

QUALITY AND SAFETY MANAGEMENT IN FRUIT AND VEGETABLE PRODUCTION



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INTRODUCTION

The training document about Management of quality and safety in fruits and vegetables belongs to the project: "Strengthen Vietnamese SPS capacities for trade - Improving safety and quality of fresh vegetables through the value chain approach" (MTF/VIE/046/STF (STDF/PG/259)) funded by the Food and Agricultural Organization (FAO) period 2010 – 2012. With the help of FAO agent, Fruit and Vegetable Research Institute (FAVRI) that implement the project compiled booklets, organized the training of trainer (TOT) and Farm Business School for farmers in three provinces Son La, Hung Yen and Lam Dong. The document helps the producers, managers and technician understand:

- What is quality and food safety?
- Why do they produce follow the quality and safety trend?
- How is the quality and safety management system?
- What can the manager do to ensure safe and good quality products? What can the producer do and How? What are the responsibilities of local agents?

The document contains some main points:

1. The concepts about good quality and safety;
2. The quality and safety management system;
3. Food safety and Good Agricultural Production VietGAP.

Moreover, the document also has the appendixes about: the questions for discussion of food safety; the methods to get fresh fruit samples for analyzing; the allowed limitation for chemicals, heavy metals, microorganisms in soil, water, fruits and vegetables after harvesting; and the checklist for production and business fruit and vegetable facilities.

This book is compiled basing on the researching results and actual production, references and quotations from national documents, and specially, it also uses the lectures of Dr. Shashi Sareen – the senior expert FAO about food safety. The book is easy to understand and apply. Thus, farmers can use it efficiently in producing, handling, good processing, and storing.

Project Management Unit

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PART 1: QUALITY AND SAFETY MANAGEMENT IN FRUITS AND VEGETABLES

I. Quality and safety

1. Quality

Quality can be determined as "the combination all the characters of a product. It is essential for the expectations and demands of customers".

Quality contains the nutrition elements (vitamin components...), appearance (smell and taste, color, size, shape and the hard of fruit), social aspect (cultural food, traditional food...), the convenience (easy to cut) and the safety.



The quality requirements relate to the storage quality, transportation, market, consume and processing.

2. Safety

Food is safe when there is not harm for human health. Safety is one of the criteria of food quality.

Safe is a "hide" criteria and hard to see. The food can have high quality (as good color, smell and tasty...) but it is not safe because of the harm bacteria (*E.coli*, *Salmonella*), heavy metal (*Cadimi*), remaining of pesticides and physical risks... In contrast, the appearance is not good but the food is considered safe.

Basically, the quality and safety system contains:

- ✓ The determination all steps of producing and processing.
- ✓ These steps can be recorded in document
- ✓ All the steps are reflected exactly as recorded in documents
- ✓ The evaluation system used for checking the producing process must be done as described in documents and abided by the requirements.
- ✓ The production processing has been improved continuously; and the problems that are not as standard must be resolved.
- ✓ The assessment of the quality and safe system must be done by the inspection organizations that are competent; and they can give certification for farmer who has good quality and safe products.

II. Why do the farmers produce follow the good quality and safety trend? And what is the quality demand of consumers?

1. Why do the farmers produce follow the good quality and safety trend?

- Problems of food poisoning that relate to production and processing are increasing in nation and worldwide.

In the trend of globalization and global integration, the quality, hygiene and food safety are the key elements of competitive ability of products. They help the products can survive and expand their market. Global factors as well as in area are increasing the demand of high quality and absolute safety agricultural products.



The level of microbial contamination and chemical residues, antibiotics, heavy metals in agricultural products has now become serious problems that affect human health and the environment.

- Hygiene and food safety plays a very important role in many developed countries as European countries, North America and New Zealand.... They set the standards and regulations to force the products of other countries that enter their market must comply with to protect consumers and the domestic environment.
- Vietnam has had the member of the World Trade Organization (WTO) since 2007. As a WTO member, Vietnam needs to solve many issues, including the undertake hygiene and safe food standards. The countries in the WTO can use the hygiene and safe food standards as barrier to prevent products from other countries that enter their market in order to protect their domestic production.

2. The demands of consumers

The consumers' requirements about hygiene and safe food focus on three main points:

- Where are the products produced and How?
- The products must have high quality and are easy to use
- The products must safe for health and are nutrition

From the reasons above, all the products must have the global standard about quality and safe for health. Producers must understand information of market as well as information about consumers' demands in order to apply suitable production methods. Nowadays, there are many tools to manage the quality from producing to consuming as ISO, TQM, SQF, GAP, GMP and HACCP...

3. Who is responsible for the safe food?

The term "Farm to Fork" is actually a food supply chain starting from production, harvesting, processing, and inspection, packing and shipping to consumers; therefore, we can assign responsibility for ensuring food safety. FAO defines food supply chain is "the recognition of responsibility for providing safe food, ensuring health and nutrition for all supply chain participants, including the producers (farmers), processing, trade, transportation and consumption".

In this food supply chain, the farmers have an important responsibility though food may be contaminated at a certain stage.

III. Quality and safety management system

1. What is quality management?

It is a continuous process from planning, training, inspection, monitoring and improvement of all activities of everyone involved. Quality management is the potential that brings benefits to efficient business, safety and quality with evident information recorded during the production process, and helps the retailers to rely on goods. Or in other words, it is a strict management system for each stage from the inputs, progress in the production system to the outputs of the products before selling to market.



2. Components of quality management system

Quality management system consists of the internal quality management system and the external monitor management system. Internal management system is key factor to produce quality and safe products. In contrast, the external monitor management system is mainly the national management on the implementation of the policy; making the regulations of quality, hygiene and safe food in vegetable productions of farmers; and certifying for safe vegetable production.

2.1. The internal quality management system consists of:

a. Quality policy

A business-production establishment should develop clear and specific quality policies. They are published with the signatures of top leaders to demonstrate commitment of organizations about quality; and considered as the message to all level of organization system. In order to be widespread the quality policy in the organization, the leadership should understand and full support. Besides, it can be put in the most conspicuous place so that people can see.

b. Document management system

- Quality manual:

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The quality books give the general policies of organization about the production and work that corresponding to the requirements of applicable standards. The manual contains some following key points:

- ✓ Application scope: record the field, work, division and the title in the production organization that take part in.
- ✓ Quality policy
- ✓ Introduction to organizational structure, functions, duties, responsibilities and powers of the organization in general and of each section, relevant titles (each title has its own description).
- ✓ List of the procedures, work instructions that issued by the quality management system and the cited documents.
- Procedures:

Process or procedure is a document that describes the purpose, scope, sequence of steps that are carried out in practice, corresponding to the process of quality management system. The process includes the items: purpose, scope, responsibility, frequency, order and note forms that are applied uniformly of the process or procedure.

- Work instruction documents

Work instruction documents are documents that describe ways to do and instruction specific tasks or task for each person step by step. The typical types of work instructions are diagram, flow chart for the organization, responsibilities and powers, regulations in work, methodology or information process, work process, storage and keeping records and other written communication forms with customers, etc.

- The records

They are the results of all activities that documented such as forms, reports and minutes of meetings, etc. These documents have been completed during the job. Their important roles are to provide objective evidence on the operation of quality system.

c. Staff relates to the quality management system

- Directors/ owners: is the person that has the highest responsibility of the production facilities and commitment to product quality.
- Technician: they must be trained on quality management processes and production process; meanwhile, they are the internal auditor's manufacturing.
 - ✓ Implementing quality policy of production facilities that is issued by the directors/ owners.
 - ✓ Monitoring quality and engineering manufacture process.

- Producers: they directly implement the manufacturing process to produce quality products. They must be technical training and guided on all stages in the production process. They are responsible for working to the technical process.

2.2. The external quality management system

They are organizations that inspect, supervise and certificate of VietGAP vegetables and fruits. They are indicated by the Central State (Ministry of Agriculture and Rural Development) or local (city, province).

The organizations that appointed by the Ministerial – level will test, monitor and certificate on a national scale; in contrast, local organizations only test, monitor and certificate in province and city.

Manufacturing establishments must hire outside agencies to control the examination and assessments, and certificate to ensure the quality and safety that follow the published standards.

The external management system will be done only when there is monitoring contract of manufacturing facilities. Currently, the Ministry of Agriculture and Rural Development is leading agencies and organizations to evaluate and certificate of safe vegetable production under VietGAP.

3. Quality and safety management by GAP

GAP (Good Agricultural Practice) are rules that established to ensure a safe and clean production environment. Food must not contain pathogens as biological agent (bacteria, fungi, viruses and parasites) and chemical (pesticide residues, heavy metals, and nitrate concentration); besides, the products must be safe from field to consumers.

GAP covers the production towards site selection, land use, fertilizer, water, pests and diseases, harvesting, packing, storage, field sanitation and transportation, etc. to develop a sustainable agriculture. GAP is set with the aims of ensuring:

- ✓ Safe food
- ✓ Safe producers
- ✓ Protect environment
- ✓ Trace the origin of products

GAP standards of food safety focus on four criteria:

- a. Standardization of production technology:*

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The goal is to use as little pesticide as possible, to minimize the effects of chemical residues on human and environment:

- ✓ Integrated Pest Management (IPM)
- ✓ Integrated Crop Management (ICM)
- ✓ Maximum Residue Limits (MRL)

b. Standards on food safety

These standards include methods to ensure no chemicals, infection or physical contamination in harvesting:

- ✓ Risks of biology infection: viruses, bacteria and mold
- ✓ Risks of chemical
- ✓ Risks of physics

c. Work environment



The goal is to prevent the abuse of labors or farmers:

- ✓ Health care facilities, emergency and toilets for workers
- ✓ Education training for workers
- ✓ Social welfare

d. Traceability

GAP focuses heavily on traceability. If there is incident, supermarkets must be able to solve problems and recall defective products.

This standard allows us to identify issues from production to consumption products.

IV. Food safety and good agricultural practices (VietGAP)

1. What is VietGAP?

VietGAP is Vietnamese Good Agricultural Practices. They are rules, order and procedures to guide the organization and individuals in producing, harvesting and processing to ensure food safety, improve product quality and ensure social welfare, health of producers and customers, environment protection and product traceability.

- ✓ It is a voluntary standard.
- ✓ Provide guidance for manufactures to improve quality, ensure food hygiene and safety on the basic of hazard control.
- ✓ Applicable to all organizations and individuals manufacturing business, testing and certificating vegetable and fruit products.

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VietGAP consists of good manufacturing practices in the production chain from farm level to distribution.

2. Food safety hazards

2.1. Chemical hazards

Hazards	Cause of contamination
<ul style="list-style-type: none"> Pesticide residues is higher than the permitted level (MRLs)¹⁰ 	<ul style="list-style-type: none"> Pesticides are not permitted Pesticides are poor quality Compounded drugs are not used properly and with a higher dose than instructions The isolation time is not cared Misuse of devices, not tested before use Pesticide residues in soil from previous crop season Throw away or dump excess pesticides into the soil
<ul style="list-style-type: none"> Contamination by: lubricants, sanitizers and cleaners, paints, refrigerants, fertilizers, adhesives and 	<ul style="list-style-type: none"> Use inappropriate chemical to clean and disinfect Leakage of oil, grease and paint on the equipment in contact with product. Use of containers of chemicals, fertilizers and petroleum from the previous season. Pour chemical (lubricants, detergents...) near the products and packaging materials
<ul style="list-style-type: none"> Concentrations of heavy metals (Cd, Pb and Hg) in the products exceed the allowed maximum 	<ul style="list-style-type: none"> Continuously use chemical fertilizers, including manure with high levels of heavy metals. Use of inappropriate manure (containing high concentration of Cd and Hg). Lead pollution from car fumes if farm near the
	<ul style="list-style-type: none"> High level of heavy metals in water High level of heavy metals in soil from previous crop or near industrial zones Use of contaminated irrigation water
<ul style="list-style-type: none"> Natural toxins - allergens, mycotoxins, alkaloids, enzyme inhibitors 	<ul style="list-style-type: none"> Storage condition is not suitable Preserved distance makes the products is mold Storage potatoes in the light
<ul style="list-style-type: none"> The causes of allergies 	<ul style="list-style-type: none"> Some substances that are susceptible to the consumer such as sulfur dioxide used against grape rot
<ul style="list-style-type: none"> Supplements 	<ul style="list-style-type: none"> Colorings for ripe fruits, disinfectants...

2.2. Biology risks

These tiny organisms can only be seen under a microscope. They are found everywhere in the environment. Vegetables and fruits have many kinds of organisms.

Microorganisms can infect food in many ways:

- Useful – affect the quality of products such as fragrance, create scum as fungi to make yogurt, beer and butter...
- Damaging, rot: make the rotten and soften food, unpleasant smells. E.g. Rot.
- Pathogens – affect consumer's health – illness caused by the multiply of microorganisms in the human body after ingestion or toxin. The most common pathogen microorganisms are bacteria, parasites and viruses.

Bacteria: nutritional requirements and suitable environmental conditions for development. They can grow in short time. In seven hours, a bacterial cell can multiply to millions of cells. The bacteria often cause pollution to fresh vegetable including:

Bacteria	Main symptoms relate to food poisoning
• <i>Salmonella</i>	- Saprophytic bacteria live in the digestion system and cause diarrhea, nausea and headaches. Salmonella can be spread by undercooked foods such as eggs, poultry and seafood.
• <i>Escherichia coli (E. coli)</i>	- Cause sick, dysentery, and death. It passes through raw food, milk, unpasteurized juice and contaminated water.
• <i>Campylobacter species</i>	- Cause less sick, diarrhea, headache, muscle soreness. It can be spread through poultry, milk and water that contaminated by animal dung.
• <i>Staphylococcus aureus</i>	- Cause normal ill with rapid nausea, vomit and cramps. Bacteria cause toxins in food as cream-cakes, salad...
• <i>Listeria monocytogenes</i>	- Cause headaches, muscle aches and vomiting. It can be found in milk, cheese, processed meat, raw fish, poultry, vegetables and cream.

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<ul style="list-style-type: none"> • <i>Bacillus cereus</i> 	<ul style="list-style-type: none"> - Cause vomiting, no diarrhea. It is found in rice and other flours such as potato flour and pasta flour.
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Some bacteria can be found in soil (*Listeria sp*, *Bacillus cereus*) and infect the plant through directly contact to the soil, contaminated boxes and equipment. Others contaminate on vegetables and fruits through manure, contaminated water sources and the process of post-harvest storage.

Parasites: are the organisms that live in other organisms called hosts. They cannot grow without a host. Parasitic is usually on contaminated vegetables and fruits, including:

Bacteria	Main symptoms relate to food poisoning
<ul style="list-style-type: none"> • <i>Cryptosporidium</i> 	<ul style="list-style-type: none"> - Cause vomiting, fever, cramps and diarrhea.
<ul style="list-style-type: none"> • <i>Cyclospora</i> 	<ul style="list-style-type: none"> - Cause bloating, nausea, diarrhea and fever. Symptoms occur soon after eating or drinking contaminated food.
<ul style="list-style-type: none"> • <i>Giardia</i> 	<ul style="list-style-type: none"> - Cause diarrhea, bloating, vomit and fever in 3-4 days.
<ul style="list-style-type: none"> • <i>Helminthes (worms)</i> 	<ul style="list-style-type: none"> - Cause bloating, diarrhea and fever.

Viruses: are tiny and cannot live outside the cell. They do not grow on vegetables and fruits. However, they can spread from animals to humans or from person to person, including the following viruses:

Viruses	Main symptoms relate to food poisoning
<ul style="list-style-type: none"> • Hepatitis A 	<ul style="list-style-type: none"> - Cause loss of appetite, yellow eyes, jaundice and fatigue.
<ul style="list-style-type: none"> • Norovirus 	<ul style="list-style-type: none"> - Cause vomiting, fever, headache and diarrhea.

Fungi/ mold: food can be contaminated by secreted fungal toxins through the process of infection. For example: Aflatoxins is produced from *Aspergillus* fungi. Plants are susceptible to

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the infection of Aspergillus fungi, including oilseed crops, groundnut and sunflower... Toxins can be found in dairy animals that eat the contaminated products.

2.3. Physical risks

They are alien, unwanted things, soil, stone, wood, glass or jewelry...

Hazards	Reasons
<ul style="list-style-type: none"> Objects from environment: soil, rock, wood and weed 	<ul style="list-style-type: none"> - Harvesting around plants in wet weather. - Tools for harvesting and packaging are contaminated. - The dirty boxes are up on the product boxes.
<ul style="list-style-type: none"> Objects of tools, containers, glass, wood and metals ... 	<ul style="list-style-type: none"> - Lights are broken on the instruments and packaging - Boxes and instrument packaging are punctures, pallets - The clean- up does not mismatch after repairing and maintaining.
<ul style="list-style-type: none"> Objects from people – jewelry, hair clips, personal items, staples used for closing packaging 	<ul style="list-style-type: none"> - Do not careful or new employees have not been trained. - The clothes are not appropriate.

2.4. Other risks

Potential food safety hazards can occur from the use of the technical measures, including the lack of understanding.

3. GAP for food safety management

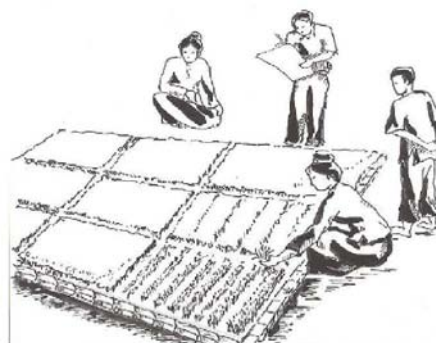
3.1. GAP and recording for farmers/ workers

a. Land management in vegetable production

Food safety hazards including: the products are contaminated chemistry and biology from the previous crops or from the neighbors.

Good Agricultural Practices:

- Evaluate the risks of potential contamination sources from outside the farm as waste systems and industrial production annually.



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- Evaluate the penetration of grazing animals to the production areas and their potential pollution every three months or before the first of each production.
- Carry out the risks immediately after the flooding.

If the field evaluation shows that the soil has a high risk of chemical contamination, soil samples should be taken for analysis; ask the managers and technician to get the samples to submit for analyzing.

In the case that microbiological and chemical hazards exceed the allowed level, the managers or technician should do the following steps:

- ✓ Find the reasons that lead to pollution.
- ✓ Consult the experts (if necessary) and give action to control hazards.
- ✓ Implementing the actions
- ✓ Do not use land for production during the implementation of remedial measures.
- ✓ Growing vegetables back when reducing the risks from pollution sources.

In the case that production areas are affected by hazards from adjacent regions such as the penetration of animals, contaminated water flow; the managers should build the physical fence and dig drainage ditches, etc.

In the case that few indicators of heavy metals in soil excess, firstly, the managers should implement some actions as above. Then, the vegetable samples should be sent to analyze the pollution level. If the result shows that there is no contamination, they can maintain the production, but they must continue to control and manage pollution sources.

They should apply measures to prevent erosion and soil degradation, such as using plastic mulch or other organic farming in upland areas to reduce the nutrient and agricultural chemicals runoff. Besides, they can use cover crops in buffer zones or adjacent areas to limit runoff and soil erosion.

Note guidance

General information:

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Farm name:

Farmers' name:..... Code:

Address: Hamlet: District:

Commune: Province:

Telephone number:

Field name/ code: Cultivated area (m²):

(If the farmers have many pieces of field, they must note for each)

Production year:

Notes: each farmer/ member must have a code in accordance with the cooperative or group and can be obtained in numerical order in the list (for example: 1, 2, 3, 4...) or letters of their initial name (for example: NVThan for Nguyen Van Than).

The record form

Farmers/ workers are assigned to record enough information in the following form:

Form 1: Soil assessment

Assessment, evaluation				Corrective actions		
Testing date	Assessment area	Description of observed risks	Implementing person	Corrective date	Actions	Implementing person
27/8/10	Lot A-27	nothing	Hai	-	-	-

Recorders: farmers/ workers (note the quarterly or before each production)

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff at least every two months.

Form 2: Measures to handle with contaminated land

Handling date	Handled land	Types of pollution	Pollution level	Methods or ways to handle	Results	People who handle

Recorders: farmers or workers

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every two months).

b. Using fertilizers and supplements

Food safety hazards: products are contaminated by chemistry and biology from the use of fertilizers and the soil additives are used directly into the soil; the growing medium or through the irrigation or spraying.

Good Agricultural Practice:

Purchasing and receiving

For inorganic fertilizers and supplements: they are only on the list of allowable production, sale and use in Vietnam.

For organic fertilizers:

- Should buy the processed manure (decomposed manure)
- In the case that manure is untreated: need to use appropriate methods of composting to reduce the risk of living organisms that can cause contaminated products and harm for human health and environment.

Methods for composting manure in farm:

- Identify and select appropriate methods of composting with available materials. Should use the improved heat annealing (material organic is biodegradable overtime) and use the

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floating and submerged incubation, microbial supplements should be added and mix them every 15-20 days for decomposing.

- Places that contain materials for composting must be far from the agricultural materials, water resources, and harvest instruments, harvested and packaged vegetables; and there should be the tank to prevent potential contamination from the leak, wash and spread on the wind.
- The raw materials of compost and compost heap should be managed and manipulated carefully to avoid product contamination.
- Should minimize the risk of cross contamination between raw materials input to finished composed manure.
- In the case of spillage/ leakage of water, the manager should assess pollution levels and test indicator of microbial contamination of water sources if necessary.
- Tools that are used in mixing, composting and raw materials need to be cleaned to prevent the contamination to other production materials and harvested vegetables.
- Farmers and workers that contact to compost materials, composting must implement good hygiene: wash hands, clothing and boots...before moving to field production or contact to products.

Storage

- Fertilizers and fertilizer supplements should be preserved in dry and appropriate places and have methods to avoid infecting to other agricultural supplies, packaging equipment, products and water.
- Manure must be loaded, unloaded and transported carefully to avoid any risk of infection for products.

Using

- Only use fertilizer when necessary and consistent with nutritional requirements of vegetable crops (under the production process).
- Fertilizers must be mixed into soil and the supplements should be applied immediately after fertilizing.
- Organic fertilizer should not be applied to the tops/ leaves and fruits of vegetables.
- When organic fertilizer is used for vegetables that have growing time under 60 days, it should be applied before planting and mixed with soil after applying.
- Organic fertilizer (particularly nitrogen) will not be applied before harvesting at least 10 days.
- Organic fertilizer, composed manure and supplements are not supplied in strong wind days, especially for fields that near other fields that are going to harvest.
- If the farmers use the tool fertilizers, they must maintain and proper cleaning them.

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- Farmers that contact to organic fertilizer and supplements must clean boots, clothing and limbs before moving to the other fields, especially in the fields are being harvested.

Note guidance

General information (as same as item 1)

The forms

Form 3: Purchase and receipt of fertilizer and supplements. Place of storage, storage of fertilizers:

Purchase date	Name of fertilizer and supplements*	Quantity (kg, L)	Price (VND/kg)	Name and address of sellers	Buyers
15/11/2009	NPK 15 10 15	50 kg	3000	Mrs. Loan – No. 16, street 2	Thuc (husband)
**	Chicken dung	200 kg			

* Name of fertilizers and supplements: for example, green manure, decomposed manure, nitrogen, NPK 15 10 15, Potassium, Phosphorus, Microorganism fertilizers Biogro, Bio fertilizers WEHG, and power lime...

** Notes for manure that produced on the farm: name of manure (for example, chicken manure), compost number and who compost.

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every two months).

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Form 4: Using fertilizers and supplements

Name of field*:	Types of vegetable:
Cultivated area (m²):	Variety:
Sowing date/ planting seedlings:	Expected harvesting date:
Quantity of seeds (optional):	

Fertilizing date	Name of fertilizers and supplements**	Quantity used (kg/ml/litre)	Fertilizing methods***	People who fertilized
17/04/2010	Nitrogen	0,5 kg	Scatter fertilizing	Van (wife)
...				

Notes: use 01 page for 01 crop and for 01 crop season (calculated from planting to harvesting). If they intercrop, they still need to ensure one page for one plant.

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every one months).

Form 5: Composting organic fertilizer in farm

Type	Composting methods and supplements for compost (if have)	Starting date	Mixing date (encourage)	Finishing date	Implementing person
.....	- Hot incubation and then making the floating

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	<i>pile incubation.</i> <i>- Add the EM.</i>				
....	...				

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every one months).

c. Planting materials: seeds, seedlings and root for grafted

Food safety hazards: products are chemical pollution from pesticides from the seeds, seedlings and roots for grafted.

Good Agricultural Practice:

Purchasing seeds/ seedlings:

- Seeds and seedlings should have explicitly addressed (including commercial cultivars and local varieties).
- Grafted: seedlings must be packed carefully to ensure quality during the transportation, loading and uploading to the destination. The information about the source of grafted, seedlings must be attached to the shipment.



Produce seedlings

- Make sure that the seedlings are produced from clear material sources (seeds and rootstocks) and in good condition such as land, and water prices.

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- Using fertilizer, supplements and plant protection chemicals must be complied with the requirements of fertilizers and plant protection drugs.
- During the seed productions, the farmers must check regularly to have appropriate technical measures to ensure the quality of seedlings and rootstocks.

Note guidance

General information (as same as item 1)

Forms:

Form 6: Purchasing seeds and seedlings

Purchasing date	Name and address of sellers	Varieties	Quantity	Name of the buyers	Supplement information (if have)		
					Using date	Name of chemicals	Using reasons

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every three months).

Form 7: Produce seedlings

Producing date	Variety	Producing place	Quantity (seedlings)	Chemicals used (if have)			
				Using date	Name of chemicals	Treating method	Implement person

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every three months).

d. Water in vegetable production

Food safety hazards: chemical and biological contamination from the use of contaminated irrigation water.

Good Agricultural Practice:

Water source:

- Only use the water that has been tested and evaluated for vegetable production.
- Must check periodically at least once a month to see if there are entry of animals or other pollution resources such as garbage, manure water, chemical packaging, chemical leaks and wash away and other causes.



When pollution is detected:

- ✓ Immediately take the corrective actions such as blocking the entry of livestock and poultry or eliminate the found pollution sources.
- ✓ In the case that water quality has not improved, the alternative water sources can be used temporarily.
- ✓ Continue using the remedies (the chemical that used for treatment must be in the list of permitted and used according to the directions); meanwhile, the managers/ technician must take the water sample for testing. The water that re-used must have the quality that meets the requirements.

Cleaning and maintaining wells and water supply systems

- Check periodically at least once a year on the state of structural wells, water supply systems to detect and prevent pollution sources in time.
- Ensure that all wells are covered carefully.
- Ensure that the wells are above the ground at least 30cm, avoid the risk of flooding.

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

- Cleaning of water supply systems regularly to prevent accumulation of sediment and maintain water quality.

Use of water

- Do not spray for vegetables near harvest time; especially there is evidence that water is contaminated.
- Should use drip irrigation or channels to prevent water to contact to the edible parts of vegetables in the case that quality of water use is not controlled actively (e.g. river, stream and canal).

Note guidance

General information (as same as item 1)

Forms

Form 8: Evaluation, assessment the water and water supply system

Evaluation and assessment					Corrective actions			
Checking date	Water source (wells, ponds and tank)	Place of water	Describe observed hazards *	Implement person	Corrective date	Corrective actions or measures	Analyzed results ** (good/ not good)	Implement person
27/8/10	Well 1	Before yard	Nothing	Hai	-	-	-	-
27/8/10	Tank	Field 1	Dead mouse	Hai	27/8/10	Buried under the star fruit tree	Not analyze (not necessary)	Hai
...				

Reporter: farmers/ workers (at least every one month)

* If there is not any hazards: note NOTHING

**The analyze results are provided by the technicians/ managers

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

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Testers: the managers, technical staff or quality control staff (at least every two months).

Form 9: Purchase of water treatment chemicals

Purchasing date	Name of chemicals	Quantity (kg/litre)	Name and address of sellers	Name of buyers

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every two months).

Form 10: Use of water treatment chemicals

Treating date	Water sources treated (well/ pond/ tank)	Chemical name	Dose (kg, litre)	Implement person

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every two months).

e. Use of plant protection drugs

Food safety hazards: pesticide residues in products exceeding the permitted level (MRLs).

Good Agricultural Practice:

Purchasing, receiving and storing

- Only buy medicines from the shops, licensed agents; drugs are on permitted list in Vietnam and registered for using on vegetables, labeled by Vietnamese and still have dating use.
- Should buy enough usage.
- Receive the correct medicines, ensure that they do not leak and torn.
- The drugs after purchased and receipt must be let into storage and warehouse and controlled (can be blocked).



Using

- Farmers/ workers must be trained for technique of using pesticides with “four rights” principles: right medication, right dosage level and concentration, right method and right time” and other safety measures.
- Only use pesticides to eliminate the right pest with appropriate isolation time and also have dating use.
- Select the suitable spray and aerosol, test to ensure that it still works.
- Must use enough of labor protection.
- Drugs can be used in right concentration and dosage that noted in the label instructions.
- Only mix enough drugs for the number of plant area and use immediately.
- Use clean water to mix drugs (water does not contain impurities).
- Do not spray under strong wind, sunny day, rain or showing signs of coming rain.
- Spray evenly on the entire area, make sure that not to include the area was not sprayed or sprayed repeated several times.
- Compliance with isolation time of each drug used.

After using drugs

- Ensure that all aerosols do not contain any medications after using.
- Make sure that the drug packages have been cleaned three times by water, the water must be blamed back to the pump in order to avoid contaminations of crops, water resources and land.
- The warning sign must be used in the spraying field.

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

- All spraying equipment must be cleaned in areas that are away from water resource.
- All cleaned instruments are put into storage.
- All the drug packages are collected and stored in drug storage or in safe place.
- Medicines that are not used or not all used must be kept in storage and ensure the original shell packaging. In the case that the original packaging is damaged, it must be switched to another package with enough information (e.g. drug name, expiration date and object prevention...).
- The protective clothing must be cleaned after washing the equipment spraying.
- Check the amount of spray bottle that has a corresponding quantity of the proposed drug. The equipment should be improved and calibrated if necessary.

Note guidance

General information (as same as item 1)

Forms

Form 11: Purchasing and receiving pesticides. Storage of pesticides

Purchasing date	Name of pesticides	Quantity (packets, bottles)	Packaging method (g, ml, kg, L/packets, bottles)	Price	Expiration date	Name and address of seller	Buyers
20/03/2010	Fipronil (Regent)	2 packets	100 g/packet	5000 VND/packet	15/12/2011	Mrs. Hang, group4, Tan Qui Tay, Binh Chanh	Van (wife)
...					

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every each months).

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

Form 12: Using plant protection drugs

Name of field*:	Type of vegetable:
Cultivate area (m²):	Variety:
Sowing date/ planting seedlings:	Expected harvesting:
Number of variety (optional):	

Spraying date	Name of pesticide	Dose (ml, L, g, Kg/1l water or 100 l water)	Number of drug solution used (litre)	Isolation time (days)	Implement person
20/04/10	Sherpa 25 EC	10 ml for 20 litre of water	40	7	Toan (husband)

Note: use 01 page for 01 crop for 01 crop season (from the planting to the harvesting). If intercropping, make ensure that 01 page for 01 crop.

**Name of field: write the code. For example, 35_A_12, in which 35 is the member code, A is the name of field/ line and 12 is the number of entire field/ line that the farmer have.*

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every each months).

f. Harvesting, packaging and storing fresh vegetables

(Not containing the process in the handling house)

Food safety hazards: chemical and biological hazards can occur due to the isolation period is not ensured when spraying and using fertilizer; by harvesting equipment, containers, contaminated vehicles or by hygiene of people.

Good Agricultural Practice:

Harvesting

- Only harvest when the product has sufficient isolation time of pesticides and fertilizers.
- Carry out personal hygiene and ensure sanitary conditions in harvest.
- Check whether the plants have been contaminated by animals (such as animal dungs, and dead animal...).
- Do not use the shell packaging of fertilizers and pesticides to cover and contain the products.
- Check the harvesting equipment and containers of products to ensure that they are clean and in good state of use.
- In harvesting, do carefully to avoid crushed or damaged products.
- Avoid the product to contact to ground.
- Remove foreign objects (pieces of glass, metal, brick and stone...), bruised and damaged vegetables, pests and other crop residues (leaves, branches...).



Packing fresh vegetables on the farm

- Choose the suitable location where is isolated from composting areas, garbage and animal grazing.
- Checking the packaging equipment, containers, and packing materials to ensure that they are clean and in good state of use.
- In case that vegetable is needed to wash, the water must have quality standards of processing. The water should be changed regularly to ensure the quality and prevent pollution.
- If towel is used to clean up some vegetables and fruits, they must be replaced frequently to ensure cleanliness.
- Packing actions should be careful to avoid crushed or damaged and contaminants on the products.

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

- Remove the foreign objects, bruised and damaged vegetables and other residues (leaves, braches...).
- Do not let the products near the ground.

Transportation and storage of fresh vegetables on the farm

- Checking and cleaning the vehicles before putting up vegetables.
- Need to remove soil clinging to the product containers as clean as possible before being loaded onto transport vehicles.
- Do not transport products, product containers with goods likely to contaminate products (fertilizers, chemicals, fuels and waste, etc.).
- Cloaking products and product containers to avoid the risk of dust, dirt in the sorting and transport process.
- Make special note of measures to prevent pollution of products when use animals (cattle, horses...) to pull the product transportation.
- The area used for storage products must be clean, dry and there is no risk of pollution and away from the fertilizer and agricultural chemicals.
- Do not let the products directly on the floor transportation or storage floor.

Note guidance

General information (as same as item 1)

Forms

(Notes: farmers/ workers can choose the form 13a or both 13b and 13c)

Form 13a: Harvesting, packaging and selling products

Harvesting date	Vegetable harvested	Field and harvested area	Quantity of selling or storing	Transportation	Harvesting and packaging person	Sellers	Buyers
15/7/2010	Spinach	35_A_12: 35m2	125 baskets type I	Motorbike	An (husband)	Thu (wife)	Cooperation

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*The code block is followed the registration of household vegetable production; 35 is the farmer code; A is the name of the field/ bed/ plot production and 12 is the number of beds, plots.

**Types of packaging: kg, crate or box...

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every each month).

Form 13b: Harvesting and packaging

Harvesting date	Name of products	Name and area harvesting field	Packaging method (kg/ bag, kg/ bunch and kg/ crate...)	Quantity (bunch, bag and crate)	Harvesting person
29/12/09	Cabbage	35_A_12: 35m ²	50 kg/ crate	20 crates	Van and Loc

Recorder: farmers/ workers

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every each month).

Form 13c: Delivery products

(It is used when there are more than one customers, the information for all products that move out the farms must be filled)

Selling date	Products	Name of field/ lot	Selling quantity (kg)	Packaging method (kg/ bag, kg/ crate...)	Buyer's name (Cooperation, traders or processors)	Sellers
29/8/10	Tomato	14_C_35	100 kg	20 Kg/ crates	Phong Thuy farm	Van (wife)

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every each month).

g. Cleaning tools, equipment, containers and loading areas, storage products

(Not applicable to the processing)

Food safety hazards: the products are contaminated from the biology, chemistry and physics hazards due to the unreasonable use, cleaning and maintenance of equipment and tank.

Good Agricultural Practice:

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Purchasing, receiving and storing materials for cleaning and disinfection

- Only buy the cleaning agents and detergents that are capable of removing chemical and biology contaminants.
- Select the place that used for storing and conserving hygiene and cleaning; it can be locked to prevent contamination for fresh vegetables.



Principles of general hygiene

- Farmers/ workers must be trained in cleaning process; understand and practice well the guidance for using chemical hygiene and cleaning.
- Cleaning must be done in a separate area, away from the processing area, storage and isolated from the tools that have been cleaned.
- Water used for cleaning must be ensured that the quality is suitable for processed vegetables.

Order of cleaning

- For equipment and containers:
 - ✓ Eliminate all plants, soil and crop residues...use a brush or other suitable tools for cleaning (if necessary).
 - ✓ Use clean water or bleach (if necessary).
 - ✓ Check and repair if there is damage.
 - ✓ Keep in requirement places to prevent pollution; avoid contact to the floor.
 - ✓ Check and clean again if they are dirty.
- For preservation of the product areas:
 - ✓ Remove all the plugs of all electrical equipment from the power source; use plastic shield to cover the electric motor, electric box, electric connection points and lamp (if have).
 - ✓ Clean with a brush or suitable tools.
 - ✓ If there are chemicals used, they must be cleaned and disinfected to comply with the directions on label.
 - ✓ Check and clean again if they are dirty.

Note guidance

Forms

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

Form 14: Purchase and receive of chemical cleaning. Storage and keeping chemicals

Purchasing date	Chemical name (trade name)	Quantity (kg, l)	Name and address of sellers	Name of buyers
25/8/2010	Vimper	1 litre	Mr. Khanh, group 1, Tan Phu Trung, Cu Chi	Mrs. Dao

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every three months).

Form 15: Using cleaning chemical equipment, tools, containers and product storage areas

Implement time	Tools/ equipment and cleaning area	Chemical used	Implement person

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every three months).

h. Management and process waste on field

Food safety hazards: products are contaminated for biological and chemical threat due to the inappropriate of management; therefore, there is cross contamination.



Good Agricultural Practice:

- Check periodically fields every month to collect all the waste.
- Collect all the waste in production every day, for example, sowing, planting trees, spraying and harvest from the packing operation.
- Classification of waste basing on its characteristics:
 - ✓ Seed and seedling packaging, fertilizers and packaging materials (e.g. bags, strapping and carton...)
 - ✓ Pesticide and other chemical packaging
 - ✓ Remnant vegetation during the harvesting, handling and packaging (e.g. weeds, stems, leaves, and removed vegetables...)
 - ✓ Animal dead (if have)
- Handling and disposal of waste
 - ✓ The packaging contains fertilizer, seeds, seedlings, rootstock and packaging materials...must be collected and stored in a safe place and moved to the urban environment agencies for handling and disposal.
 - ✓ The packaging of pesticides and other chemicals must be collected and stored in a safe place. The destruction must be carried out by agencies and function organizations. Farmers and workers must not arbitrarily destroy.
 - ✓ All crop residues can be used to compost organic fertilizer.
 - ✓ Animal dead may be buried in a safe place and away from production areas or compost as fertilizer as normal organic fertilizer.

Note guidance

General information (as same as item 1)

Forms

Form 16: Handling and disposal of waste

Handling and disposal date	Type of wastes	Handling and disposal method	Place for handling and disposal	Implement person

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26/8/2010	Pesticide packaging	Company collected	A	Processing factory of company A in HCM	Anh (wife)
26/8/2010	Crop residues	Compost organic fertilizers		In compost area	Anh (wife)

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (at least every three months).

i. Water used in the processing

Food safety hazards: products are contaminated from the water that used in washing and handling of the processed products.

Good Agricultural Practice:

Water source

Water used for processing should be from wells but it must be minimum drinking water standards that promulgated by national technical regulations QCVN 02/ 2009 issued by the Ministry of Health or equivalent standards.



Assessment of water resources

Assess at least once a year for ground water (e.g. water from wells) about the chemical and biological pollution criteria in accordance with:

- The agricultural and industrial activities located close to the wells and the risk of polluting water as well as pollution risk from flooding.
- The other risks of pollution e.g. waste near water sources. Not need to evaluate tap water.

In the case of leaching, leaking and flooding, the managers should immediately implement the following controls:

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- Assess the level of pollution water sources through analysis.
- If the water is contaminated, it cannot be used; thus, the farmers should find a replacement water until the pollution can be solved.
- Implement corrective actions to ensure the water meets standards.
- Any unusual and corrective actions should be recorded.

Testing water quality

- For groundwater, samples should be taken 2times/ year, once in the dry season and other in the rainy. Public water should be checked once per year.
- Water sample should be taken in the final water level in accordance with the current method and sent to designated laboratories. If the water is contaminated, the managers must implement the actions that are similar to section 2 and any changes in water sources and corrective actions should be documented.

Water treatment

If the water is needed to treat, it is necessary to buy permitted treatment chemicals as chlorine, pH regulators and water treatment. Ozone disinfection system can be used but it is needed to verify the effect before using. If chemicals are used, they must be monitored and controlled the dose and processed the chemicals at least 30 minutes/ time as directed by the manufacturer to ensure effective and efficient chemical. Record information about the process, methods and results to check again as needed.

To treat water with high efficiency, the implementation needs to adjust the pH value and remove organic matter in water (filtered, salvaged).

Water reuse

In the case of reuse or cycle to the preliminary stages of preparing vegetables and fruits, water must meet standards.

Maintenance of wells, storage tanks and water supply systems

- Wells and tanks must be covered carefully to avoid contamination from outside. The platform of well must be above the surrounding surface of about 30cm to prevent flood water to flow into the well.
- Checking and repairing wells at least once a year, especially one-way valve to ensure good operation to prevent backflow of water into the well.
- Check the water tanks and water supply systems in the state structure.

Product pollution from water sources

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

In any case, if the contaminated water is used for all stages in the processing, it must be performed risk assessment of chemical and biological pollution to fruits and vegetables; take samples to test the corresponding threat. If the test result shows that fresh fruits and vegetables are contaminated, they are not necessarily taken to consume. However, to note the fact that the time from sending samples to getting results usually last 7-10 days. During this time, fresh fruits and vegetables have been losing the nutritional value.

Note record:

Form 17: Record of the water treatment process

Date	Time	Level of observed concentration	Name of chemicals	Added quantity	Processing person	Signature

Implementation: managers or staff assigned to processing.

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff.

Form 18: Notes on the examination and assessment of water and sanitation, maintenance of wells and water supply systems

Testing and assessment					Corrective actions			
Checking date	Water sources	Position of water sources	Describe observed threats	Implement person	Corrective date	Corrective actions or repairing	Water analysis results*	Implement person

Implementation: managers or staff assigned to processing.

*Note that if the results meet the requirements.

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

Testers: the managers, technical staff or quality control staff.

Form 19: Recording the purchasing water treatment chemicals

Purchasing date	Name of chemicals	Quantity (Kg/liter)	Name and address of sellers	Storing place	Buyers	Signature

Implementation: managers or staff assigned to processing.

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff.

j. Cleaning and maintenance in the processing

(Not applicable for wholesale markets and supermarkets and the simple processing on farm)

Food safety hazards: products are contaminated from biological and chemical threats due to the processing house, and dirty processed equipment.

Good Agricultural Practice

Frequency of implementation

- Cleaning and maintaining floors, the toilet facilities, equipment, tools, containers and recycling vehicles every day.
- Adjust the devices according to manufacturer's instructions.
- Check the areas around the processing every week.



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- Testing, cleaning and maintenance of the processing components such as walls, windows, ceilings and lighting systems every three months.

Order of implementation

1. Purchase, receipt and storage of detergents, cleaning and lubricating oil:

- Only buy the detergents and cleaning as soap, detergent, chlorine, ammonium compounds and the alkali... for food and effective cleaning agents for chemical pollutants and microorganisms.
- Only buy oil and fat used in food processing for equipment.
- When receiving them, check to see that these chemicals are the correct to buy.
- Store them in a separate area and are controlled carefully to avoid contaminating to fresh fruits and vegetables.

2. Cleaning the surrounding areas

- The surrounding area should be checked and removed garbage to prevent the infiltration and infestation of pests such as insects, rats...

3. Cleaning and maintenance

3.1. General requirements

Managers and staff members who are responsible for the preliminary cleaning and maintenance must comply with the order and the following requirements:

- The appropriate training on procedures for cleaning and maintenance.
- Develop a program for cleaning and maintenance (including schedules) in frequency as recommended.
- Maintenance and cleaning should be done in the given order, for example from top to bottom or from the ceiling to the floor.
- Water used for cleaning must ensure the prescribed standards.
- The cleaning of tools, containers and recycling facilities must be done in a certain area, and away from fresh fruits and vegetables.

3.2. Cleaning and maintenance

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Every three months, managers and staff should check processing, maintenance and cleaning products containing region by following up the order as follows:

- Check ceilings, walls and around windows to prevent pests and inspect the pipeline leaks; the paint may chip into products; the light taken to protect...if there is any damage, it should be promptly repaired.
- Cleaning all workshops, including ceiling and walls. If necessary, scrub with a brush and detergent as soap, detergent powder, etc... follow the instructions.
- Cleaning the ventilation system as much as possible.
- Bring out all the washed water, note that no wash water shot into the devices.
- To dry at room temperature.

3.3. Scouring and cleaning toilets

- Collecting and disposal of waste spillage on the floor every day.
- Use the appropriate detergent and follow directions of cleaning toilets, sinks and other areas; washing the entire floor.
- Check and complement full of toilet paper, soap and towels.

3.4. Cleaning and maintenance tools, equipment and reuse-containers

- Maintenance and adjustment according to the manufacturer's instructions and cleaning equipment every day.
- Test instruments, equipment and containers to see if there is any damage. If have, it is necessary to repair immediately.
- Check oil and grease on the moving parts of equipment.
- Clean and disinfect instruments, equipment and containers. If using chemical cleaners, disinfectants should follow instructions on the preparation.
- Rinse with standard water, if any parts of the coated device that cannot be washed with water, use a damp cloth to wipe. Leave to dry naturally at room temperature.
- Checking equipment and tools, reuse-containers before using them. If they are not clean, they should be washed again.

3.5. Cleaning and maintenance of floor

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

- Every day, remove any dirt or residues on the floor.
- Use low-pressure water to rinse the entire floor to remove all dirt or dust. Note that do not let water touch to devices.
- Use of detergents, the disinfectants should follow instructions on the preparation.
- Drain all water and wash floor with clean water.
- To dry at room temperature.

3.6. Means of transportation

- Checking the transportation to see whether there is any physical hazard such as debris or sharp objects that could puncture vegetables and fruits. If have, they must be removed or repaired in time.
- Eliminate waste and dirt, oil and grease. If necessary, scrub with chemical washing; then, dry them before loading goods.
- Do not transport with goods likely to cause pollution of vegetables and fruits such as liquid chemical tanks that can leak.
- Shielding means to prevent dust during transportation.

Notes

Form 20: Record of purchasing and receiving of chemical disinfection and hygiene

Purchasing date	Name of chemical disinfection and hygiene	Quantity (kg/ liter)	Name and address of sellers	Name of buyers

Implementation: managers or staff that assigned.

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

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Testers: the managers, technical staff or quality control staff (every three months).

Form 21: Record of cleaning and maintenance

Purchasing date	Tools are cleaned and maintained	Name of chemical used	Any incorrect found	Corrective actions	Corrective person	Signature

Implementation: managers or staff that assigned.

k. Cleaning and disinfection of fresh vegetables

Food safety hazards: products may be contaminated by biological hazards of dirt clinging to the field during harvest products; or from other devices, tools, containers and transporting harvest during transportation from the farm to home; or the processing is not hygienic.



Good Agricultural Practice:

Frequency of implementation

The managers or technician must do the following:

- If using chemical disinfection, monitoring and supervision the concentrations of chemical disinfectants and pH regulators with the frequency 30 minutes/ time or less.
- If using ozone generators, they should be adjusted according to manufacturer's instructions or maintain documents attached.

Order of implementation

1. Purchasing, receiving and storing chemical disinfection
 - Only buy the disinfectants as chlorine, chlorine dioxide, bromide, iodine, trisodium phosphate, quaternary ammonium compounds, organic acids, hydrogen peroxide and

peracetic acid used for food and are effective in reducing microorganism pollutions on fresh fruits and vegetables.

- pH regulators and testing kits (e.g. special strips of paper to check the concentration of the disinfectant or pH).
- When receiving them, must ensure that they are correct chemical bought.
- Store them in areas where are controlled and prevent pollution for fresh fruits and vegetables.

2. Cleaning fresh fruits and vegetables

Cleaning is the process of removing as much soil, dirt and organic matter clinging to fresh fruits and vegetables as possible. The implementation person can clean fruits and vegetables with:

- The air pressure to remove soil contaminants that stick or cling to the products.
- Damp towels. In this case, the towels must be cleaned and replaced regularly to prevent contaminant build up and spread of microbial contamination to fresh fruits and vegetables.
- Wash fruits and vegetables with water, in this case:
 - ✓ Make sure that water quality accordance to standards.
 - ✓ Water should be changed regularly to avoid accumulation of organic matter and prevent microbial contamination spread to fresh fruits and vegetables.
 - ✓ Wash water temperature should be higher 50⁰C than the temperature of fresh fruits and vegetables to avoid sucking water, thus, making the contaminants and microorganisms on the surface may be wrapped into.

3. Disinfection of fruits and vegetables (optional)

Managers or technician must:

- Well-trained on the use of disinfectants.
- Clean fruits and vegetables before applying the chemical disinfectants.

3.1. Treated by ozone

- The concentration of ozone that efficiency for vegetables and fruits is 20ppm.

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

- Need to control the quantity of ozone and time of exposure to vegetables so as not to damage (e.g. dark spots) on fruits and vegetables.
- Adjust the ozone generator according to the user manual of the manufacturer.
- Not required to rinse or wash.

3.2. Treated with chlorine

- The chlorine that put into water is about 150 to 200ppm of total chlorine or about 2 to 5ppm of free chlorine deposition after exposure to the products. Make ensure that the pH value is about 6-7. The rate of chlorine is too low, the treatment will be ineffective. In contrast, the level is too dense; the products will be contaminated by the chemical, for example, to form chloramines. The effect of chlorine treatment is influenced if the pH value is not adjusted to the proper level.
- Need to monitor and control the density of chlorine and pH in water.
- Time of treatment vary depending on the volume of processed products and processing time. Should periodically check the concentration of treatment chemicals and pH with a frequency of 30 minutes/ time or longer if less products handling.
- Processing time may vary depending on the product and chlorine concentrations of no more than 5 minutes.
- In the case that the chlorine level is too high, fruits and vegetables can be cleaned by coating with standard water.

3.3. Other chemical for disinfection

The other disinfectants such as chlorine dioxide, bromide, iodine, trisodium phosphate, ammonium compounds, organic acids, hydrogen peroxide, and peracetic acid can be used to destroy or reduce microbial contamination.

Notes

If the chemical disinfectants are used, the managers must build forms to record the following information:

Form 22: Record of purchasing and receiving chemical disinfectants

Purchasing date	Chemical name and pH regulators	Quantity	Name and address of	Buyers	Signature
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Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

		(kg/ l)	sellers		

Implementation: managers or staff that assigned.

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff.

Form 23: Record the processing

Date	Hours	Concentration level observed	Chemical name and pH regulators *	Added quantity	Implementation person	Signature

Implementation: managers or staff that assigned.

** Name of chemicals and pH regulators (e.g. pH⁺ or pH⁻).*

Check the compliance

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff.

1. Management and waste treatment in the processing

Food safety hazards: products can have biological or chemical hazards from waste in the processing due to the mismanagement. Then, they are cross-contamination.

Good Agricultural Practice

Frequency of implementation

- Perform weekly in areas that surrounding the processing.
- Perform every day in the place for processing and packaging.

Process of implementation

- Check weekly in the surrounding area to gather all kinds of garbage/ waste.
- Every day, collect all waste of the processing and packaging. For example, from the classification, sorting, trimming and chemical processing.
 - ✓ The vegetables that removed after pruning and classification must be immediately contained to the tank (trash) and when it full, trash must be taken destroyed immediately.
 - ✓ After the destruction, trash can continue to be used to collect garbage and trash should be cleaned daily.
- Classification of waste based on their characteristics.
- Waste must be destroyed according to their nature:
 - ✓ Waste from plants can be used to make organic fertilizers.
 - ✓ The packaging container of the post-harvest handling chemical and others must be let in right place before it is sent to the destroy organization or company.
 - ✓ If there are no organizations or companies, the destruction must be done in safe place, do not pollute water sources and environment.
 - ✓ Insects, dead pests can be destroyed in place that away from water sources or can be used to make compost.



Notes

Form 24: Record of collecting and destroying waste

Collecting and destroying date	Type of waste	Destruction methods	Place for destruction	Implementation person

Implementation: managers or staff that assigned.

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (every three months).

m. Control insects and pests in the preliminary

Food safety hazards: products are contaminated by biological and chemical hazards due to the infection of insects, animals and chemical to prevent those insects and animals.

Good Agricultural Practice:

Frequency of implementation

- Renovation and maintenance the building every three months.
- Maintenance the surrounding areas every week.
- Check weekly to see the bait and traps whether damaged.

Process of implementation

- Protection the building, especially the area of preparation, packaging and storage. Do not let pests, animals enter those areas.



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- Cleaning the surrounding areas such as lawn mowing and cleaning wastes.
- Process waste regularly to reduce the attack of pests. Can spray inside and outside buildings to control pests.
- Develop programs to control pests with traps, baits, etc...

The pest control can be assigned to an independent company.

Notes

Form 25: Record the pest control program

Chemical used	Concentration for spraying/ handling	Spraying/ handling date	Spraying/ handling position	Implementation person

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (every three months).

Form 26: Record the Pest management program

Checking date	Observed pests (if have)	Observed position	Actions (if required)	Implementation person

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (every three months).

n. Storage and selling fresh vegetables in the preliminary

Food safety hazards: products can be contaminated from biological threats due to the inappropriate storage.

Good Agricultural Practice:

Preservation of post-harvested fresh vegetables in preliminaries

- Storage in place that there is not hazardous for fresh fruits and vegetables and other containers; storage area must have opened-air and protected (covered if necessary).
- To avoid contact between the harvested vegetables and selling vegetable, tools and other chemicals, etc...



Preservation vegetable products, fresh fruits packed in a complete processing

- Vegetables are prepared to sell must be placed in private, clean sector (depending on the conditions of each vegetables and fruits), and there is no danger of contamination for vegetables and other containers.
- Not too directly to the floor.
- Away from the walls from 8 to 30cm.

Notes

Form 27: Receiving, storing and packaging fresh fruits and vegetables in preliminaries

Harvesting date	Receiving products in preliminary (types,	Product sources (plot location,	Storage date (if have)	Packaging date	Packing method (quantity,	Sellers (name and	Name and signature of implement
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	quantity)	plot harvest)			quality)	address)	person

Implementation: packaging person, managers or assigned workers.

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (twice per year).

3.2. GAP and recording for farm owners, manager cooperatives and cooperatives

a. Evaluating and choosing production area

Food safety hazards: biological and chemical threats in water, soil in surrounding areas including industrial zones, farm livestock, poultry, etc... can lead to product contamination.

Good Agricultural Practice:

Evaluation and corrective actions

- Need to make an assessment in the field and investigate the history of the production and surrounding areas.
- Need to review the following factors:
 - ✓ The land use of the production and the surrounding areas:
 - The invasion of wild and captive animals to the plant and water.
 - The concentrated livestock. E.g. cattle or poultry.
 - The waste systems that near the production area.



- Place for collecting waste.
- Industrial activities
- Waste treatment factory.
- ✓ The history of previous use of the land:
 - Place for storing animal manure and organic wastes
 - Flooding from contaminated surface water (microorganism and chemicals)
 - Use of pesticides, especially herbicides (DDT, etc...)
 - Place for collecting of agricultural chemicals
 - Landfill
 - Industrial activities
 - The battle field
- If the investigation results and survey the plant and surrounding areas show the danger of pollution, soil and water sample must be taken to test the quality. Results of analysis of heavy metals residues in soil and water must be compared to the maximum allowed threshold that issued in the Decision No. 99/2008/QD-BNN.
- In case of soil and water samples are contaminated, vegetable products should be sampled and analyzed pollution levels. If vegetables are not contaminated, it is necessary to maintain the level of pollution control for land and water. In contrast, vegetable production must be stopped at the request of VietGAP and implementation of remedial measures. Contaminated vegetables are not sold for consumption.
- If water is analyzed the microbiological criteria, the results must be compared to the standard TCVN 6773:2000. Measures to reduce/ deal with contaminated irrigation water can be found in the Code of Practical standards for water used in the production of vegetables.

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Note guidance

Complete the following recording forms

Form 28: Assessment of land

Reviewer:, Evaluating date:

Evaluation position:, Area:

Environment	Pollution factors	Pollution sources	Corrective actions used
Soil	Microorganisms		
	Chemicals		
Water	Microorganisms		
	Chemicals		

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (once per year).

Form 29: Using chemicals to correct the soil and water pollution

Farmer:

Area:

Date	Land area (lot, piece)	Water source (position)	Name of chemical used	Quantity used	Processing method	Implementation person

Recorders: technicians, farmer owners.

Check the recording

No.	Checking date	Assessments	Corrective request	Signs

Testers: the managers, technical staff or quality control staff (once per year).

b. Training the farmers



Responsibility: the representative groups, staff or representative of the cooperative farms, organizations and individuals.

Building the training programs:

- The trainers must comply with the content of the training of farmers (TOF) to ensure that they capture the requirements of the practical standard VietGAP, the code of practical standards and regulations of personal hygiene.
- The content of each training program should be designed according to specific requirements and practical tasks of employees working on the farms.

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- The program and training content should include all of the SOPs and the specific sequence of safe vegetable production such as fertilizers and pesticides, harvesting, packing, loading and storage of fresh vegetables in farm; operation and maintenance of equipment, sanitation, personal hygiene regulations, working safety and environmental protection.

Organizing of training

- The training program should be implemented with farm workers in the form of sitting through regular education with technical performance (e.g. hand washing), display (e.g. utensils and tools) and training content of each.
- All employees working on the farm to attend training or instruction on all the necessary skills.
- The seasonal workers or part-time should be trained in personal hygiene regulations and the content is directly related to their mission.
- For new comers, they should be trained as soon as they come each item before they do the job.

Monitoring and evaluation of training

- It is necessary to assess the effectiveness of programs and training content.
- The workers should be monitored periodically to ensure that they perform properly and efficiently VietGAP requirements, codes of practice and standards of personal hygiene regulations.
- If the observed inequality, there should be additional training sessions for both groups of employees or individual training content specific for each employee.

Additional training

- The program and training content should be updated and adjusted periodically.
- If the training is adjusted, there should be one training session to provide farm labor good practice that have just updated.
- Additional training should be organized at least once a year for employees working on the farm.

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Notes

Fill information into the following forms:

Form 30: Training the employees

Training date	Content/ topic of the training	Lecturers and training organization	Number of labour in the training
25/9/2010	<i>Fertilizer and how to use them</i>	<i>Horticulture Division – Department of Agriculture</i>	<i>15 labours</i>
...	

Recorders: farm owners or board of cooperative/ group production

*Note: attach the list of farmers that trained at each.

PART II: APPENDIXES

Appendix 1: Additional questions for discussion on food safety

Topics	Questions
Choosing and preparing planting position	<ul style="list-style-type: none"> - What are the crops in previous crop season? - Is there any information of using fertilizer and plant protection drugs before? - Is the soil analyzed? - The surrounding threats (high ways, ...) - Are there animals that near your farm? - Do the plants grow well?
Planting	<ul style="list-style-type: none"> - Why do you buy seeds that stored in that farm? - How do you store seeds? - Where do you buy seeds? - Do you handle seeds with plant protection drugs? - Are these varieties sold much in local?
Watering	<ul style="list-style-type: none"> - What are the water sources for watering? - Are there animals that drink in those water sources? - Do you see plant residues near the water sources? - Do you see farmers that clean their spray bottle near the water sources? - Do you see any toilets near those? - How do you water?
Supplying fertilizers	<ul style="list-style-type: none"> - Do you use manure? - Why does manure become threat for food safety? How are the manure prepared? - When do you supply? How? What type of fertilizer do you use? What are the quantities for chemical fertilizer? Do you use manure as same as others? How to use them?
Pest and disease prevention	<ul style="list-style-type: none"> - What are pesticide residues? - What will happen to the pesticide residues? - How do you know about pesticide residues on products?

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	<ul style="list-style-type: none"> - What are the methods to prevent and reduce the concentration of pesticide residues? - Where are the places for storing plant protection drugs? How? - What methods do you use to prevent?
Weed prevention	<ul style="list-style-type: none"> - What type of herbicides do you use? - What is the last time you use herbicide? - How do you use them?
Harvesting	<ul style="list-style-type: none"> - What plants bring fast profit after harvesting? How do you feel about that profit? - When do you harvest? Which time, the ripen level?
Sanitation/ cleaning	<ul style="list-style-type: none"> - What is the water source for cleaning? - Is it contaminated chemical? Manure....?
Sorting and packaging	<ul style="list-style-type: none"> - What types of materials you used for packaging? Do they influence on the products? Who sort, package? How did they do? - Do you remove damaged vegetables? Why? Why not?
Storage	<ul style="list-style-type: none"> - Do you use any chemical to last the storage time? Where do you store products? Is it near the chemical storage? Do you store at home?
Transportation	<ul style="list-style-type: none"> - How far is it to transport products? What are the reasons that cause damage of your products during transportation? - How do you avoid and reduce the damage time during transportation?

Appendix 2: Sampling methods for analysis in the production of fresh vegetables

(Quoted from standard samples of fresh vegetables, TCVN-2010)

Principles of sampling

- Should determine the purpose of sampling and analysis criterion before sampling.
- The sampling must be carried out randomly so that the forms represent field plot production.
- Ensure there is no confusion about the samples from the laboratory production and minimize the changes of mechanical properties, physical and chemical properties of samples.

Time of sampling

- Depending on the purpose to determine the time of sampling.
- For assessing the quality and safety of products, samples should be taken at the right stage for harvesting.
- Time for sampling: avoid intense sunlight or rainy time.

Sampling tools and sample containers

Sampling tools

- Tools for sampling and sample containers must be clean, dry and without changing the chemical composition and the micro-biota of samples.
- The materials used to collect, cut vegetables (gloves, knives and scissors...)
- The metal tools (knives, scissors...) must be disinfected prior to sampling in one of the following measures: 700 wiped with cotton soaked in ethanol, dipped in boiling water at a temperature of 100⁰C in 10 to 20 minutes, wet sterilization (autoclave sterilization) at a temperature of 121⁰C at least 20 minutes; dry sterilization (oven) at a temperature of 170⁰C at least 60 minutes or sterilized by ultraviolet light.

Sample containers

- They are utensils used for storing vegetables after sampling:
 - ✓ Direct container sample: nylon bags, plastic bags, paper bags.

- ✓ Indirect container sample: basket, plastic bins, plastic trays, cardboard, foam box...
- Containers must have capacity and shape that appropriate to the size of the sampling units. The material of the containers that directly contact to samples must be waterproof insoluble, do not absorb and does not cause mechanical damage to the vegetables.

Number of sample tested, the minimum samples

Field plots produced by a household or a business manager

- Lot farm production area ≤ 5 ha: each batch took 1 sample tested.
- Lot farm production area > 5 ha: must be divided into small lots so that each lot has an area < 5 ha, each small batch took 1 sample tested.
- The number of minimum sample for testing depends on the field plot area of production (see appendix 1).

Field plot that many households have the same production conditions

- Lot farm production area ≤ 5 ha: each batch took 1 sample tested.
- Lot farm production area > 5 ha: must be divided into small lots so that each lot has an area < 5 ha, each small batch took 1 sample tested.
- The number of minimum simple sample for 01 testing sample must be based on the two factors: the production area (Appendix 1) and single household is sampled at least equal to \sqrt{n} in which n is the number of households participate in small batch production.

Field plot of many households do not product the same production conditions

- Taken 01 sample for each.
- The number of minimum single sample depends on the production area of field plots (appendix 1).

Vegetables at harvest time

- For vegetables that have large quantities (≥ 0.5 kg) as water melon, cabbage, kohlrabi and etc.: sampling unit distributed diagonally or the zigzag five points (Figure 3a.2 and Appendix 1.1).

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- For the vegetables that have medium mass, small ($< 0.5\text{kg}$) as water spinach, beans and species:
 - ✓ Lot fields are narrow shape: sampling as zigzag shape, the number of points depending on the production areas (Figure 3a.2 and Appendix 1.1):
 - Area $\leq 1000\text{m}^2$: take at least 5 points.
 - $> 1000 - 10,000\text{m}^2$: take at least 6 points.
 - $> 1 - 5\text{ha}$: take at least 12 points.
 - $= 5\text{ha}$: take at least 16 points.
 - ✓ Lot fields are balance shape: sampling diagonally distributed 5 points or horizontal or vertical lines:
 - $\leq 1000\text{m}^2$: take the diagonal 5 points (Figure 3a.1).
 - $> 1000 - 10,000\text{m}^2$: take at least 6 points (Figure 3a.3).
 - $> 1 - 5\text{ha}$: take at least 12 points (Figure 3a.6).
 - $= 5\text{ha}$: take at least 16 points (Figure 3a.7).

Sampling methods

- At each point, collected one single sample or more trees, vegetables depending on how the minimum adequate amount to take.
- Plants were sampled have normal growth, no deformity, no insect damage and at least 1m from the bank, not take the outside row.
- For vegetables that have edible fruits: samples were taken in the trunk and branches, but do not take the top and bottom fruits.
- How to obtain sample unit: disconnect the fruits, cut the tubers, vegetables and edible parts are taken.

Packaging, labeling and sealing for the testing samples

- The samples must be packaged, sealed and labeled carefully to ensure that they are well-maintained, no damage, no cross-contamination or sample confusion when are delivered to the laboratory.

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- Packaging: wrap each sample unit into the appropriate sample containers such as envelope, perforated plastic bags, plastic bags, paper bags that are not waterproof (specific requirements in section 5.3 and 7.2).
- Labels must have appropriate size, bright, waterproof, hard to erase, easy to read and includes a number of necessary information to identify as:
 - ✓ Encoded symbol of the sample
 - ✓ Sampling time
 - ✓ Name of sampling and signatures
- Seals must be affixed at the outer edge of each sample package. Seal should be used with own seal of the sampling and vegetable production organization.

Preservation time in transit

- After sampling, the sample containers must be transported immediately to the laboratory to minimize the change in the initial quality of the sample.
- The storage and transportation time depends on the fruits and vegetables; hard-shelled fruits will have longer storage time than vegetables and soft fruits. After taking a maximum of 24hrs, samples should be handled in the laboratory.

Method of preservation in transit

- Packages of vegetable samples by one of the envelope: PE (polyethylene), LDPE (Low Density Polyethylene), HDPE (High density Polyethylene), OTR 2000, OTR 4000. Packaging method: individual packaged unit vegetable in a package (for vegetables in large quantities) or joint unit to form one or several packages (for vegetable have medium mass, small).
- Store sample at 10 – 15⁰C in a dedicated cabin or in insulated boxes containing dry ice.
- Combine vegetables in a package form in the envelope of storage at low temperature.

Transport unit sample to the laboratory

- Transporting at low temperature (10-15⁰C) by car or using dedicated cold boxes, insulated boxes containing dry ice bags.
- Transport at room temperature: only vegetable samples are transported to the laboratory to process within a day.

Annex 2.1. Number of tested samples and number of minimum single samples (regulation)

Plot field production area	The minimum tested samples	The minimum single sample/ tested sample
$\leq 1.000 \text{ m}^2$	01	5
$>1.000 - 10.000 \text{ m}^2$	01	6
$>1 - 5 \text{ ha}$	01	12
$\geq 5 \text{ ha}$	01 sample/ 5ha	16

Notes: for vegetables that have large quantity ($\geq 0.5\text{kg}$), the simple samples for tested samples are 5 for four areas.

Annex 2.2. Fresh vegetables: the minimum size for tested samples (regulation)

No.	Groups of veg.	Types of vegetables	Natural form of taken samples	Minimum size of tested sample (A)
1	Species	Parsley, basil, dill, corn, shiso and marjoram...	Edible parts	0.5 kg
2	Leaf vegetables	Large mass vegetables ($> 0.5 \text{ kg/plant}$): cabbages...	Edible parts (entire plants)	5 plants
		Medium mass vegetables ($>0.1 - 0.5 \text{ kg/plant}$): vegetables, chayote, celery and leeks.....	Edible parts	2 kg
		Small mass vegetables ($<0.1 \text{ kg}$): spinach, jute, water dropwort, pot-herbs	Edible parts	1 kg
		Lettuce, kale...	Edible parts (entire plants)	10 plants
3	Flower vegetables	Small cauliflower ($<0.5\text{kg}$)	Edible parts	10 plants
		Large cauliflower ($>0.5\text{kg}$)	Edible parts (entire plants)	5 plants

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		Cynanthe ...	Edible parts	0.5 kg
4	Fruits vegetables	Gourd, melon, cucurbit, pumpkin ... (>0.5 kg)	Entire fruits	5 fruits
		Cucumber, eggplant, chayote, sweet corn, okra, tomato... (>0.1 – 0.5 kg).	Entire fruits	10 fruits
		Tomato, pepper, eggplant, cucumber... (<0.1 kg)	Entire fruits	20 fruits (or 1 kg)
		Bean vegetables	Entire fruits	1 kg
5	Stem vegetables	Large kohlrabi (>0.5kg)	Entire stems	5 tubers
		Small kohlrabi (<0.5kg)	Entire stems	10 tubers
		Asparagus....	Edible parts (entire plants)	10 plants (or 1 kg)
6	Tuber vegetables	Beets, carrots, potatoes, taro, onion, leeks...	Entire tubers	10 tubers (or 1 kg)
		Onion, garlic bulbs (fresh)	Entire bulb	1 kg
7	Others	Scallion, chives	Edible parts (entire plants)	1 kg
		Sprouts	Edible parts (entire plants)	0.5 kg
		Food mushrooms	Edible parts (entire plants)	0.5 kg

Notes: A is chosen to suitable to cited references 2.1, 2.2, and 2.3.

Appendix 3: Heavy metals in soil

(Issued together with the Decision No.99/2008/QĐ-BNN October 15th, 2008, Ministry of Agriculture and Rural Development)

No.	Elements	Allowed maximum threshold (mg/ kg dry soil)	Testing method *
1	Arsen (As)	12	TCVN 6649:2000 (ISO11466:1995) TCVN 6496:1999 (ISO11047:1995)
2	Cadimi (Cd)	2	
3	Lead (Pb)	70	
4	Copper (Cu)	50	
5	Zinc (Zn)	200	

*Can use other method with equivalent corrective level

Appendix 4: The permitted maximum limitation of some heavy metals in irrigation water

(Issued together with the Decision No.99/2008/QD-BNN October 15th, 2008 of Minister of Agriculture and Rural Development)

No.	Elements	Permitted maximum limitation (mg/liter)	Testing methods *
1	Mercury (Hg)	0,001	TCVN 5941:1995
2	Cadimi (Cd)	0,01	TCVN 665:2000
3	Arsen (As)	0,1	TCVN 665:2000
4	Lead (Pb)	0,1	TCVN 665:2000

**Can use other method with equivalent corrective level*

Appendix 5: Permitted maximum limitation of some microorganisms and harm chemical on fruits, vegetables and teas

(Issued together with the Decision No.99/2008/QĐ-BNN October 15th, 2008 of Minister of Agriculture and Rural Development)

No.	Criteria	Permitted maximum limitation	Testing method*
I	Nitrate concentration NO₃ (for vegetables)	mg/kg	TCVN 5247:1990
1	Lettuce	1.500	
2	Species	600	
3	Cabbage, kohlrabi, cauliflower, garlic	500	
4	Onion, cucurbit, chili, eggplant	400	
5	Vegetable corn	300	
6	Potato, carrot	250	
7	Fruit beans, asparagus, sweet chili	200	
8	Tomato, cucumber	150	
9	Cantaloupe	90	
10	Onion bulbs	80	
11	Water melon	60	
II	Harmful microorganisms (for fruits and vegetables)		
1	<i>Salmonella</i>	0	TCVN 4829:2005
2	<i>Coliforms</i>	200	TCVN 4883:1993; TCVN 6848:2007
3	<i>Escherichia coli</i>	10	TCVN 6846:2007
III	Concentration of heavy metals (for fruits, vegetables and teas)		
1	Arsen (As)	1,0	TCVN 7601:2007; TCVN 5367:1991
2	Lead (Pb)		TCVN 7602:2007
	- Cabbage, leaf vegetables	0,3	
	- Fruits, others	0,1	
	- Tea	2,0	
3	Mercury(Hg)	0,05	TCVN 7604:2007
4	Cadimi (Cd)		TCVN 7603:2007
	- Leaf vegetables, herbs, mushrooms	0,1	

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	- Stem and tuber vegetables, potato.	0,2	
	- Other fruits and vegetables	0,05	
	- Tea	1,0	
IV	Pesticide residues (for fruits, vegetables and teas)		
1	Chemicals that mentioned in the Decision 46/2007/QĐ-BYT December 19th, 2007, Ministry of Health	Decision 46/2007/QĐ-BYT December 19th, 2007, Ministry of Health	TCVN or correspond ISO, CODEX
2	Chemicals that not mentioned in the Decision 46/2007/QĐ-BYT December 19th, 2007, Ministry of Health	CODEX or ASEAN	

Notes: Basing on the actual situation of pesticide used on production facilities to determine the high risk contamination chemical should be analyzed.

** Can use other method with equivalent corrective level*

*** Evaluate with more than 25g with Salmonella.*

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CHECKLIST FOR FRUIT AND VEGETABLE PRODUCTION ACCORDING TO VIETGAP

No.	Assessment criteria	Results					Error interpretation and time remedy
		Achi. (Ac)	Min. (Mi)	Max. (Ma)	Serious (Se)	Cri. (Cr)	
	1. Evaluation and choosing production area						
1 (A)	Is the production area suitable to planning of Government and local for expected crop production?	[]				[]	
2 (A)	Are the risks of chemical, biological and physical pollution due to contaminated production areas assessed?	[]			[]	[]	
3 (A)	Have there been enough scientific basics to overcome or reduce the risks of chemical, biological and physical pollution?	[]			[]	[]	
	2.Seeds and roots for grafted						
4 (A)	Have there been full documented records of remedial measures for seeds and rootstocks?	[]		[]	[]		
5 (B)	In the case of buying, Are there documents that record the sources of seeds and rootstocks?	[]	[]	[]			
	3. Soil and media management						
6 (A)	Has conducted annual analytical work and evaluate of potential risks of chemical, biological and physical and media of production area that cause contamination to products?	[]			[]	[]	
7 (B)	Are there any methods to prevent erosion and soil degradation?	[]	[]	[]			
8 (B)	Are there livestock grazing that cause pollution to soil and water in production area?	[]		[]			
9 (A)	If there is livestock grazing, is there any measure to ensure that the process does not contaminate environment and products?	[]		[]	[]		
	4. Fertilizers and supplements						

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10 (A)	Are the risk of chemical, biological and physical pollutions that cause contamination to products from the use of fertilizers and supplements assessed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11 (A)	Do you use the fertilizers that on the allowed list for business in Vietnam?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 (A)	Do you use decomposed manure and have enough documentation for them?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13 (A)	Have the tools, place for mixing and storing fertilizer and additives been maintained and hygiene to reduce the risk of contamination?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14 (A)	Do you record the purchasing and using fertilizers and supplements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Watering						
15 (A)	Does the water quality meet the current standards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16 (A)	Do you have records of assessing the risks of chemical and biological pollution from water use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Using chemical and plant protection drugs						
17 (B)	Are the organizations, individuals that use labor trained about chemical, plant protection drugs and their usage?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18 (A)	Are the labors that use or guide to use chemical trained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19 (B)	Do you apply the Integrated Pest Management (IPM) and Integrated Crop Management (ICM)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20 (A)	Are the chemical, biological drugs and pesticides in the allowed list?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21 (B)	Do you buy chemical, plant protection drugs and biological medicines from the stores that have business license?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22 (A)	Do you use the chemical, plant protection drugs as right as in label?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

23 (A)	Have you made diary to observe the using and handling chemical and plant protection drugs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24 (A)	Have the warehouses, sorting, storing, using and handling of chemical been made as requirements of VietGAP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25 (A)	Are the fuel gas, oil and other chemical stored separately in appropriate places?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26 (A)	Do you check the chemicals regularly to remove the out of date and banned chemicals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27 (A)	When you replace the packs and tanks, do you write enough information as the previous packs and tanks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28 (A)	Are the destroy actions done as the regulations of Government?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29 (A)	Do you check regularly the chemical use and residues?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Harvesting and handling after harvest						
30 (A)	Is the isolation time ensured?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31 (A)	Are the tools for harvesting, handling and storing clean and safe?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32 (A)	Do you comply with the actions that not let the products directly to ground?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33 (A)	Are the sorting, packaging and storing products away from chemical storage and other tools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34 (A)	Do you use clean water to wash vegetables after harvesting?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

35 (A)	Have the products been processed, sorted, and packaged with the regulations to ensure no contamination?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
36 (A)	Do the chemical used to treat post-harvest product implement the provision of safe use of chemicals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
37 (A)	Do you implement the safe and hygiene conditions and protect the lights in processing area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
38 (A)	Are the processing, and tools cleaned regularly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
39 (A)	Are the animals and poultry isolated from processing area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
40 (A)	Do you have any methods to prevent the microorganism inside and outside the processing house?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
41 (A)	Do you note the traps, baits and ensure that they do not contaminate products?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
42 (A)	Have you built toilets in appropriate positions and give hygiene regulations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
43 (A)	Have chemicals and preparations, wax film after harvesting been permitted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
44 (A)	Does the water quality for post-harvesting meet the requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
45 (A)	Are the vehicles, equipment and transport products clean and safe?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Controlling and processing waste						
46 (A)	Are waste water and garbage collected and processed as regulations to ensure not contamination to human and products?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

9. Labors

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

47 (B)	Do the labors have personal documentation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
48 (A)	Is the age of labors as same as Government regulations?	<input type="checkbox"/>				<input type="checkbox"/>	
49 (A)	Have the employees be trained to operate machine, use chemical, labor safe and fully equipped labor protections?	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
50 (A)	Are the employees supplied work and live conditions as VietGAP?	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
51 (B)	Are the labors that involve in transporting, loading and uploading trained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
52 (B))	Do they have fully equipped, medical and measure instruction when they are poisonous?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
53 (B	Are there warning sign for the production areas that has just been sprayed?	<input type="checkbox"/>		<input type="checkbox"/>			
10. Record, record keeping, traceability and product recall							
54 (A)	Were the diary of harvesting and selling products recorded?	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
55 (A)	Is there any check for recording?	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	
56 (A)	Has the position of each batch recorded clearly?	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
57 (A)	Are there labels in the packages to help the traceability?	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

58 (A)	Are the time of selling, name of buyers recorded carefully?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59 (A)	When there is contamination and potential of contamination, were the products isolated and stopped to distribute to the consumers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Internal control						
60 (A)	Have you conducted internal control at least once a year?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61 (B)	Do you hire staff for internal control?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62 (A)	Have they signed to the checklist?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63 (A)	Have you wrapped up and reported the results to checking quality agents as required?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Complaint and resolving complaint						
64 (A)	Do the organizations and individuals have complaint form when the customers ask?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65 (A)	Do they resolve the complaint according to regulation of law? Do they record in the documents?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conclusion						

Notes:

- Critical error (Cr): is the deviation from the standards, cause unsafe food and affects consumers' health.
- Serious error (Se): is the deviation from the standards, if prolonged, it will cause unsafe food but not to critical levels.
- Maximum error (Ma): is the deviation from the standards, it may cause unsafe food but not to serious.

Project: "Strengthen Vietnamese SPS capacities for trade-Improving safety and quality of fresh vegetables through the value chain approach" MTF/VIE/046/STF (STDF/PG/259)

- Minimum error (Mi): is the deviation from the standards, it is hard to control but less serious.

Result evaluation:

- Producers will have VietGAP certification if they reach 100% A and minimum 90% B.
- For manufactures of users, processing the test results are as follows:
 - ✓ Manufacturers are rated up to A when 100% members comply with those criteria.
 - ✓ Manufacturers are rated up to B when at least 90% members comply with those criteria.