Area	Activity	Time s m l			Responsibility	Co-executors
Research and transfer	Nutrients	N u t r i e n t requirements	x			CORPOICA, Universities	S E N A , ASOHOFRUCOL
		Fertilization plans	x				
Training and skills development		Production and management of organic fertilizers	x				
		Management of organic fertilizers and fertilization plans	x			CORPOICA, SENA	
Research and transfer	Stakes	A l t e r n a t i v e materials			x	CAR	Secretariat of Agriculture
		R e f o r e s t a t i o n plans			x		

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

Area	Sub-Area	Activity	Time s m l			Responsibility	Co-executors
Training and skills development	Phytosanitary management	Maintenance and calibration of application equipment				SENA, ANDI	ICA, CORPOICA
		Safe pesticide management	x				
		Use of protection equipment				SENA, ICA, CORPOICA, Universities	P R O V I N C I A L CENTRES
		Integrated crop management	x				
Hygiene standards, medical background and protection equipment	x			Secretariat of Health and CAR			

POST-HARVEST

Research and transfer	Quality	Validate the index of maturity adjusted to region and terminal market		x		CORPOICA, Universities	S E N A , ASOHOFRUCOL
	Drying	Drying management and alternatives		x			
Training and skills development	Transport	Hygiene of transport and holding baskets	x			SENA, Market Operators, ASOHOFRUCOL	Secretariat of Agriculture
	Quality	Training in collection criteria according to post-harvest management and markets	x				
		Post-harvest management; importance, hygiene, post-harvest pest management, management of secondary packing	x				
		Waste management in marketing operations	x			Secretariat of Health and CAR	
Marketing							

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

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

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

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

4. EQUIPMENT, IMPLEMENTS AND TOOLS

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

5. RELATED FACILITIES

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

6. STAFF HYGIENE

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

7. HEALTH, SAFETY AND WELFARE OF WORKFORCE

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

8. MANAGEMENT OF WASTE

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

9. TRACEABILITY OF RECORDS

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

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

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

Stage of the process	Status
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1. FACILITIES

The installations of all plants were designed to facilitate cleaning and disinfection and all buildings have protection barriers against parasites, animals and insects. However, 25% of plants have floors, walls or ceilings that are not in good condition and therefore more difficult to clean.

All processing plants have sloped flooring to avoid the accumulation of water in packing and storage areas, which are kept separate. Only authorized personnel handle chemical agents, running constant sanitary and maintenance procedures and systems of pest control and monitoring. The workers are trained to report any equipment failure to the person responsible in the plant.

Despite this, only 75% of plants keep their windows closed and covered with wire netting, cover their lighting, have drainage systems that prevent the accumulation of water in packing and storage areas, keep their chemical agents properly packaged and labelled and separate from packaging materials and food products, run comprehensive cleaning and maintenance programmes, and have a person responsible for each piece of equipment.

All plants have a specific, secured and fenced area for the temporary storage of residues and waste, located beyond the company's production area. These materials are collected on a regular basis.

Despite this, only 75% of such areas have been designed to facilitate cleaning and avoid build-up of waste and bad smells. Only 50% keep their waste and residue containers closed to avoid bad smells.

2. INPUTS

Water for washing	
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The broccoli is not washed or disinfected so does not come into direct contact with water. Possible risks of contamination appear to be from water used for cleaning facilities and personal hygiene. However, as most plants are located in Bogota, the water used is safe.

3. PROCESS

Delivery and weighing	
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Only one plant reports broccoli delivery in refrigerated vehicles. This may be true for certain types of producer, but not for all and especially not for small producers. For the other plants, the produce normally arrives in trucks that are fully laden and only covered with canvas or sheeting to prevent dehydration from the sun and contamination. All processing plants have rapid and effective reception systems that are operated by trained personnel. Upon delivery, the broccoli is immediately placed in an appropriate clean location for quality control. Accepted produce is then held in cold chambers that are relatively small because the holding period before processing is short.

Cleaning and washing

Only 50% of plants report initial cleaning of produce surface. This is mainly done in the field ensuring that good agricultural practices are applied during the harvesting phase to remove surface dirt from the raw material. The initial cleaning usually means dipping the raw material in water that is almost always safe. Only one company uses raw water, but this is treated and boron is also applied.

Only one plant uses hot water; 75% use cold water.

For washing the raw material, 75% of plants use conveyor belts with sprinklers and only 25% have fitted revolving washing mechanisms.

With regard to washing with disinfectants, 75% of plants have processes to check the removal of surface dirt with the disinfectant in direct contact with microorganisms and to control water temperature in order to prevent the back suction of contaminants towards the produce.

The chemical agent used as disinfectant in all processing plants is chlorine.

Storage

All plants have packing material storerooms that are dry, clean and without waste or animals. However one of them has drips from the ceiling. All packing materials are kept separate from chemical agents or dangerous materials and are not in direct contact with the ground.

All plants have storage areas in which produce is not in contact with the ground (however only 75% of plants observe the recommended spacing of 45 cm from walls and 10 cm above the ground). The storage areas are separated from areas with chemical products and waste. They are kept clean and operate by inventory rotation to minimize holding times.

All storage chambers have precise temperature and relative humidity controls and gauges to eliminate microbes but only 75% of plants regularly clean the walls, floors and ceilings.

Transport to port

The containers used for transportation are made from non-toxic materials that are easy to clean and disinfect. The companies report that deteriorated containers are not discarded immediately, but pest control processes are always applied when inspecting containers.

A reported 66.7% of companies clean their containers after each use; the same percentage cleans containers that have been in direct contact with earth, mud or animal dung when used for packing or reception. The containers are labelled before and after washing to prevent contamination.

There is virtually full adherence to broccoli transportation standards. Detailed registers are kept of previous loads, which is why containers that have carried fish, raw meat or eggs are never used.

Containers are always disinfected and thoroughly inspected before loading. This requirement serves to ensure that they are free of dirt, odour and bits of food and that they are completely dry, without condensation.

Companies report that 75% of containers are hermetically sealed against pests and contamination.

All containers used for transportation have refrigeration units that are in good condition and fitted with instruments to check their functioning. The refrigeration units are constantly inspected, with regular servicing avoid malfunction.

The usual practice is to turn the refrigeration unit on before loading so that an appropriate temperature is reached. The containers are loaded in such a way that air circulates around the produce.

The whole transport system has refrigeration in good condition and unit temperature gauges that are properly calibrated and tamperproof.

4. CLEANING AND DISINFECTION

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

5. HYGIENE AND HEALTH OF WORKFORCE

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

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

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

6. TRAINING

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

7. DOCUMENTATION AND REGISTERS

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

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

	Priority actions
	Recommended actions
	Total cost per component

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

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

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

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

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

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

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

Source: Survey team. Costa Rica.

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

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