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PRIMARY FARM ASSURANCE

All Farm Base - Crops Base - Fruit and Vegetables

CONTROL POINTS AND COMPLIANCE CRITERIA
INTERMEDIATE LEVEL

ENGLISH VERSION 5.0_OCT19
BASED ON INTEGRATED FARM ASSURANCE V5.2

VALID FROM: 15 OCTOBER 2019
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Control Points and Compliance Criteria

PRIMARY FARM ASSURANCE – Intermediate Level

ALL FARM BASE

Based on IFA CPCC V5.2

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INTRODUCTION

a) The Primary Farm Assurance (PFA) Control Points and Compliance Criteria (CPCC) documents are separated into different modules, each one covering different areas or levels of activity on a production site.
These modules are grouped into:
(i) "Scopes" – covering more generic production issues, classified more broadly and
(ii) "Sub-scopes" – covering more specific production details, classified per product type.

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Nº	Control Points	Compliance Criteria	Level
AF	**ALL FARM BASE**		
	Control points in this module covers issues relevant to all farming businesses and are applicable to all producers.		
AF 1	**SITE HISTORY AND SITE MANAGEMENT**		
	One of the key features of sustainable farming is the continuous integration of site-specific knowledge and practical experience into future management planning and practices. This section is intended to ensure that the land, buildings, and other facilities, which constitute the fabric of the farm, are properly managed to ensure the safe production of food and protection of the environment.		
AF 1.1	**Site History**		
AF 1.1.1	Is there a reference system for each field, orchard, greenhouse, yard, plot, and/or other area/location used in production?	Compliance shall include visual identification in the form of: • A physical sign at each field/orchard, greenhouse/yard/plot, or other farm area/location or • A farm map, which also identifies the location of water sources, storage/handling facilities, ponds, etc., and that could be cross-referenced to the identification system No N/A.	Major Must
AF 1.1.2	Is a recording system established for each unit of production or other area/location to provide a record of agronomic activities undertaken at those locations?	Current records shall provide a history of production of all production areas. No N/A.	Minor Must

Nº	Control Points	Compliance Criteria	Level
AF 1.2	**Site Management**		
AF 1.2.1	Is there a risk assessment available for all sites registered (this includes rented land, structures, and equipment) and does this risk assessment show that the site in question is suitable for production, with regards to food safety and the environment?	A written risk assessment to determine whether the sites are appropriate for production shall be available for all sites. It shall be ready for the initial inspection and maintained updated and reviewed when new sites enter in production and when risks for existing ones have changed, or at least annually, whichever is shorter. The risk assessment may be based on a generic one but shall be customized to the farm situation. Risk assessments shall take into account: • Potential physical, chemical (including allergens) and biological hazards • Site history (for sites that are new to agricultural production, history of 5 years is advised and a minimum of one year shall be known) • Impact of proposed enterprises on adjacent stock/crops/environment. (See Annex AF 1 and Annex AF 2 for guidance on risk assessments. Annex FV 1 includes guidance regarding flooding)	Minor Must
AF 1.2.2	Has a management plan that establishes strategies to minimize the risks identified in the risk assessment (AF 1.2.1) been developed and implemented?	A management plan addresses the risks identified in AF 1.2.1 and describes the hazard control procedures that justify that the site in question is suitable for production. This plan shall be appropriate to the farm operations, and there shall be evidence of its implementation and effectiveness.	Minor Must
AF 2	**RECORD KEEPING AND INTERNAL SELF-ASSESSMENT/INTERNAL INSPECTION**		
	Important details of farming practices shall be recorded, and records kept.		
AF 2.1	Are all records requested during the external inspection accessible and kept for a minimum period of 2 years, unless a longer requirement is stated in specific control points?	Producers shall keep up-to-date records for a minimum of 2 years. Electronic records are valid and when they are used, producers are responsible for maintaining back-ups of the information. For the initial inspections, producers shall keep records from at least 3 months prior to the date of the external inspection or from the day of registration, whichever is longer. New applicants shall have full records that reference each area covered by the registration with all of the agronomic activities related to PFA documentation required for this area. This refers to the principle of record keeping. When an individual record is missing, the respective control point dealing with those records is not compliant. No N/A.	Major Must

Nº	Control Points	Compliance Criteria	Level
AF 2.2	Does the producer take responsibility to conduct a minimum of one internal self-assessment per year against the PFA standard?	There is documented evidence that in Option 1 an internal self-assessment has been completed under the responsibility of the producer (this may be carried out by a person different from the producer). Self-assessments shall include all applicable control points, even when a subcontracted company carries them out. The self-assessment checklist shall contain comments of the evidence observed for all non-applicable and non-compliant control points. This has to be done before the CB/VB inspection (See PFA General Rules, section 6.1.). No N/A, except for multi-site operations with QMS and producer groups, for which the QMS checklist covers internal inspections.	Major Must
AF 2.3	Have effective corrective actions been taken as a result of non-conformances detected during the internal self-assessment or internal producer group inspections?	Necessary corrective actions are documented and have been implemented. N/A only in the case no non-conformances are detected during internal self-assessments or internal producer group inspections.	Major Must
AF 3	**HYGIENE**		
	People are key to the prevention of product contamination. Farm staff and contractors as well as producers themselves stand for the quality and safety of the product. Education and training will support progress toward safe production. This section is intended to ensure good practices to diminish hygiene risks to the product and that all workers understand the requirements and are competent to perform their duties. *Further hygiene requirements, specific to certain activities such as harvest and product handling, are defined in the applicable standard module.*		
AF 3.1	Does the farm have a written risk assessment for hygiene?	The written risk assessment for hygiene issues covers the production environment. The risks depend on the products produced and/or supplied. The risk assessment can be a generic one, but it shall be appropriate for conditions on the farm and shall be reviewed annually and updated when changes (e.g., other activities) occur. No N/A.	Minor Must

Nº	Control Points	Compliance Criteria	Level
AF 3.2	Does the farm have a documented hygiene procedure and visibly displayed hygiene instructions for all workers and visitors to the site whose activities might pose a risk to food safety?	The farm shall have a hygiene procedure addressing the risks identified in the risk assessment in AF 3.1. The farm shall also have hygiene instructions visibly displayed for workers (including subcontractors) and visitors; provided by way of clear signs (pictures) and/or in the predominant language(s) of the workforce. The instructions must also be based on the results of the hygiene risk assessment in AF 3.1 and include at a minimum: • The need to wash hands • The need to cover skin cuts • Limitation on smoking, eating and drinking to designated areas • Notification of any relevant infections or conditions. This includes any signs of illness (e.g., vomiting; jaundice, diarrhea), whereby these workers shall be restricted from direct contact with the product and food-contact surfaces • Notification of product contamination with bodily fluids • The use of suitable protective clothing, where the individuals' activities might pose a risk of contamination to the product.	Minor Must
AF 3.3	Have all persons working on the farm received annual hygiene training appropriate to their activities and according to the hygiene instructions in AF 3.2?	An introductory training course for hygiene shall be given in both written and verbal form. All new workers shall receive this training and confirm their participation. This training shall cover all instructions defined in AF 3.2. All workers, including the owners and managers, shall annually participate in the farm's basic hygiene training.	Minor Must
AF 3.4	Are the farm's hygiene procedures implemented?	Workers with tasks identified in the hygiene procedures shall demonstrate competence during the inspection and there is visual evidence that the hygiene procedures are being implemented. No N/A.	Major Must

Nº	Control Points	Compliance Criteria	Level
AF 4	**WORKERS' HEALTH, SAFETY, AND WELFARE**		
	People are key to the safe and efficient operation of any farm. Farm staff and contractors as well as producers themselves stand for the quality of the produce and for environmental protection. Education and training will help progress towards sustainability and build on social capital. This section is intended to ensure safe practices in the work place and that all workers understand and are competent to perform their duties; are provided with proper equipment to allow them to work safely; and that, in the event of accidents, can obtain proper and timely assistance.		
AF 4.1	**Training**		
AF 4.1.1	Do all workers handling and/or administering, chemicals, disinfectants, plant protection products (PPPs), biocides, and/or other hazardous substances and all workers operating dangerous or complex equipment have evidence of competence or details of other such qualifications?	Records shall identify workers who carry out such tasks and can demonstrate competence (e.g., certificate of training and/or records of training with proof of attendance). This shall include compliance with applicable legislation. No N/A.	Major Must
AF 4.2	**Hazards and First Aid**		
AF 4.2.1	Are first aid kits available at all permanent sites and in the vicinity of fieldwork?	Complete and maintained first aid kits (i.e., according to local recommendations and appropriate to the activities being carried out on the farm) shall be available and accessible at all permanent sites and readily available for transport (tractor, car, etc.).	Minor Must
AF 4.3	**Protective Clothing/Equipment**		
AF 4.3.1	Are workers, visitors, and subcontractors equipped with suitable protective clothing in accordance with legal requirements and/or label instructions and/or as authorized by a competent authority?	Complete sets of protective clothing, which enable label instructions and/or legal requirements and/or requirements as authorized by a competent authority to be complied which are available on the farm, utilized, and in a good state of repair. To comply with label requirements and/or on-farm operations, this may include some of the following: Rubber boots or other appropriate footwear, waterproof clothing, protective overalls, rubber gloves, face masks, appropriate respiratory equipment (including replacement filters), ear and eye protection devices, life-jackets, etc. as required by label or on-farm operations.	Minor Must

Nº	Control Points	Compliance Criteria	Level
AF 4.4	**Worker Welfare**		
AF 4.4.1	Do workers have access to clean food storage areas, designated rest areas, hand-washing facilities, and drinking water?	A place to store food and a place to eat shall be provided to the workers if they eat on the farm. Hand washing equipment and drinking water shall always be provided.	Major Must
AF 5	**SUBCONTRACTORS**		
	A subcontractor is the entity furnishing labor, equipment and/or materials to perform specific farm operation(s) under contract with the producer (e.g., custom grain harvesting, fruit spraying and picking).		
AF 5.1	When the producer makes use of subcontractors, do they oversee their activities in order to ensure that those activities relevant to PFA CPCC comply with the corresponding requirements?	The producer is responsible for observing the control points applicable to the tasks performed by the subcontractors who carry out activities covered in the PFA standard, by checking and signing the assessment of the subcontractor for each task and season contracted. Evidence of compliance with the applicable control points shall be available on the farm during the external inspection. i) The producer can perform the assessment and shall keep the evidence of compliance of the control points assessed. The subcontractor shall agree that GLOBALG.A.P. approved certifiers are allowed to verify the assessments through a physical inspection or ii) A third-party certification body, which is GLOBALG.A.P. approved, can inspect the subcontractor. The subcontractor shall receive a letter of conformance from the certification body with the following info: 1) Date of assessment 2) Name of the certification body 3) Inspector name 4) Details of the subcontractor 5) List of the inspected control points and compliance criteria. Certificates issued to subcontractors against standards that are not officially approved by GLOBALG.A.P. are not valid evidence of compliance with PFA.	Major Must

Nº	Control Points	Compliance Criteria	Level
AF 6	**WASTE AND POLLUTION MANAGEMENT, RECYCLING, AND RE-USE**		
	Waste minimization shall include review of current practices, avoidance of waste, reduction of waste, re-use of waste, and recycling of waste.		
AF 6.1	**Identification of Waste and Pollutants**		
AF 6.1.1	Have possible waste products and sources of pollution been identified in all areas of the farm?	Possible waste products (e.g., paper, cardboard, plastic, oil) and sources of pollution (e.g., fertilizer excess, exhaust smoke, oil, fuel, noise, effluent, chemicals, sheep-dip, feed waste, algae produced during net cleaning) produced by the farm processes have been listed. For crops, producers shall also take into consideration surplus application mix and tank washings.	Minor Must
AF 6.2	**Waste and Pollution Action Plan**		
AF 6.2.1	Is there a documented farm waste management plan to avoid and/or minimize wastage and pollution to the extent possible, and does the waste management plan include adequate provisions for waste disposal?	A comprehensive, current, and documented plan that covers wastage reduction, pollution and waste recycling is available. Air, soil, and water contamination shall be considered where relevant along with all products and sources identified in the plan.	Minor Must
AF 6.2.2	Is the site kept in a tidy and orderly condition?	Visual assessment shall show that there is no evidence of waste/litter in the immediate vicinity of the production site(s) or storage buildings. Incidental and insignificant litter and waste on the designated areas are acceptable as well as the waste from the current day's work. All other litter and waste shall be cleared up, including fuel spills.	Major Must
AF 6.2.3	Provided there is no risk of pest, disease and weed carry-over, are organic wastes composted on the farm and recycled?	Organic waste material is composted and used for soil conditioning. The composting method ensures that there is no risk of pest, disease or weed carry-over.	Recom.

Nº	Control Points	Compliance Criteria	Level
AF 7	**COMPLAINTS**		
	Management of complaints will lead to an overall better production system.		
AF 7.1	Is there a complaint procedure available relating to both internal and external issues covered by the PFA standard and does this procedure ensure that complaints are adequately recorded, studied, and followed up, including a record of actions taken?	A documented complaint procedure is available to facilitate the recording and follow-up of all received complaints relating to issues covered by the PFA standard and actions taken with respect to such complaints. In the case of producer groups, the members do not need the complete complaint procedure, but only the parts that are relevant to them. The complaint procedure shall include the notification of GLOBALG.A.P. Secretariat via the certification body (CB)/verification body (VB) in the case that the producer is informed by a competent or local authority that they are under investigation and/or has received a sanction in the scope of the letter of conformance. No N/A.	Major Must
AF 8	**RECALL/WITHDRAWAL PROCEDURE**		
AF 8.1	Does the producer have documented procedures on how to manage/initiate the withdrawal/recall of PFA compliant products from the marketplace and are these procedures tested annually?	The producer shall have a documented procedure that identifies the type of event that may result in a withdrawal/recall, the persons responsible for making decisions on the possible product withdrawal/recall, the mechanism for notifying the next step in the supply chain and the approved CB/VB, and the methods of reconciling stock. The procedures shall be tested annually to ensure that they are effective. This test shall be recorded (e.g., by picking a recently sold batch, identifying the quantity and whereabouts of the product, and verifying whether the next step involved with this batch and the CB/VB can be contacted. Actual communications of the mock recall to the clients are not necessary. A list of phone numbers and e-mails is sufficient). No N/A.	Major Must
AF 9	**FOOD DEFENSE** (N/A FOR FLOWERS AND ORNAMENTALS AND PLANT PROPAGATION MATERIAL)		
AF 9.1	Is there a risk assessment for food defense and are procedures in place to address identified food defense risks?	Potential intentional threats to food safety in all phases of the operation shall be identified and assessed. Food defense risk identification shall assure that all input is from safe and secured sources. Information of all employees and subcontractors shall be available. Procedures for corrective action shall be in place in case of intentional threat.	Major Must

Nº	Control Points	Compliance Criteria	Level
AF 10	**FOOD SAFETY POLICY DECLARATION** (N/A FOR FLOWERS AND ORNAMENTALS)		
	The 'Food Safety Policy Declaration' reflects in an unambiguous manner the commitment of the producer to ensure that food safety is implemented and maintained throughout the production processes.		
AF 10.1	Has the producer completed and signed the 'Food Safety Policy Declaration' included in the PFA checklist?	Completion and signature of the 'Food Safety Policy Declaration' is a commitment to be renewed annually for each new assessment cycle. A written policy shall outline a commitment to food safety, in general terms, how it is implemented and how it is communicated to employees and be signed by senior management. The food safety plan shall designate who has the responsibility and authority for food safety, including a provision for the absence of key personnel. Twenty-four-hour contact information shall be available for these individuals in case of food safety emergencies. These roles and responsibilities shall be communicated within the organization. The organization's senior management shall determine and provide, in a timely manner, the resources needed to implement and maintain the food safety plan. No N/A.	Major Must

ANNEX AF 1 GUIDELINE: RISK ASSESSMENT – GENERAL

Introduction to Risk Assessment

In the Primary Farm Assurance (PFA) standard, a number of risk assessments are required in order to facilitate food safety, workers' health, and safety, and environmental protection. This guidance document provides assistance to producers.

Five Steps to Risk Assessment

A risk assessment is an important step in protecting the products, workers, and business, as well as complying with PFA requirements and the law. A risk assessment helps you to focus on those risks that really matter in the workplace–the ones with the potential to cause real and serious harm. In many instances, straightforward, simple, effective, and inexpensive measures can readily control risks (e.g., ensuring spillages are cleaned up promptly so that the product cannot be contaminated).

It is not expected that you eliminate all risks, but you are expected and required to protect your products and workers as far as it is reasonably practicable.

This is not the only way to perform a risk assessment. There are other methods that work well, particularly for more complex risks and/or circumstances. However, we believe this method provides a straightforward approach for most producers. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures. Accidents and ill health can ruin lives and affect the business as well, if output is lost or you have to go to court. Producers are legally required to assess the risks in their workplace so that a plan to control the risks can be put in place.

What is Risk Assessment?

A risk assessment is simply a careful examination of what, in your work, could cause harm to the product, environment and/or workers, so that you can evaluate whether you have taken sufficient precautions or should do more to prevent harm.

Don't overcomplicate the process. In many enterprises, the risks are well known, and the necessary control measures are easy to apply. Check that you have taken reasonable precautions to avoid contamination and/or injury.

When thinking about your risk assessment, remember:

- A *hazard* is anything that may cause harm, such as chemicals, electricity, working from ladders etc.
- The *risk* is the chance, high or low, that these and other hazards, together with an indication of how serious the harm could be, could harm somebody.

How to Assess the Risks in Your Enterprise

Step 1: Identify the hazards.
Step 2: Decide who/what might be harmed and how.
Step 3: Evaluate the risks and decide on precautions.
Step 4: Record the work plan/findings and implement them.
Step 5: Review the assessment and update if necessary.

Step 1: Identify the Hazards

First, you need to identify how the product, environment, and/or workers could be harmed. Here are some tips to help identify the ones that matter:

- Walk around the workplace and look at what could reasonably be expected to cause harm (e.g., situations, equipment, products, practices, etc.).
- Ask the workers (if applicable) or their representatives what they think. They may have noticed things that are not immediately obvious to you.
- Check manufacturers' instructions or data sheets for chemicals and equipment, as these can be very helpful in identifying the hazards and putting them in their true perspective.
- Review prior incidence and accident records, as these often help to identify less obvious hazards. Remember to think about long-term hazards to health (e.g., high levels of noise or exposure to harmful substances) as well as (food) safety hazards.

Step 2: Decide Who/What Might be Harmed and How

For each hazard, you need to be clear about who or what might be harmed. This will help you identify the best way of managing the risk.

Remember:

- Some activities have particular requirements, (e.g., harvesting).
- Some hazards will require extra thought, especially in situations where individuals (e.g., cleaners, visitors, contractors, maintenance workers, etc.) may not be in the workplace all the time.

Step 3: Evaluate the Risks and Decide on Precautions

Having spotted the hazards, you then have to decide what to do about them. The law requires you to do everything reasonably practicable to protect people from harm. You can work this out for yourself, but the easiest way is to compare what is being done against what are already defined as good practices.

So first, look at what you are already doing, and think about what controls you have in place and how the work is organized. Then compare that with the good practices and see if there's more you should be doing to bring yourself up to standard. During your evaluation process, consider the following:

- Can I get rid of the hazard altogether?
- If not, how can I manage the risks so that harm is unlikely?

When managing risks, if possible, apply the principles below and, if possible, in the following order:

- Try a less risky option (e.g., switch to using a less hazardous chemical).
- Prevent access to the hazard (e.g., by guarding).
- Organize the work/tasks to reduce exposure to the hazard.
- Issue personal protective equipment (e.g., clothing, footwear, goggles, etc.).
- Provide welfare facilities (e.g., first aid and washing facilities for removal of contamination).

Improving health and safety need not cost a lot. For instance, placing a mirror on a dangerous blind corner to help prevent vehicle accidents is a low-cost precaution considering the risks. Failure to take simple precautions can cost you a lot more if an accident does happen.

Involve staff (if applicable), so that you can be sure that what you propose to do will work in practice and won't introduce any new hazards.

Step 4: Record the Work Plan/Findings and Implement Them

Putting the results of the risk assessment into practice will make a difference when looking after food safety, workers' health and safety, and your business.
Writing down the results of the risk assessment and sharing them with your staff encourages you to complete the implementation.
When writing down the results, keep it simple (e.g., contamination at harvest: handwashing facilities at the field).

The risk assessment is not expected to be perfect, but it shall be suitable and sufficient. You need to be able to show that:

- A proper check was made.
- You asked who or what might be affected.
- You dealt with all the significant hazards.
- The precautions are reasonable, and the remaining risk is low.
- You involved your staff or their representatives (where applicable) in the process.

A good plan of action often includes a mixture of different responses such as:

- Temporary solution until more reliable controls can be put in place.
- Long-term solutions to those risks most likely to cause accidents or ill health.
- Long-term solutions to those risks with the worst potential consequences.
- Arrangements for training employees on the primary risks that remain and how these risks are to be controlled.
- Regular checks to make sure that the control measures stay in place.
- Clearly defined responsibilities. Who will lead on what action and by when?

Remember, prioritize and tackle the most important things first. As you complete each action, tick it off your work plan.

Step 5: Review the Risk Assessment and Update if Necessary

Few enterprises stay the same. Sooner or later, you will bring in new equipment, substances, and/or procedures that could lead to new hazards. It makes sense, therefore, to review what you are doing on an ongoing basis. Every year formally review where you are with respect to recognized good practices to make sure you are still improving, or at least not sliding back.

Look at your risk assessment again:

- Have there been any changes?
- Are there improvements you still need to make?
- Have your workers spotted problems?
- Have you learned anything from incidences or near misses?
- *Make sure your risk assessment stays up-to-date.*

When you are running a business, it's all too easy to forget about reviewing your risk assessment–until something has gone wrong and it's too late. Why not set a review date for this risk assessment now? Write it down and note it in your diary as an annual event.

During the year, if there is a significant change, don't wait. Check the risk assessment and, where necessary, amend it. If possible, it is best to think about the risk assessment when you're planning a change–that way there is more flexibility.

Source: 'Five Steps to Risk Assessment, Health and Safety Executive' (www.hse.gov.uk/pubns/indg163.pdf) www.hse.gov.uk/pubns/indg163.pdf)

ANNEX AF 2 GUIDELINE: RISK ASSESSMENT – SITE MANAGEMENT

Control points AF 1.2.1 (m) and AF 1.2.2 (m) require producers to carry out a risk assessment of their production site and to take appropriate action to mitigate any risks identified.

Control Point AF 1.2.1

Is there a risk assessment available for all sites registered (this includes rented land, structures, and equipment) and does this risk assessment show that the site in question is suitable for production, with regards to food safety, and the environment?

Compliance Criterion AF 1.2.1

A written risk assessment to determine whether the sites are appropriate for production shall be available for all sites. It shall be ready for the initial inspection and maintained, updated, and reviewed when new sites enter in production, and when risks for existing ones have changed, or at least annually, whichever is shorter. The risk assessment may be based on a generic one but shall be customized to the farm situation.

Risk assessments shall take into account:

- Potential physical, chemical (including allergens), and biological hazards
- Site history (for sites that are new to agricultural production, history of 5 years is advised and a minimum of one year shall be known)
- Impact of proposed enterprises on adjacent stock/crops/environment

(See Annex AF 1 and Annex AF 2 for guidance on risk assessments. Annex FV 1 includes guidance regarding flooding)

Control Point AF 1.2.2

Has a management plan that establishes strategies to minimize the risks identified in the risk assessment (AF 1.2.1) been developed and implemented?

Compliance Criterion AF 1.2.2

A management plan addresses the risks identified in AF 1.2.1 and describes the hazard control procedures that justify that the site in question is suitable for production. This plan shall be appropriate to the products being produced, and there shall be evidence of its implementation and effectiveness.

NOTE: Environmental risks do not need to be part of this plan and are covered under AF 7.1.1 in the GLOBALG.A.P. standard.

The risk assessment should consider relevant physical, chemical and microbiological hazards and take into account the type of farm operation and the way in which farm output will, eventually, be used. The next table helps to identify the most common factors and hazards to consider when carrying out a site risk assessment. *This is not an exhaustive list of factors.* Growers shall consider it as guidance designed to help trigger their analysis of farm conditions in order to prepare the risk assessment for the site. They shall not consider these examples as a comprehensive list.

1. Legislation:

Legislation (national or local) may restrict the farm operations. Local regulations should be checked first to verify legal compliance.

2. Prior Use of Land:

Example of Factors to Consider	Example of Risks that can be Involved
Previous crops	Some crops (e.g., cotton production) typically involve heavy use of residual herbicides that can have long-term effects on cereal and other vegetable crops.
Former use	Industrial or military use can cause contamination to land through residues, petroleum contamination, garbage storage, etc. Landfill or mining sites may have unacceptable waste in their subsoil that can contaminate subsequent crops or harm livestock. They may be subject to sudden subsidence endangering persons working on the land. Husbandry may create zones of high microbial content (manure deposit, etc.).

3. Soil:

Example of Factors to Consider	Example of Risks that can be Involved
Soil structure	Structural suitability for intended use (including susceptibility to erosion) and chemical/microbiological integrity.
Erosion	Conditions that cause losses of topsoil by water/wind that may affect crop yields and/or affect land and water downstream.
Susceptibility to flooding	Susceptibility to flooding and probable contamination of soil through the flood.
Wind exposure	Excessive wind speeds can cause crop losses.

4. Water:

Example of Factors to Consider	Example of Risks that can be Involved
Water availability	Adequacy throughout the year, or at least the proposed growing season. The amount of water supply shall at least match the consumption of the intended crops. Water shall be available in a sustainable condition.
Water quality	The risk assessment should establish whether water quality is 'fit for purpose'. In some instances, 'fit for purpose' may be defined by a local authority. Evaluate probabilities of upstream contamination (sewage, animal farms, etc.) that may need costly treatments. For certain applications, the grower shall be aware of a minimum microbiological water quality specified by the authority or PFA. Where this is the case, the requirements are specified in the relevant PFA module (WHO Guidelines for Drinking-Water Quality, 2008: *E. coli* or thermo-tolerant coliform bacteria shall not be detectable in any 100ml sample). See also FV 1.1.1 under FV 1.1 'Risk Assessment'.
Authorization to use water	Rights or license of use of water: local laws or customs may recognize other users whose needs may pre-empt agricultural use at times. Environmental impact: While legal, some extraction rates could adversely affect flora and fauna associated with or dependent on the water source.

5. Allergens:

Food allergies have received much attention over the past few years with an estimated 2% of adults and 5% of children now suffering from some type of food allergy.

All foods have the potential to cause a food allergy, however there are groups of foods that are responsible for causing the majority of food allergies. In the EU, for example, 14 main allergens which are subject to labeling legislation have been identified: Celery, cereals containing gluten, eggs, fish, lupin (a kind of legume of the Fabaceae family), milk, molluscs, mustard, peanuts, sesame seeds, shellfish, soya, sulfur dioxide (used as an antioxidant and preservative, e.g., in dried fruits), and tree nuts.

Whilst the control of allergens is crucial for food processors and caterers, it is also a relevant issue to be considered by primary producers.

Allergens in fruits and vegetables are not as complicated as other foods. Cooking destroys many of them, and thus cooked fruits are often safe for fruit allergic people to eat. Peanut allergy can be so severe that only very tiny amounts of peanut can cause a reaction. Tree nuts such as Brazil nut, hazelnut, walnut and pecan can cause symptoms as severe.

Lists of food allergens and information on labelling can be found on national or EU websites (see AF 1.2.1, AF 1.2.2, and FV 5.9.1 (IFA)).

Example of Factors to Consider	Example of Risks that can be Involved
Previous crops	Mechanical harvest of crops in rotation with peanuts (legume grown underground) might introduce rests of peanuts. Transportation of produce in vehicles that have transported products in the group of main allergens may introduce cross-contamination if vehicles are not adequately cleaned.
Product handling	Cross-contamination when packing and/or storing of products in the same facilities with those considered amongst main food allergens.

6. Other impacts:

Example of Factors to Consider	Example of Risks that can be Involved
Impacts on the neighborhood	Dust, smoke and noise problems caused by the operation of agricultural machinery. Contamination of downstream sites by silt-laden or chemical-laden runoff. Spray drift.
Impacts on the farm	Type of adjacent farming activities. Smoke, fumes, and/or dust from nearby industrial or transport installations, including roads with heavy traffic. Insects attracted by crops, waste products, and/or operations using manure. Depredations by pests from nearby natural or conservation areas.

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Control Points and Compliance Criteria

PRIMARY FARM ASSURANCE – Intermediate Level

CROPS BASE

Based on IFA CPCC V5.2

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Nº	Control Points	Compliance Criteria	Level
CB	**CROPS BASE**		
CB 1	**TRACEABILITY**		
	Traceability facilitates the recall/withdrawal of foods and flowers and ornamentals and enables customers to be provided with targeted and accurate information concerning implicated products.		
CB 1.1	Is a Primary Farm Assurance (PFA) registered product traceable back to and trackable from the registered farm (and other relevant registered areas) where it has been produced and, if applicable, handled?	There is a documented identification and traceability system that allows PFA registered products to be traced back to the registered farm or, in a producer group, to the registered farms of the group, and tracked forward to the immediate customer (one step up, one step down). Harvest information shall link a batch to the production records or the farms of specific producers. Produce handling shall also be covered, if applicable. No N/A.	Major Must
CB 2	**PROPAGATION MATERIAL**		
	The choice of propagation material plays an important role in the production process and, by using the appropriate varieties, can help to reduce the number of fertilizer and plant protection product (PPP) applications. The choice of propagation material is a precondition of good plant growth and product quality.		
CB 2.1	**Chemical Treatments and Dressings**		
CB 2.1.1	Is the purchased propagation material (seed, rootstocks, seedlings, plantlets, cuttings) accompanied by information of chemical treatments done by the supplier?	Records with the name(s) of the chemical product(s) used by the supplier on the propagation material (e.g., maintaining records/seed packages, list with the names of the plant protection product (PPP) used, etc.) are available on request. Suppliers who hold a GLOBALG.A.P. Plant Propagation Material, equivalent or GLOBALG.A.P. recognized certificate are considered compliant with the control point. N/A for perennial crops.	Minor Must
CB 2.1.2	Are PPP treatments recorded for in-house nursery propagation materials applied during the plant propagation period?	Records of all PPP treatments applied during the plant propagation period for in-house plant nursery propagation are available and include location, date, trade name and active ingredient, operator, authorized by, justification, quantity, and machinery used.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 3	**FERTILIZER APPLICATION**		
	The fertilization decision-making process involves consideration of crop demands. Nutrients shall be available for crops in the growing substrate or soil and fertilization is often necessary. Correct application to optimize use and storage procedures to avoid loss and contamination shall be followed.		
CB 3.1	**Advice on Quantity and Type of Fertilizer**		
CB 3.1.1	Are recommendations for the application of fertilizers (organic or inorganic) provided by competent and qualified persons?	Where the fertilizer records show that the technically responsible person determining quantity and type of the fertilizer (organic or inorganic) is an external adviser, training and technical competence shall be demonstrated via official qualifications, specific training courses, etc., unless employed for that purpose by a competent organization (e.g., official advisory services). Where the fertilizer records show that the technically responsible person determining quantity and type of fertilizer (organic or inorganic) is the producer or designated employee, experience shall be complemented by technical knowledge (e.g., access to product technical literature, specific training course attendance, etc.) and/or the use of tools (software, on farm detection methods, etc.).	Minor Must
CB 3.2	**Records of Application**		
	3.2.1 to 3.2.6: Do records of all applications of soil and foliar fertilizers, both organic and inorganic, include the following criteria:		
CB 3.2.1	Field, orchard or greenhouse reference and crop?	Records shall be kept of all fertilizer applications, detailing the geographical area and the name or reference of the field, orchard or greenhouse where the registered product crop is located. Records shall also be kept for hydroponic situations and where fertigation is used. No N/A.	Minor Must
CB 3.2.2	Application dates?	The exact dates (day, month and year) of the application are detailed in the records of all fertilizer applications. No N/A.	Minor Must
CB 3.2.3	Applied fertilizer types?	The trade name, type of fertilizer (e.g., NPK), and concentrations (e.g., 17-17-17) are detailed in the records of all fertilizer applications. No N/A.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 3.2.4	Applied quantities?	The amount of product to be applied in weight or volume relative to a unit of area or number of plants or unit of time per volume of fertigation is detailed in the records of all fertilizer applications. The actual quantity applied shall be recorded, as this is not necessarily the same as the recommendation. No N/A.	Minor Must
CB 3.2.5	Method of application?	The method and/or equipment used are detailed in the records of all fertilizer applications. In the case the method/equipment is always the same, it is acceptable to record these details only once. If there are various equipment units, these are identified individually. Methods may be e.g., via irrigation or mechanical distribution. Equipment may be e.g., manual or mechanical. No N/A.	Minor Must
CB 3.2.6	Operator details?	The name of the operator who has applied the fertilizer is detailed in the records of all fertilizer applications. If a single individual makes all of the applications, it is acceptable to record the operator details only once. If there is a team of workers performing the fertilization, all of them need to be listed in the records. No N/A.	Minor Must
CB 3.3	**Fertilizer Storage**		
	3.3.1 to 3.3.3: Are all fertilizers stored:		
CB 3.3.1	Separately from PPPs?	The minimum requirement is to prevent physical cross-contamination between fertilizers (organic and inorganic) and PPPs by using a physical barrier (wall, sheeting, etc.). If fertilizers that are applied together with PPPs (i.e., micronutrients or foliar fertilizers) are packed in a closed container, they can be stored with PPPs.	Minor Must
CB 3.3.2	Not together with harvested products?	Fertilizers shall not be stored with harvested products.	Major Must
CB 3.3.3	In an appropriate manner that reduces the risk of contamination of water sources?	All fertilizers are stored in a manner that poses minimum risk of contamination to water sources. Liquid fertilizer stores/tanks shall be surrounded by an impermeable barrier to contain a capacity to 110% of the volume of the largest container, if there is no applicable legislation.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 3.4	**Organic Fertilizer**		
CB 3.4.1	Does the producer prevent the use of human sewage sludge on the farm?	No treated or untreated human sewage sludge is used on the farm for the production of registered crops. No N/A.	Major Must
CB 3.4.2	Has a risk assessment been carried out for organic fertilizer, which, prior to application, considers its source, characteristics and intended use?	Documented evidence is available to demonstrate that a food safety and environmental risk assessment for the use of organic fertilizer has been done, and that at least the following have been considered: • Type of organic fertilizer • Method of treatment to obtain the organic fertilizer • Microbial contamination (plant and human pathogens) • Weed/seed content • Heavy metal content • Timing of application, and placement of organic fertilizer (e.g., direct contact to edible part of crop, ground between crops, etc.). This also applies to substrates from biogas plants.	Minor Must
CB 3.4.3	Is organic fertilizer stored in an appropriate manner that reduces the risk of contamination of the environment?	Organic fertilizers shall be stored in a designated area. Appropriate measures, adequate according to the risk assessment in AF 1.2.1, have been taken to prevent the contamination of water sources (e.g., concrete foundation and walls, specially built leak-proof container, etc.) or shall be stored at least 25 meters from water sources.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 4	**WATER MANAGEMENT**		
	Water is a scarce natural resource and irrigation should be designed and planned by appropriate forecasting and/or by technical equipment allowing for the efficient use of irrigation water. For information about responsible water use, see Annex CB 1.		
CB 4.1	**Efficient Water Use on Farm**		
CB 4.1.1	Has a risk assessment been undertaken that evaluates environmental issues for water management on the farm and has it been reviewed by the management within the previous 12 months?	There is a documented risk assessment that identifies environmental impacts of the water sources, distribution system and irrigation and crop washing usages. In addition, the risk assessment shall take into consideration the impact of own farming activities on off-farm environments, where information is known to be available. The risk assessment shall be completed, fully implemented and it shall be reviewed and approved annually by the management. See 'Annex AF 1 Guideline: Risk Assessment - General' and 'Annex CB 1 Guideline: Responsible On-Farm Water Management for Crops' for further guidance. No N/A.	Minor Must
CB 4.1.2	Is there a water management plan available that identifies water sources and measures to ensure the efficiency of application and which management has approved within the previous 12 months?	There is a written and implemented action plan, approved by the management within the previous 12 months, which identifies water sources and measures to ensure efficient use and application. The plan shall include one or more of the following: Maps (see AF 1.1.1), photographs, drawings (hand drawings are acceptable), or other means to identify the location of water source(s), permanent fixtures and the flow of the water system (including holding systems, reservoirs or any water captured for re-use). Permanent fixtures, including wells, gates, reservoirs, valves, returns, and other above-ground features that make up a complete irrigation system, shall be documented in such a manner as to enable location in the field. The plan shall also assess the need for the maintenance of irrigation equipment. Training and/or retraining of personnel responsible for the oversight or performance duties shall be provided. Short and long-term plans for improvement, with timescales where deficiencies exist, shall be included. This can either be an individual plan or a regional activity that the farm may be participating in or is covered by such activities.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 4.2	**Water Quality**		
CB 4.2.1	Is the use of treated sewage water in pre-harvest activities justified according to a risk assessment?	Untreated sewage is not used for irrigation/fertigation or other pre-harvest activities. Where treated sewage water or reclaimed water is used, water quality shall comply with the WHO published 'Guidelines for the Safe Use of Wastewater and Excreta in Agriculture and Aquaculture 2006'. Also, when there is reason to believe that the water may be coming from a possibly polluted source (i.e., because of a village upstream, etc.) the producer shall demonstrate through analysis that the water complies with the WHO guideline requirements or the local legislation for irrigation water. No N/A.	Major Must
CB 4.2.2	Has a risk assessment on physical and chemical pollution of water used on pre-harvest activities (e.g., irrigation/fertigation, washings, spraying) been completed and has it been reviewed by the management within the last 12 months?	A risk assessment that takes into consideration, at a minimum, the following shall be performed and documented: • Identification of the water sources and their historical testing results (if applicable). • Method(s) of application (see Annex CB 1 for examples). • Timing of water use (during crop growth stage) • Contact of water with the crop • Characteristics of the crop and the growth stage • Purity of the water used for PPP applications PPP must be mixed in water whose quality does not compromise the effectiveness of the application. Any dissolved soil, organic matter or minerals in the water can neutralize the chemicals. For guidance, producers must obtain the required water standards from the product label, the literature provided by the chemical manufacturers, or seek advice from a qualified agronomist The risk assessment shall be reviewed by the management every year and updated any time there is a change made to the system or a situation occurs that could introduce an opportunity to contaminate the system. The risk assessment shall address potential physical (e.g., excessive sediment load, rubbish, plastic bags, bottles) and chemical hazards and hazard control procedures for the water distribution system.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 4.2.3	Is water used on pre-harvest activities analyzed at a frequency in line with the risk assessment (CB 4.2.2) taking into account current sector specific standards?	Water testing shall be part of the water management plan as directed by the water risk assessment and current sector specific standards or relevant regulations for the crops being grown. There shall be a written procedure for water testing during the production and harvest season, which includes frequency of sampling, who is taking the samples, where the sample is taken, how the sample is collected, the type of test, and the acceptance criteria. N/A for sub-scope Flowers and Ornamentals.	Minor Must
CB 4.2.4	According to the risk assessment in CB 4.2.2 and current sector specific standards, does the laboratory analysis consider chemical and physical contamination, and is the laboratory accredited against ISO17025 or by competent national/local authorities for testing water?	If according to the risk assessment and current sector specific standards there is a risk of contamination, the laboratory analysis provides a record of the relevant identified chemical and physical contaminants. Analysis results from an appropriate laboratory accredited against ISO 17025 or equivalent standard, or laboratories approved for water testing by the competent national/local authorities are available. N/A for sub-scope Flowers and Ornamentals.	Minor Must
CB 4.2.5	Are corrective actions taken based on adverse results from the risk assessment before the next harvest cycle?	Where required, corrective actions and documentation are available as part of the management plan as identified in the water risk assessment and current sector specific standards.	Minor Must
CB 5	**INTEGRATED PEST MANAGEMENT**		
	Integrated pest management (IPM) involves the careful consideration of all available pest control techniques and the subsequent integration of appropriate measures that discourage the development of pest populations and keeps plant protection products (PPPs) and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. An IPM toolbox (Annex CB 2) has been developed to provide alternative actions for the application of IPM techniques in the commercial production of agricultural and horticultural crops. Given the natural variation on pest development for the different crops and areas, any IPM system shall be implemented in the context of local physical (climatic, topographical etc.), biological (pest complex, natural enemy complex, etc.), and economic conditions.		
	CB 5.1 to 5.3: Can the producer show evidence of implementing activities that fall under the category of:		
CB 5.1	Prevention?	The producer shall show evidence of implementing at least 1 activity per registered crop that include the adoption of production practices that could reduce the incidence and intensity of pest attacks, and thereby reducing the need for intervention.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 5.2	Observation and Monitoring?	The producer shall show evidence of a) implementing at least 1 activity per registered crop that will determine when and to what extent pests and their natural enemies are present, and b) using this information to plan what pest management techniques are required.	Minor Must
CB 5.3	Intervention?	The producer shall show evidence that in situations where pest attacks adversely affect the economic value of a crop, intervention with specific pest control methods will take place. Where possible, non-chemical approaches shall be considered. N/A when the producer did not need to intervene.	Minor Must
CB 6	**PLANT PROTECTION PRODUCTS**		
	In situations where a pest attack will adversely affect the economic value of a crop, it may be necessary to intervene using specific pest control methods, including PPPs. The correct use, handling and storage of PPPs are essential.		
CB 6.1	**Choice of Plant Protection Products**		
CB 6.1.1	Is a current list kept of PPPs that are authorized in the country of production for use on crops being grown?	A list is available for the commercial brand names of PPPs (including their active ingredient composition or beneficial organisms) that are authorized on crops being, or which have been, grown on the farm under PFA within the last 12 months.	Minor Must
CB 6.1.2	Does the producer only use PPPs that are currently authorized in the country of use for the target crop (i.e., where such an official registration scheme exists)?	All the PPPs applied are officially and currently authorized or permitted by the appropriate governmental organization in the country of application. Where no official registration scheme exists, refer to the guideline on this subject (Annex CB 3) as well as the 'FAO International Code of Conduct on the Distribution and Use of Pesticides'. Refer also to Annex CB 3 for cases where the producer takes part in legal field trials for final approval of PPPs by the local government. No N/A.	Minor Must
CB 6.1.3	Is the PPP that has been applied appropriate for the target as recommended on the product label?	All the PPPs applied to the crop are suitable and can be justified (according to label recommendations or official registration body publication) for the pest, disease, weed or target of the PPP intervention. If the producer uses an off-label PPP, there shall be evidence of official approval for use of that PPP on that crop in that country. No N/A.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 6.2	**Advice on Quantity and Type of Plant Protection Products**		
CB 6.2.1	Are the persons selecting the PPPs competent to make that choice?	Where the PPP records show that the technically responsible person making the choice of the PPPs is an external qualified adviser, technical competence shall be demonstrated via official qualifications or specific training course attendance certificates. Fax and e-mails from advisers, governments, etc. are permissible. Where the PPP records show that the technically responsible person making the choice of PPPs is the producer or designated employee, experience shall be complemented by technical knowledge that can be demonstrated via technical documentation (e.g., product technical literature, specific training course attendance, etc.).	Major Must
CB 6.3	**Records of Application**		
CB 6.3.1	Are records of all PPP applications kept and do they include the following minimum criteria: • Crop name and/or variety • Application location • Date and end time of application • Product trade name and active ingredient • Pre-harvest interval	All PPP application records shall specify: • The crop and/or variety treated. No N/A. • The geographical area, the name or reference of the farm, and the field, orchard or greenhouse where the crop is located. No N/A. • The exact dates (day/month/year) and end time of the application. The actual date (end date, if applied more than one day) of application shall be recorded. Producers need not record end times, but in these cases, it shall be considered that application was done at the end of the day recorded. No N/A. • The complete trade name (including formulation) and active ingredient or beneficial organism with scientific name. The active ingredient shall be recorded ,or it shall be possible to connect the trade name information to the active ingredient. No N/A. • The pre-harvest interval has been recorded for all PPP applications where a pre-harvest interval is stated on the product label or, if not on label, as stated by an official source. No N/A unless Flowers and Ornamentals.	Major Must

Nº	Control Points	Compliance Criteria	Level
	6.3.2 to 6.3.6: Are records of all plant protection product (PPP) applications kept and do they also include the following criteria:		
CB 6.3.2	Operator?	Full name and/or signature of the responsible operator(s) applying the PPPs shall be recorded. For electronic software systems, measures shall be in place to ensure authenticity of records. If a single individual makes all the applications, it is acceptable to record the operator details only once. If there is a team of workers doing the application, all of them need to be listed in the records. No N/A.	Minor Must
CB 6.3.3	Justification for application?	The name of the pest(s), disease(s), and/or weed(s) treated is documented in all PPPs application records. If common names are used, they shall correspond to the names stated on the label. No N/A.	Minor Must
CB 6.3.4	Technical authorization for application?	The technically responsible person making the decision on the use and the doses of the PPPs being applied has been identified in the records. If a single individual authorizes all the applications, it is acceptable to record this person's details only once. No N/A.	Minor Must
CB 6.3.5	Product quantity applied?	All PPP application records specify the amount of product to be applied in weight or volume or the total quantity of water (or other carrier medium) and dose in g/l or internationally recognized measures for the PPP.No N/A.	Minor Must
CB 6.3.6	Application machinery used?	The application machinery type (e.g., knapsack, high volume, U.L.V., via the irrigation system, dusting, fogger, aerial, or another method) for all the PPPs applied (if there are various units, these are identified individually) is detailed in all PPP application records. If it is always the same unit of application machinery (e.g., only 1 boom sprayer), it is acceptable to record the details only once. No N/A.	Minor Must
CB 6.3.7	Does the producer take active measures to prevent pesticide drift to neighboring plots?	The producer shall take active measures to avoid the risk of pesticide drift from own plots to neighboring production areas. This may include, but is not limited to, knowledge of what the neighbors are growing, maintenance of spray equipment, etc.	Recom.

Nº	Control Points	Compliance Criteria	Level
CB 6.3.8	Does the producer take active measures to prevent pesticide drift from neighboring plots?	The producer shall take active measures to avoid the risk of pesticide drift from adjacent plots e.g., by making agreements and organizing communication with producers from neighboring plots in order to eliminate the risk for undesired pesticide drift, by planting vegetative buffers at the edges of cropped fields, and by increasing pesticide sampling on such fields. N/A if not identified as risk.	Recom.
CB 6.4	**Pre-Harvest Interval** (N/A for Flowers and Ornamentals)		
CB 6.4.1	Have the registered pre-harvest intervals been complied with?	The producer shall demonstrate that all pre-harvest intervals have been complied with for PPPs applied to the crops, through the use of clear records such as PPP application records and crop harvest dates. Specifically in continuous harvesting situations, there are systems in place in the field, orchard or greenhouse (e.g., warning signs, time of application, etc.) to ensure compliance with all pre-harvest intervals. Refer to CB 6.6.4. No N/A, unless Flowers and Ornamentals production.	Major Must
CB 6.5	**Disposal of Surplus Application Mix**		
CB 6.5.1	Is surplus application mix or tank washings disposed of in a way that does not compromise food safety and the environment?	Applying surplus spray and tank washings to the crop is a first priority under the condition that the overall label dose rate is not exceeded. Surplus mix or tank washings shall be disposed of in a manner that does compromise neither food safety nor the environment. Records are kept. No N/A.	Minor Must
CB 6.6	**Plant Protection Product Residue Analysis** (N/A for Flowers and Ornamentals Production or Plant Propagation Material Production)		
CB 6.6.1	Can the producer demonstrate that information regarding the maximum residue levels (MRLs) of the country(ies) of destination (i.e., market(s) in which the producer intends to trade) is available?	The producer or the producer's customer shall have available a list of current applicable MRLs for all market(s) in which produce is intended to be traded (domestic and/or international). The MRLs shall be identified by either demonstrating communication with clients confirming the intended market(s), or by selecting the specific country(ies) (or group of countries) in which produce is intending to be traded, and presenting evidence of compliance with a residue screening system that meets the current applicable MRLs of that country. Where a group of countries is targeted together for trading, the residue screening system shall meet the strictest current applicable MRLs in the group. Refer to ‚Annex CB 4 Guideline CB 6.6 Residue Analysis‘.	Major Must

Nº	Control Points	Compliance Criteria	Level
CB 6.6.2	Has action been taken to meet the MRLs of the market in which the producer is intending to trade the produce?	Where the MRLs of the market in which the producer is intending to trade the produce are stricter than those of the country of production, the producer or the producer's customer shall demonstrate that during the production cycle these MRLs have been taken into account (i.e., modification where necessary of PPP application regime and/or use of produce residue testing results).	Major Must
CB 6.6.3	Has the producer completed a risk assessment covering all registered crops to determine if the products will be compliant with the MRLs in the country of destination?	The risk assessment shall cover all registered crops and evaluate the PPP use and the potential risk of MRL exceedance. Risk assessments normally conclude that there is a need to undertake residue analysis and identify the number of analyses, when and where to take the samples, and the type of analysis according to 'Annex CB 5 Guideline: CB 6.6.3 Maximum Residue Limit Exceedance Risk Assessment'. The Annex CB 5B 'Mandatory Minimum Criteria of a Residue Monitoring System (RMS)' is obligatory. A risk assessment that concludes that there is no need to undertake residue analysis shall have identified that there is: • A track history of 4 or more years of analytical verification without detecting incidences (e.g., exceedances, use of non-authorized PPPs, etc.) • No or minimal use of PPPs • No use of PPPs close to harvesting (spraying to harvest interval is much bigger than the PPP pre-harvest interval) • A risk assessment validated by an independent third party (e.g., CB inspector, expert, etc.) or the customer Exceptions to these conditions could be those crops where there is no use of PPPs and the environment is very controlled, and for these reasons the industry does not normally undertake PPP residue analysis (mushrooms could be an example).	Major Must

Nº	Control Points	Compliance Criteria	Level
CB 6.6.4	Is there evidence of residue tests, based on the results of the risk assessment?	Based on the outcome of the risk assessment, current documented evidence or records shall be available of PPP residue analysis results for the registered product crops, or of participation in a PPP residue monitoring system that is traceable to the farm and compliant with the minimum requirements set in Annex CB 5. When residue tests are required as a result of the risk assessment, the criteria relating to sampling procedures, accredited labs, etc., shall be followed. Analysis results have to be traceable back to the specific producer and production site where the sample comes from.	Major Must
CB 6.7	**Plant Protection Product Storage**		
	The plant protection product (PPP) store must comply with basic rules to ensure safe storage and use.		
CB 6.7.1	Are PPPs stored in accordance with local regulations in a secure place with sufficient facilities for measuring and mixing them, and are they kept in their original package?	The PPP storage facilities shall: • Comply with all the appropriate current national, regional and local legislation and regulations. • Be kept secure under lock and key. No N/A. • Have measuring equipment whose graduation for containers and calibration verification for scales been verified annually by the producer to assure accuracy of mixtures, and are equipped with utensils (e.g., buckets, water supply point, etc.), and they are kept clean for the safe and efficient handling of all PPPs that can be applied. This also applies to the filling/mixing area if this is different. No N/A. • Contain the PPPs in their original containers and packs. In the case of breakage only, the new package shall contain all the information of the original label. No N/A.	Major Must
	CB 6.7.2 to 6.7.10: Are plant protection products (PPPs) stored in a location that is:		
CB 6.7.2	Sound?	The PPP storage facilities are built in a manner that is structurally sound and robust. Storage capacity shall be appropriate for the highest amount of PPPs that need to be stored during the PPP application season, and the PPPs are stored in a way that is not dangerous for the workers and does not create a risk of cross-contamination between them or with other products. No N/A.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 6.7.3	Appropriate to the temperature conditions?	The PPPs are stored according to label storage requirements. No N/A.	Minor Must
CB 6.7.4	Well ventilated (in the case of walk-in storage)?	The PPP storage facilities have sufficient and constant ventilation of fresh air to avoid a build-up of harmful vapors. No N/A.	Minor Must
CB 6.7.5	Located away from other materials?	The minimum requirement is to prevent cross-contamination between PPPs and other surfaces or materials that may enter into contact with the edible part of the crop by the use of a physical barrier (wall, sheeting, etc.). No N/A.	Minor Must
CB 6.7.6	Is the PPP storage facility able to retain spillage?	The PPP storage facilities have retaining tanks or products are bunded according to 110% of the volume of the largest container of stored liquid, to ensure that there cannot be any leakage, seepage, or contamination to the exterior of the facility. No N/A.	Minor Must
CB 6.7.7	Is all PPP storage shelving made of non-absorbent material?	The PPP storage facilities are equipped with shelving that is not absorbent in case of spillage (e.g., metal, rigid plastic, or covered with impermeable liner, etc.).	Minor Must
CB 6.7.8	Are keys and access to the PPP storage facility limited to workers with formal training in the handling of PPPs?	The PPP storage facilities are kept locked and physical access is only granted in the presence of persons who can demonstrate formal training in the safe handling and use of PPPs. No N/A.	Minor Must
CB 6.7.9	Are liquids not stored on shelves above powders?	All the PPPs that are liquid formulations are stored on shelving that is never above those products that are powder or granular formulations. No N/A.	Minor Must
CB 6.7.10	Are PPPs approved for use on the crops registered for the PFA standard stored separately within the storage facility from PPPs used for other purposes?	PPPs used for purposes other than for registered crops (i.e., use in garden etc.) are clearly identified and stored separately in the PPP store.	Minor Must
CB 6.8	**Plant Protection Product Handling** (N/A if no Plant Protection Product Handling)		
CB 6.8.1	When mixing PPPs, are the correct handling and filling procedures followed as stated on the label?	Facilities, including appropriate measuring equipment, shall be adequate for mixing PPPs, so that the correct handling and filling procedures, as stated on the label, can be followed. No N/A.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 6.9	**Empty Plant Protection Product Containers**		
CB 6.9.1	Are empty containers rinsed either via the use of an integrated pressure-rinsing device on the application equipment or at least 3 times with water before storage and disposal, and is the rinsate from empty containers returned to the application equipment tank or disposed of in accordance with CB 6.5.1?	Pressure-rinsing equipment for PPP containers shall be installed on the PPP application machinery or there shall be clear written instructions to rinse each container at least 3 times prior to its disposal. Either via the use of a container-handling device or according to a written procedure for the application equipment operators, the rinsate from the empty PPP containers shall always be put back into the application equipment tank when mixing, or disposed of in a manner that does compromise neither food safety nor the environment. No N/A.	Major Must
CB 6.9.2	Is re-use of empty PPP plant protection product containers for purposes other than containing and transporting the identical product being avoided?	There is evidence that empty PPP plant protection product containers have not been or currently are not being re-used for anything other than containing and transporting identical product as stated on the original label. No N/A.	Minor Must
CB 6.9.3	Are empty containers kept secure until disposal is possible?	There is a designated secure store point for all empty PPP containers prior to disposal that is isolated from the crop and packaging materials (i.e., permanently marked via signage and locked, with physically restricted access for persons and fauna).	Minor Must
CB 6.9.4	Does disposal of empty PPP containers occur in a manner that avoids exposure to humans and contamination of the environment?	Producers shall dispose of empty PPP containers using a secure storage point, a safe handling system prior to the disposal, and a disposal method that complies with applicable legislation and avoids exposure to people and the contamination of the environment (watercourses, flora and fauna). No N/A.	Minor Must

Nº	Control Points	Compliance Criteria	Level
CB 7	**EQUIPMENT**		
CB 7.1	Is equipment sensitive to food safety (e.g., PPP sprayers, irrigation/fertigation equipment, post-harvest product application equipment) maintained in a good state of repair, routinely verified and, where applicable, calibrated at least annually, and are records of measures taken within the previous 12 months available?	The equipment is kept in a good state of repair with documented evidence of up-to-date maintenance sheets for all repairs, oil changes, etc. undertaken. E.g., PPP sprayers: See Annex CB 6 for guidance on compliance with visual inspection and functional tests of application equipment. The calibration of the PPP application machinery (automatic and non-automatic) has been verified for correct operation within the last 12 months and this is certified or documented either by participation in an official scheme (where it exists) or by having been carried out by a person who can demonstrate their competence. If small handheld measures not individually identifiable are used, then their average capacity has been verified and documented, with all such items in use having been compared to a standard measure at least annually. Irrigation/fertigation equipment: As a minimum, annual maintenance records shall be kept for all methods of irrigation/fertigation machinery/techniques used.	Minor Must
CB 7.2	Is equipment sensitive to the environment and other equipment used on the farming activities (e.g., fertilizer spreaders, equipment used for weighing and temperature control) routinely verified and, where applicable, calibrated at least annually?	The equipment used is kept in a good state of repair with documented evidence of up-to-date maintenance sheets for all repairs, oil changes, etc. undertaken. E.g., fertilizer spreader: There shall exist, as a minimum, records stating that the verification of calibration has been carried out by a specialized company, supplier of fertilization equipment or by the technically responsible person of the farm within the last 12 months. If small handheld measures not individually identifiable are used, then their average capacity has been verified and documented, with all such items in use having been compared to a standard measure at least annually.	Minor Must

ANNEX CB 1 GUIDELINE: RESPONSIBLE ON-FARM WATER MANAGEMENT FOR CROPS

1. INTRODUCTION TO THE GUIDANCE DOCUMENT

This is a GUIDELINE. Where examples are supplied, the lists are not exhaustive, but provide sufficient guidance to producers to design a risk assessment, develop a farm-specific water management plan, and implement good practices .

Water is one of the main basic raw materials needed to produce food. Fresh water resources have become scarce in more and more regions. Water allocation is becoming a complex issue, especially in certain regions and for certain uses. Managing water requires specific knowledge, skills and improved planning, for example, to react in times of water scarcity. Clean and sufficient water is important for human health, the health of our ecosystems, and for global economic growth and development. To achieve this, good on-farm practices are required, as the agricultural sector is one of the major users of fresh water resources.

This guidance document is designed to support growers seeking assessment and to make them aware that the control points and compliance criteria (CPCC) regarding responsible water management have been upgraded. This document helps growers understand the requirements that must be fulfilled in order to achieve complianc.

The document is intended to help growers carry out and comply with some of the new and more complicated tasks or requirements concerning water use, such as performing a risk analysis and drafting a water management plan. This guidance document attempts to identify all the relevant factors that need to be considered and/or the measures that need to be implemented in order to ensure that responsible water management takes place on the farm.

This guidance document is not a manual for agronomists or academics–it does not fully illustrate and discusses on-farm water management according to theoretical or applied science. It is designed to be a practical document to help producers, persons responsible for irrigation on farms, auditors, consultants, members of GLOBALG.A.P., and others to develop an integrated understanding of good practices for on-farm water management.

2. RESPONSIBLE ON-FARM WATER MANAGEMENT

This section elaborates on good practices to improve on-farm water management. The focus is on reducing direct and indirect contamination of water bodies from agricultural fields by introducing good water management practices on the farm. These practices will also help to improve the efficient and safe use of water resources to grow crops.

The recommended good practices for water management described in this section are at farm level and mainly focus on:

- **The day-to-day management of irrigation and soil** (e.g., avoiding over-irrigation, leaching, excessive drainage and agricultural runoff, reducing soil erosion, improving soil fertility, etc.)
- **The use of crop protection products** (i.e., the use of insecticides, fungicides, and/or herbicides)
- **The application of crop nutrition** (i.e., the application of fertilizers and organic soil amendments such as manure)
- **Waste management** (e.g., the management of spray tank leftovers, the disposal of empty plant protection product (PPP) containers, etc.)

2.1 Definition of Responsible On-Farm Water Management

The following characterizes sustainable and responsible water management at farm level:

- The farm management has a proper overview of all the water sources surrounding the farm. This includes identifying the sources that are used for extraction, how much water is extracted and when, and having an overview of the farm water distribution system.
- The farm uses water resources in an efficient and planned manner for irrigating crops.
- The irrigation water quality is controlled.
- There is control over the possible return of wastewater from the farm back into water bodies.
- There is proper handling and use of PPPs, fertilizers and organic soil amendments (correct time, place and amount of application).
- Good soil management practices are in place (to prevent soil erosion, improve the water retaining capacity of the soil and as such prevent water pollution by surface runoff, subsurface runoff and drainage).

2.2 Water Quality

The *three* main sources of water contamination in agriculture are chemical (i.e., nutrients, such as nitrates, phosphates, and agrochemicals), physical (e.g., soil, stones, glass) and microbial.

The main potential pollutants from agricultural fields are PPPs and nutrients.

If organic and inorganic fertilizers end up in surface waters in excessive quantities, this can cause eutrophication of waters bodies.

It is important to handle and use **PPPs** and **fertilizers** according to their registered uses, while following recommended best practices to prevent them from transferring to other parts of the environment, notably vulnerable areas such as drinking water sourcing areas.

It is important to consider that microbial contamination of irrigation water, for example **with organic manures,** can impact food safety. In this case, the quality of irrigation water is critically important and shall be controlled regularly (See Annex FV 1 for risks associated with microbial contamination of water).

Direct and Indirect Contamination

- Direct (also known as point source) contamination refers to clearly identifiable sources of contamination, for example spills of PPPs made during mixing and loading of the sprayer or the disposal of tank leftovers fields without properly diluting the mixture and/or without taking into account adjacent water bodies.

By contrast, indirect (also known as diffuse source) contamination is distributed at various locations around the farm and fields. Transfer routes from indirect sources include runoff, drainage, leaching and spray drift. The prevention of indirect source contamination is more complicated than the prevention of direct contamination. Preventing indirect source contamination often involves changing agricultural practices in the field, such as introducing:

- Vegetative buffers at the edges of cropped fields
- Crop rotation with more diverse crops, and other cropping practices that improve soil organic matter and prevent erosion

- Contour cropping
- Minimum tillage
- Better irrigation scheduling and intensities
- Low-drift spray nozzles, careful calibration of spray equipment, etc.

It is important to assess whether direct contamination occurs at the farm and to identify the main areas of risk. This will enable plans to be put in place to ensure that risks are reduced.

These plans include, for example, careful management of PPPs to avoid contamination of water bodies and sources. Keeping records of PPP use is important as well as implementing recommended good practices, which, for example, include proper storage rooms, contained areas for sprayer mixing and loading, the management of spills and tank leftovers, and the collection and safe disposal of contaminated wastewater.

It is more complicated to determine whether there is indirect contamination from agricultural fields and if so to identify the main triggers. This requires an assessment of the fields. For example, visible erosion in the form of tramlines indicates the occurrence of surface runoff. This may be caused by poor infiltration capacity of the soil due to poor soil management practices (e.g., deep plowing, no crop rotation and/or the absence of a proper farm traffic plan). It is more difficult to assess whether the fields are susceptible to leaching of agrochemicals. Local farm advisers or farm service providers can support producers in assessing the risk of agricultural runoff, leaching, drainage, and drift from agricultural fields.

According to the type and source of contamination, tailored mitigation measures and best management practices can be implemented. The most important mitigation measure is the correct management of PPP applications, i.e., the right time, place and amount. It is important to keep track of the weather forecast. Applying PPPs before a heavy shower can increase the risk of agricultural runoff and/or leaching and as such contaminate water bodies.

2.3 Water Quantity

There are 3 sources of water:

- Groundwater: Water that is captured and stored naturally under the soil. Renewable groundwater is stored in underground aquifers, which are recharged in the short term by rainfall. Fossil groundwater is stored in deeper aquifers, which are not recharged by rainfall.
- Surface water: Fresh water in lakes, rivers, natural and artificial ponds, and ditches.
- Captured water: Water stored by dams or captured in artificial basins.

Unsustainable (over)extraction of water from groundwater aquifers can cause a drop in the groundwater table. Lower groundwater tables impact not only the producers, as they will have to drill deeper to extract groundwater, but also the wider community. It can also cause the intrusion of salt water into freshwater aquifers in regions located close to the sea.

Reducing the consumption of water for irrigation by a more efficient use (and thus less wastefully) is good practice for producers.This can be achieved by better irrigation management through timely applications of the correct amount of water the crops need. It can also be achieved through better soil management, for example, by increasing the

soil water retaining capacity by increasing the organic matter content, or investing in mulching. Some crop varieties also use water more optimally. The efficient use of water for irrigation also does not impact crop yields if planned properly, for example by avoiding water stress (e.g., by using soil moisture probes).

2.4 Irrigation Methods

Irrigation methods can generally be divided into 3 types:
1) Surface irrigation
2) Sprinkler irrigation
3) Drip irrigation

Each of these methods impacts water quality and quantity in different ways. The choice of using a certain irrigation method depends on the crop, the soil, the producer's ability to invest in irrigation and/or get support from local authorities in irrigation systems, as well as long-standing irrigation practices in the case of traditional irrigation systems.

Surface Irrigation

There are different types of surface irrigation systems: flood, basin, border or furrow irrigation. There is a greater risk of water contamination in the case of surface irrigation due to the reduced control producers have on the application of water to the crops. For example, flood irrigation brings a larger risk of leaching and drainage. Furrow irrigation also increases the risk of runoff at the tail end of the field, if not managed effectively. Surface irrigation systems are considered to have a low irrigation efficiency (IE) or water use efficiency (WUE) due to high evaporative losses as compared to sprinkler and drip irrigation systems.

Sprinkler Irrigation

Sprinkler irrigation systems can irrigate large fields and are in most cases replaceable. They are often used when irrigation is not a steady need but required in exceptional circumstances such as dry periods. There are different sprinkler irrigation methods, such as micro-sprinklers, central pivot irrigation systems, laterals, and gun and boom systems. Sprinkler irrigation systems are pressurized irrigation systems and thus need energy to function. The main disadvantage of sprinkler irrigation systems (aside from the high cost) is the evaporative loss of water. This makes the timing of irrigation critical; for example, irrigation at mid-day will increase losses by evaporation.

Drip Irrigation

Like sprinkler irrigation systems, drip irrigation systems are pressurized and thus make use of energy only when functional (some more than others depending on topographical differences and thus the need to pump water). These systems are popular due to their ease of use and high IE or WUE. Water loss, i.e., evaporative losses or other non-beneficial uses, is minimal. Drip irrigation systems are considered to be the preferred solution in arid and semi-arid regions. However, having drip irrigation in place does not by definition mean that water is used efficiently, and that water is being saved. Good management practices need to be implemented to ensure that on-farm irrigation does not impact water availability to other users in the catchment or river basin (this includes the need for water for healthy ecosystems).

2.5 Water-Related Practices in Rain-Fed Agriculture

Good soil management to improve the infiltration of precipitation in the topsoil and increase the soil's water holding capacity is very important in both irrigated and rain-fed agriculture, as this prevents agricultural runoff or drainage from agricultural fields. Moreover, better retention of available water in the soil allows crops to consume more water, which can improve crop biomass and yields in rain-fed agriculture in arid and semi-arid regions. Increasing soil organic matter content is critical in raising the soil's water-holding capacity.

To improve water quantity management, tools can be put into place to store excess precipitation, which can be used in periods of water stress. Precipitation can be stored by collecting water from roofs or by storing water in reservoirs built in areas that are not cultivated.

2.6 Good Practices for Water Management

The following are examples of practices that may be implemented to ensure responsible on-farm water management:

2.6.1 Water Quality

- Test the quality of irrigation water and monitor, where possible, the amount of effluent entering water bodies from agricultural fields at accurate intervals.
- Preferably mix and load the sprayer on a concrete/impermeable area at the farm within a safe distance from streams, ditches, wells, food and feed storage rooms, residential areas and roads. Make sure that the area has a small depression that leads possible spills and wastewater from washing the sprayer and the nozzles into an artificial drain for collection and safe disposal. The collected effluent and any remnants, such as tank leftovers, can be sent off for disposal to authorized waste disposal companies or treated at the farm using an effluent management system.
- Areas used for mixing and loading the sprayer must not be located in the vicinity of irrigation storage reservoirs.
- Use the correct irrigation method based on crop, soil, climate and slope to prevent erosion, leaching, evaporative losses and agricultural runoff.
- Improving topsoil permeability can also reduce agricultural runoff. This can be done, for example, by preventing capping or compaction of the soil, introducing controlled farm traffic, and improving soil structure by applying minimum tillage or no till if the soil and other circumstances allow this.
- Agricultural runoff can further be prevented from directly entering surface water bodies by installing buffers next to streams. This will protect surface water bodies from agrochemicals or nutrients that may run off the fields due to precipitation or irrigation.
- Do not irrigate with surface or groundwater if it is contaminated (e.g., microbial, heavy metals, industrial pollutants, etc.).
- If irrigation water is recycled through a drainage system, check that the following crops are not sensitive to herbicides in water even when very low concentrations (this information is normally provided on the label about sensitivities of following crops).
- Do not use PPPs with a high leaching potential (the label will normally state this), if the groundwater table is very close to the surface and the soil is vulnerable to leaching (high drainage rate, coarse texture (sandy) or heavier textures with extensive cracks/worm channels, and low organic matter levels).
- Ensure that oil from tractors is not disposed of in ditches.
- Adhere to all local laws and bylaws regarding water quality (management).

Surface Irrigation Systems

- For crops treated with agrochemicals, ensure that border, basin or furrow irrigation is delayed for a few days after applications. In the case of furrow irrigation or when the borders are relatively small, ‘surge irrigation’ can be applied to allow for better infiltration of water into the soil avoiding runoff at the tail ends.
- Avoid irrigating with water that contains a high level of industrial effluents or grey water/black water, e.g., water from untreated sewage, or treated sewage high in heavy metals. This can have adverse effects on human health (both operators and consumers of the crops) and soils.

Sprinkler and Drip Irrigation Systems

- If crop protection is applied through chemigation, drip irrigation systems should be thoroughly checked because clogging can cause damage to the system and the nozzles, which may lead to leaks.
- If chemigation is applied, use high quality and strong materials for drip lines. Also make sure that the permanent drip irrigation systems (such as in orchards) are equipped with back-flow prevention devices, which stop water from flowing back into reservoirs and thus contaminating larger amounts of water.
- The differences in wetting area and crop root volumes must be kept minimal to prevent leaching.

2.6.2 Water Quantity

- Comply with national and international legislation concerning water quantity management and related good practices, if available
- Adhere to all local laws and bylaws regarding water abstraction
- Maintain the correct irrigation rate and intervals depending on crop needs, soil type, and water availability. The latter is important because in the case of serious water shortages or water scarcity, one can choose to apply deficit irrigation, i.e., applying water during the most critical growth stages of the crops, such as flowering, to prevent yield loss.
- Always avoid over-irrigation to prevent leaching, agricultural runoff, and drainage.
- Minimize evaporative losses, for example, from open water surfaces.
- When using groundwater for irrigation, use it sustainably. This means not extracting more than the yearly recharge rate to avoid a drop in the groundwater table.
- Maintain a correct irrigation application rate depending on the crop, the growth stage, the availability of water, and the crop water requirements, which also depend on the weather conditions (heat and amount of precipitation).
- Advice on the correct irrigation application rates during the season is available from water user associations, local water management authorities or from private service providers. Growers can also estimate correct irrigation application rates themselves if tools such as soil moisture probes are available.
- Timely maintenance of the irrigation system is important to reduce leaks and improve IE or WUE.
- Increase the soil's water holding capacity, reduce agricultural runoff, leaching, and prevent soil erosion. The soil's water holding capacity can be improved by increasing soil organic matter. Conservation agriculture, which includes minimum tillage or no tillage, helps improve soil organic matter depending on the local circumstances, e.g., soil type, climate, etc.
- Monitor and document water usage.

Surface Irrigation Systems

- Improve conveyance and application efficiencies where needed and possible. If return flows have clearly proven to be useful for downstream users and if this does not financially impact the producer, allow these return flows to occur and avoid recapturing these flows for re-use in the irrigation system.

- Maintain proper design of the irrigation system, i.e., the size of flood basins, the distribution of gates, the length of furrows, etc.

Sprinkler and Drip Irrigation Systems

- Use good quality drip lines to prevent damage and leaks.
- Use water optimally by ensuring the correct wetting pattern, i.e., avoid too much overlap of wetted circles around drippers or sprinklers.
- Drip irrigation: Use correct sized pipes and maintain equal pressure on all plots of a culture, etc.

3. GUIDANCE ON THE CONTROL POINTS AND COMPLIANCE CRITERIA (CPCC) FOR ON-FARM RESPONSIBLE WATER MANAGEMENT

This section provides guidance on what to consider in order to ensure that a more sustainable and responsible management of water is taking place on the farm, and to fulfill the requirements of PFA. This is particularly important in regions where water resources are scarce.

CB 4.1.1 Irrigation/Fertigation Management

Control Point	***Compliance Criterion***	***Level***
Has a risk assessment been undertaken that evaluates environmental issues for water management on the farm, and has it been reviewed by the management within the previous 12 months?	*There is a documented risk assessment that identifies environmental impacts of the water sources, distribution system and irrigation and crop washing usages. In addition, the risk assessment shall take into consideration the impact of own farming activities on off-farm environments, where information is known to be available. The risk assessment shall be completed, fully implemented and it shall be reviewed and approved annually by the management. See 'Annex AF 1 GLOBALG.A.P. Guideline: Risk Assessments – General' and 'Annex CB 1 GLOBALG.A.P. Guideline: Responsible On-Farm Water Management for Crops' for further guidance. No N/A.*	*Minor Must*

Guidance:

A documented risk assessment should identify the relevant food safety and environmental impacts of on-farm water use. This includes risks concerning the potential contamination of water (water quality) as well as the over-use of water (water quantity) as explained in the introductory sections of this guidance document.

For this purpose, you should assess the way in which water is used and identify any activities that could result in the inefficient and wasteful use of water, as well as opportunities for more efficient water use. Issues such as over-irrigation or the use of wastewater for irrigation should be addressed.

Farm water sources and distribution systems shall be described to help identify potential sources and opportunities for contamination. The risk assessment will provide guidance on how to best manage possible direct and indirect sources of contamination.

The risk assessment shall be reviewed and approved annually by the farm management.

See Annex AF 1 of the GLOBALG.A.P. Integrated Farm Assurance (IFA) CPCC document for further guidance on how to perform an on-farm risk assessment.

The risk assessment shall be updated annually and be farm-specific.
Any format can be used, but with strong reference to the guidance provided in Annex AF 1, and taking into consideration the following main elements:

1. Food Safety:

Specific risk analysis on food safety according to CPCC CB 4.2.2.
Please see the annexes on risks associated with on-farm microbiological contamination of water for more detail.

2. Environment

Water Source:
The risk assessment shall address the water sources on and surrounding the farm and the specific use of the water.

- Describe the sources and distribution systems of water used on the farm.
- Describe any natural or man-made water bodies on the farm.
- Does the water source contain debris and/or sediment?
- Is there national legislation that stipulates maximum allowed residue levels of PPPs and nutrients in groundwater and surface water levels?
- Compile a list of pesticides applied on the fields, including the location on the farm, method of application, the target crop, time of application, dose rate.
- Compile a list of fertilizers and organic amendments applied on the fields, including the location on the farm, method of application, target crop, time of application, and dose rate.
- Maximum allowed residue levels of PPPs and nutrients in groundwater and surface water levels according to national legislation

Permits and Licenses Needed:

- Are permits or licenses needed in order to extract and store groundwater or surface water (for example from rivers, lakes, streams or ditches on or near the farm?
- Quantities of water within legal limitations: Are there any restrictions concerning water use from local authorities or irrigation schemes to which the producer belongs?
- Permits for all installations: Are permits needed for wells, pumping stations, storage basins, and distribution systems?

Water Use:

- Identify all uses of water on the farm.
- Identify activities that could result in wastage and over-use of water (e.g., leakage from water distribution systems, poorly maintained irrigation equipment, inefficient irrigation.

Water Quality

- Identify activities that could be potential sources of contamination of water bodies (streams, ponds, etc.) and water sources. This includes disposal of wastewater, spray-tank washings and leftovers, use of agrochemicals (pesticides, organic/inorganic fertilizers).
- Identify locations where wastewater and spray-tank leftovers are disposed of, and their proximity to water sources.
- Identify locations where the use of plant protection chemicals could contaminate water bodies and sources through runoff or spray drift.
- Identify locations where the use of organic or inorganic manure could contaminate water bodies and sources through runoff (e.g., where there is close proximity to water, or where land is steep).
- Does or could the use of water by the farm cause agricultural runoff containing PPPs, nutrients or hazardous contaminants?

CB 4.1.2 Irrigation/Fertigation

Control Point	***Compliance Criterion***	***Level***
Is there a water management plan available that identifies water sources and measures to ensure the efficiency of application and which management has approved within the previous 12 months?	*There is a written and implemented action plan that identifies water sources and measures to ensure efficient use and application, which has been approved by the farm management within the previous 12 months.* *The plan shall include one or more of the following: maps (see AF 1.1.1), photographs, drawings (hand drawings are acceptable) or other means to identify the location of water source(s), permanent fixtures and the flow of the water system (including holding systems, reservoirs or any water captured for re-use).* *Permanent fixtures, including wells, gates, reservoirs, valves, returns and other above-ground features that make up a complete irrigation system, shall be documented in such a manner as to enable location in the field. The plan shall also assess the need for the maintenance of irrigation equipment. Training and/or retraining of personnel responsible for the oversight or performance duties shall be provided. Short and long-term plans for improvement, with timescales where deficiencies exist, shall be included. This can either be an individual plan or a regional activity that the farm may participating in or is covered by such activities.*	*Minor Must*

Guidance:

A written on-farm water management plan will help assess current practices on the farm and identify practices that may need to be changed or optimized to improve overall on-farm water use and water quality management. Such a plan needs to be approved by the farm manager and be reviewed each year.

Each on-farm water management plan should provide a description of which measures are in place or will be put into place. These measures should address the efficient use of water resources as well as the prevention of contamination of water bodies. The plan shall be formulated based on the risk assessment. It shall include factors to mitigate the risks identified in the risk assessment, and include training for producers and workers to ensure proper implementation.

Short and long-term plans for improvement, with timescales where appropriate, shall be included. This plan can either be an individual plan or a regional activity that the farm may be participating in or is covered by such activities.

The following are recommended good practices that can help to improve water management on the farm:

Sustainable Soil and Crop Management Practices

- Implement practices such as conservation agriculture, mulching, controlled traffic, crop rotation, and planting of cover crops. These can reduce agricultural runoff and thus possible contamination of surface water bodies.
- Improve the soil organic matter content.
- Choose crop varieties that use water optimally (perhaps with specific features to optimize water use.)

Losses:

- Prevent water loss in the irrigation system, for example, that occur through leaks.
- Prevent leaks through effective maintenance of the irrigation system.
- Use well designed basins, pipes, and pumps to avoid losses.

Evaporative Losses:

- Prevent substantial evaporative losses in the irrigation.
- Attempt to avoid such losses by measuring or estimating them.

Irrigation Interval:

- Ensure irrigation intervals are well managed to ensure efficiency.
- Take into account precipitation events and the soil moisture content to calculate the required irrigation interval and irrigation application rate.
- Be flexible and reactive in adjusting the irrigation interval according to changing crop water requirements.

Pressure Management in Hydrants:

- In the case of pressurized irrigation systems (i.e., sprinkler and drip irrigation systems), ensure a correct homogeneous pressure is maintained in all hydrants and on all plots to optimize the distribution of irrigation and thus avoid over- and under-irrigation.

Downstream shortages:

- Consider if the use of water by the farm could cause water shortages downstream.

It is recommended to include the following aspects into the on-farm water management plan:

1. Measure water use for all on-farm water extraction and distribution infrastructure such as:
    - All groundwater wells used for irrigation (m3/month, m3/year).
    - All intakes from streams or ditches (m3/month, m3/year)
    - All irrigation infrastructures such as water distribution pipes or channels
    - Main, secondary and tertiary irrigation channels and gates in the case of surface irrigation water pumps (capacity m3/ha)
    - All hydrants in case of a pressurized irrigation system
    - All reservoirs either used for irrigation or used to capture precipitation
    - All water harvesting constructions
2. Fixed constructions on the farm should be mapped. The map may also include the larger water bodies outside the farm if there are any close to the fields.
3. Mention whether the distribution of water to/on the farm is centrally managed, for example, through a water user association, or whether water is extracted individually by using a private well or pumped from adjacent streams and ditches.
4. Include data on crops and water use: Measure/estimate how much water has been applied on the field (m^3/ha/month/crop, m^3/ha/year/crop). Review and explain the methods used to calculate this.
5. If possible and relevant to the irrigation method used (e.g., drip irrigation systems, etc.), include irrigation system efficiency data, such as the conveyance (efficiency of water transport in irrigation canals or through irrigation pipes, which is a function of canal/pipe length, canal characteristics (e.g., earthen or lined canals), soil type and system maintenance. This can be determined using widely available estimation tables (measured in %)) and application efficiencies (the volume of water added to the root zone divided by the volume of water applied to the field (measured in %), which will help in assessing and improving the efficiency of the irrigation infrastructure.
6. Indicate how crop water requirements (CWR) are calculated. Also, include the irrigation intervals and length of irrigation cycles. Optimal intervals and cycle lengths should be maintained. For example, in the case of furrow-irrigated fields, surge flow can significantly improve irrigation uniformity and beneficial uptake of the water by crops. Temperature can also trigger differences in intervals (e.g., larger intervals when lower temperatures and thus a reduced need for crop evapotranspiration).
7. Maintenance: It is important to have a plan in place for the maintenance of the irrigation system and of farm machinery:
    - Indicate how often the fixed water extraction and distribution infrastructure are maintained and/or repaired and who is responsible for it.

- Address whether there is proper pressure management for optimal design flow through the drip and sprinkler irrigation systems.
- There should be a plan in place in case emergency maintenance is required.
- The persons who carry out the maintenance shall be properly trained to do so.
- Records should be available of when the maintenance was done, by whom and on what, e.g., what has been repaired?

8. Surface irrigation systems: Address whether surface irrigation systems are designed to make optimal use of gravity to minimize the use of pumps and consequently the energy use.

9. Direct and indirect sources of contamination: The plan should outline any measures put in place to mitigate the risks related to direct and indirect sources of water contamination identified in the risk assessment. It needs to address issues such as potential spillage from the crop protection mixing area, and sprayer loading and cleaning area, as well as contamination due to agricultural runoff, leaching and/or drainage.

10. Fertigation and/or chemigation: If fertigation and/or chemigation activities are maintained these need to be outlined, e.g., how much is applied, are drip irrigation systems used for fertigation/chemigation, etc.? Measures to mitigate any risks of contamination of water bodies and/or sources identified in the risk assessment should be outlined (e.g., avoiding applications on or near water, especially on sloping land; use of techniques to reduce runoff such as contour planting).

11. Climate data: Add information concerning the precipitation and temperature and, if possible, the reference evapotranspiration (if this information is available) throughout the year to make informed decisions on irrigated agriculture. Indicate if this information is easily accessible.

12. Training: The plan shall assess who needs training and in which topics. Training may be required to draft/implement a comprehensive water management plan, including logbooks, as well as on record keeping. Growers, technicians and farm workers may also need basic training in on-farm water quality management; the management, maintenance and operation of irrigation systems; and water quantity management. Growers, technicians, and farm workers should be aware of the management plan and its goals.

    Basic training on the following is recommended to assist the farm in implementing good water management practices:

    - The control of water quality
    - Safe use of pesticides on the farm and how to handle the sprayer and spray solutions/remnants
    - Management of the soil to maintain soil organic matter, improve infiltration capacity, improve soil water retaining capacity, and prevent erosion
    - Calculating the crop water requirements to make informed decisions about when to irrigate, what the irrigation interval should be, whether deficit irrigation can be applied in times of need, etc

13. Untreated sewage: The plan should take note of the fact that untreated sewage shall not be used for fertigation or irrigation. This point is covered under CB 3.4.1 and CB 4.1.1.

14. Record keeping: The guidance on record keeping is provided under AF 2.

15. Water use permits and licenses: The plan should make reference to all local regulations, by-laws and irrigation scheme rules concerning water extraction and use. The plan should ensure that all necessary licenses and permits have been obtained, are up-to-date, and are complied with. It should include details on all records that need to be kept in order to ensure and demonstrate that all relevant licenses, by-laws, and regulations are complied with.

Permits may be required for putting into place new water storage infrastructure and for the on-farm use of the captured or stored water. For example, local water harvesting and storing of precipitation shall not impact users elsewhere in the catchment area.

The plan must make reference to any local laws or by-laws concerning the correct disposal of wastewater, and indicate how they will be complied with, as well as any relevant records that need to be kept.

This requirement is the object of two control points and is further examined under CB 5.4.1 and 5.4.2 in IFA.

16. Predicting irrigation water use: This specific requirement is based on CPCC CB 5.1.1 in IFA.

Glossary

Aquifer: An aquifer is an underground layer of water-bearing, permeable rock consolidated materials (gravel, sand or silt), from which groundwater can be extracted using a water well.

Black water: Water polluted with food, animal, or human waste (source: online dictionary).

Chemical contamination: Soils and aquifers can be contaminated by irrigation water containing chemical contaminants, such as PPPs and heavy metals, in quantities above the legal limits.

Chemical status of soil: Chemical characteristics of a soil (affected by mineral composition, organic matter, and environmental factors).

Chemigation: Chemigation is the name for the injection of chemicals such as nitrogen, phosphorus or a pesticide into irrigation water that is then applied to the land using the irrigation system.

Contaminants, contamination: This may be microbial contamination (through microorganisms such as bacteria, virus, yeast) or chemical contamination (through chemicals such as heavy metals or agrochemicals).

Control points: Questions in the checklist of PFA that have to be answered positively. There are two types of control points: Major and Minor.

Contour cropping: A farming practice of plowing and/or planting across a slope following its elevation contour lines. These lines create a water break, which reduces the formation of rills and gullies during times of heavy water run-off (a major cause of topsoil loss and soil erosion). The water break also allows more time for the water to settle into the soil. In contour plowing, the ruts made by the plough run perpendicular rather than parallel to slopes, generally resulting in furrows that curve around the land and are level. This method is also known for preventing tillage erosion. (source: Wikipedia)

Compliance criteria: Normative elements attached to every control point and indicating the criteria to have the control point fulfilled.

Crop water requirements (CWR): This is the crop evapotranspiration, which is a function of the crop coefficient (depending on the crop characteristics and evaporation from the soil) and the evapotranspiration.
Diffuse source contamination: In contrast to point source contamination, it describes sources of contamination disseminated among various locations of farms and fields.

Downstream shortages: Water shortages downstream caused by the use of water by a farm.

Drip irrigation: Drip irrigation is an irrigation method that uses drip lines and emitters (or mini-sprinklers) for the localized delivery of water to the crop. In drip irrigation systems water is distributed from a storage basin through a pressurized distribution system to the fields.

Eutrophication: A process where water bodies receive excess nutrients that stimulate excessive plant growth. (source: USGS 2014)

Fertigation: Application of fertilizers, soil amendments or other water-soluble products through an irrigation system. (source: Wikipedia)

Fossil water: Water that has been infiltrated usually millennia ago and often under climatic conditions different to the present, and that has been stored underground since that time. This water has no or minimal contacts with the outer world and no, or only minimal recharge.

Furrow irrigation: Furrow irrigation is a surface irrigation system in which water is delivered in small, long streams to crops that are grown on ridges. Furrow irrigation systems are gravity led.

Grey water: Wastewater generated from hand-wash basins, showers and baths, which can be recycled on-site for uses such as toilet flushing, landscape irrigation and constructed wetlands. (source: Wikipedia)

Irrigation: Artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growth in grain fields, and preventing soil consolidation. By contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dryland farming.

Irrigation efficiency (IE): Terminology used for engineering irrigation systems and consists of the application efficiency (ea) and conveyance efficiency (ec) of the irrigation system (IE = ea * ec/100).

Microbial contamination: By water containing microbes in quantities above the legal limits.

Major control points: All Major control points must be fulfilled to achieve PFA compliance.

Minor control points: 95% of the minor control points must be fulfilled to achieve PFA compliance.

Minimum tillage: A conservation agriculture technique where the grower works 10 to 15 centimeter of the topsoil using minimum tillage machinery to allow for minimum disturbance of the soil so as to improve soil structure over time.

Point source contamination: This refers to clearly identifiable sources of contamination, for example spills of PPPs made during mixing and loading of the sprayer or the disposal of tank leftovers on the fields without properly diluting the mixture and/or without taking into account adjacent water bodies.
Plant protection products (PPP): Insecticides, fungicides and herbicides.
Pressurized irrigation: Sprinkler and drip irrigation are pressurized irrigation systems requiring energy to distribute the water.

(Agricultural) return flow: The (agricultural) return flow is the amount of water that flows back to water bodies downstream after being used on agricultural fields–thus the amount of water that has not been consumed.

River discharge: The flow of water through the river in m^3/s.

Surface irrigation: Surface irrigation systems comprise open channels in which water is distributed by gravity to field units and controlled by gates which are adjusted by the local irrigation system management authorities.

Sprinkler irrigation: An irrigation method that uses different sprinklers (travelling sprinklers, pivot systems, gun and boom, etc.) for the localized delivery of water to the crop. In sprinkler irrigation systems water is distributed from a storage basin through a pressurized distribution system to the fields.

Surge flow: Irrigation water is applied to furrows in a number of intervals to allow the applied water drain into the topsoil in the first parts of the furrow and reduce infiltration in these parts when applying the second time. This allows for an improved uniformity of irrigation water applied in the furrow-irrigated system.

Surge irrigation: Irrigation is not applied at once, but in surges or cycles that allow water to infiltrate in the soil at the head end of the furrow or border. A second surge of irrigation will allow water to move or advance further to the areas that have not received irrigation yet, reducing the potential for runoff at the tail end of the furrow or border.

Water body: The term most often refers to large accumulations of water, such as oceans, seas, and lakes, but it includes smaller pools of water such as ponds, wetlands, or more rarely, puddles. A body of water does not have to be still or contained–rivers, streams, canals, and other geographical features where water moves from one place to another are also considered bodies of water. (source: Wikipedia)

Water harvesting: Collecting and storing rainwater and/or runoff for domestic or agricultural use. The stored rainwater and/or runoff should be protected against pollution.

Water user association (WUA): Growers are members of this association and pay this association a price for the use of water in the irrigation systems. The WUA manages the maintenance of the irrigation system and, in the case of supply-based systems, also the distribution of water to its members.

Water use efficiency (WUE): The ratio between crop yield and the total amount of water applied.

4. EXAMPLE – RISKS SUMMARY

Risk	Issue		Status	Action
Physical	**Water scarcity**	Does the river basin or area face water scarcity due to the overexploitation of water resources? Can water scarcity affect the current or planned water usage by the producer? Does the producer contribute significantly to water scarcity in the river basin or area or might the producer do so in future?		
	Drought events	Does the river basin or area face droughts due to irregular rainfall? Can this phenomenon affect the producer's water usage? How flexible is the farm's water usage? Can this phenomenon affect the environmental, social and/or cultural issues?		
	Flood events	Does the river basin or area face floods due to irregular rainfall or water management? Can this phenomenon affect the producer? Can this phenomenon affect the environmental, social and/or cultural issues?		
	Water pollution	Does the river basin or area face water pollution? Are current or potential pollution sources upstream or located in the same groundwater area as the producer? Can the pollution affect the producer? Can this pollution affect the environmental, social and/or cultural issues?		
	Alternative water sources	Do alternative non-overexploited and/or non-polluted water sources exist? Can this water be allocated to the producer on a regular basis? Can this water be allocated to the producer under extreme situations (drought, pollution, etc.)? Are there (new) storage mechanisms in order to address temporary extreme situations? What are the environmental effects of the alternative sources or water storage systems?		
Regulatory	**Water allocation and management scheme**	Is the river basin or area managed according to a plan or scheme? Has this plan or scheme been consulted to the public and interested parties and approved by the corresponding water authority? Is the plan being implemented and updated on a regular basis? Is the producer's water usage included in the plan or scheme? If not, is the producer's water usage coherent with the plan's allocation and management scheme? Does this plan consider adequately the environmental, social and/or cultural issues?		
	Water usage permit	Does a procedure exist to hold a water usage permit? Does the producer hold a water usage permit adequate to its water usage? Does this permit interact with other (water usage) permits?		

Risk	Issue		Status	Action
	Non-authorized water usage	Does the producer use water (partially) without the correspondent permit? Do other users use water without the corresponding permit? Can this non-authorized water usage affect the producer's water usage permit or the water usage itself? Can this non-authorized water usage affect the environmental, social and/or cultural issues?		
	Priority usage	Is the usage of water prioritized in the river basin or area? What is the ranking of the producer in relation to other water users? Are specific regulations foreseen for extreme situations (drought, pollution, etc.)? Is there a risk for the producer's water usage taking into account the trend scenarios of priority water users and extreme situations? Can the permit be derogated in order to supply water to priority water users?		
Reputational	**Water conflict**	Does the river basin or groundwater area cross national, regional, local or cultural/ethnical borders? Are there conflicts about water in the river basin or area? What are their reasons? Are these conflicts addressed by conflict-resolution dialogue-processes? Is the producer involved in water conflicts in this particular area or in any other geographical area the producer operates? Are similar water users involved in water conflicts in the river basin or area or adjacent areas?		
	Environmental issues	What is the current situation of the freshwater environment in the river basin or area? What are the environmental and biodiversity trends for the river basin or area? Can these environmental trends affect negatively the farm's operations? Does the farm's water usage impact significantly, in direct or indirect form, the key environmental or biodiversity features? Has the producer developed a (public) environmental statement and/or plan? Does this plan respond to any water-related environmental conflicts or concerns that have arisen? Is this plan implemented, audited and updated on a regular basis? Is this plan publicly accessible?		

Risk	Issue		Status	Action
	Social issues	What is the current social situation regarding water issues (access to drinking water and adequate sanitation, etc.) in the river basin or area? What are the social trends for those aspects? Can social requirements or claims affect negatively the farm's operations? Does the farm's water usage impact significantly, in direct or indirect form, the access to drinking water and sanitation for the inhabitants of the river basin or area? Has the producer developed a (public) statement and/or plan in this regard? Does this plan respond to any conflicts or concerns that have arisen on the water usage? Is this plan implemented, audited and updated on a regular basis? Is this plan publicly accessible?		
	Cultural issues	What are the key cultural issues related to water in the river basin or area? What has been their evolution? Can cultural trends, requirements or claims affect negatively the farm's operations? Does the farm's water usage impact significantly, in direct or indirect form, the cultural heritage of the river basin or area? Has the producer developed a (public) statement and/or plan in this regard? Does this plan respond to any conflicts or concerns that have arisen on the water usage? Is this plan implemented, audited and updated on a regular basis? Is this plan publicly accessible?		
	Farm's water management	Is the water in the farm managed according to a plan? Does this plan include registers for historical, current and future water usage? Does this plan include provisions for the sustainable and efficient water usage? Does this plan respond to any conflicts or concerns that have arisen regarding the farm's water management? Is this plan implemented, audited and updated on a regular basis? Is this plan publicly accessible?		
Financial	**Financing**	Does the producer require regular or irregular external financing? Do the (current and potential) investors consider water-related criteria in their funding evaluation? Are there any specific aspects (e.g., water management plan, water usage permits) required by the investors? Do the investors establish thresholds for compliance with its water-related criteria?		

Risk	Issue		Status	Action
	Insurance	Does the producer subscribe insurances for its operations? Do the (current and potential) insurance operators consider water-related criteria in their evaluation? Are there any specific aspects (e.g., water management plan, water usage permits) required by the insurance operators? Do they establish risk thresholds for compliance with its water-related criteria?		
	Water pricing	Does the producer pay for the water usage? How is this price/tax/tariff fixed? Does it include operational costs and (environmental) externalities? Is the pricing system stable, foreseeable and transparent? How likely is it that water prices will be increased on a regular or irregular basis?		

ANNEX CB 2 GUIDELINE: INTEGRATED PEST MANAGEMENT TOOLKIT

1 INTRODUCTION

This document is a toolbox of alternative actions for the application of IPM techniques in the commercial production of agricultural and horticultural crops. It has been elaborated to provide possible actions for the IPM implementation. Given the natural variation on pest development for the different crops and areas, a specific model for every situation involved in IPM cannot be developed, and therefore the considerations analyzed, and examples given in this document are not all inclusive, but are directed towards the implementation of IPM in the local industry. This is an important consideration because any IPM system must be implemented in the context of local physical (climatic, topographical, etc.), biological (pest complex; natural enemy complex, etc.), and economical (access to subsidies or lack thereof; requirements of all importing countries, etc.) conditions.

1.1 DEFINITION

Integrated pest management (IPM) is the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms ('International Code of Conduct on the Distribution and Use of Pesticides', FAO 2002).

1.2 GOAL

The goal of applying IPM into the framework of Primary Farm Assurance (PFA) is to ensure sustainable production that includes crop protection. This can be achieved by integrating and applying all available pest control and suppression tactics, including the responsible application of chemicals.

The last word in IPM is management. This is of cardinal importance, because it implies that there must be knowledge of what the problem(s) is/are and the intensity of the problem(s). In the case of pest management this information can only be obtained by applying standardized pest monitoring systems.

1.3 FRAMEWORK

This document lists potential approaches that can be used to implement the three basic pillars of IPM, which are the prevention, monitoring and control of diseases, weeds and arthropod pests in fruit and vegetable crops. This toolbox is designed to supply examples of the different approaches that producers can consider for developing their own IPM programs. It is not intended as an exhaustive and final text on IPM tools and will be updated regularly.

Different crops in different areas of the world require different combinations of IPM methods. However, the overall IPM philosophy is generic and universal. IPM must be considered as a flexible system that must be suited to the local conditions (physical, biological, and economical) under which a particular crop is produced in a particular area. Therefore, a generic IPM model that could be used for every situation cannot be developed, and so the list of examples given here is a guideline. It is not and cannot be complete but is sufficient as a guide for local producers to design and implement an IPM program.

Producers should critically evaluate, at least every year, their current crop protection practices and systematically evaluate the potential of different IPM practices for their crop. Local or regional technical specialists will be able to analyze the IPM plans by area-crop-pest, disease, or weed and to verify which IPM practices or their combinations are successful. Such information will be very useful to help producers in the same area as well as in other similar areas of the world to improve their IPM practices.

1.4 THE THREE PILLARS OF IPM

PFA has identified three chronological steps in the IPM technique, which are in accordance with the IOBC principles:

(1) PREVENTION

Maximum efforts should be made to prevent problems with pests, diseases, and weeds to avoid the need for intervention. This includes the adoption of cultivation techniques and management actions at farm level to prevent or reduce the incidence and intensity of pests, diseases, and weed. In the case of some chronic pests, (Stern *et al.* 1959; Pringle 2006) this may include preventative pest management options, including spraying.

(2) MONITORING AND EVALUATION

Monitoring is the systematic inspection of the crop and its surroundings for the presence, stage (eggs, larvae, etc.), and intensity (population level; infestation level) of development, and location of pests, diseases, and weeds. It is one of the most critical activities of IPM, as it will alert the grower about the presence and level of pests, diseases, and weeds in his crop. This will allow the grower to make a decision on the most appropriate intervention, highlighting how essential the part of monitoring and record keeping is to an IPM program.

(3) INTERVENTION

Different IPM techniques can be used when monitoring indicates that an action threshold has been reached and that intervention is required to prevent economic impacts on the crops value or the disease/pest will spread in other crops. Within an IPM program, priority is given to non-chemical methods that reduce the risk to people and the environment as long as these effectively control pest, disease or weed. However, most of these at present are preventative, such as placing mating disruption dispensers, conserving natural enemy populations, etc. If further monitoring indicates that control is insufficient, then the use of chemical plant protection products (PPPs) can be considered. In such cases selective pesticides that are compatible with an IPM approach should be selected and the products should be applied in a selective way.

In order to implement IPM on a farm, producers must acquire basic knowledge on the IPM aspects related to their crop and location. This basic knowledge is described in section 2.

2 DEVELOPMENT OF BASIC KNOWLEDGE

In order to be successful with IPM, it is important to have a basic knowledge of:

- The key pests, diseases, and weeds that can affect a crop
- The potential strategies, methods, and products to control them

For this purpose, producers should gather information on:

2.1 PESTS, DISEASES, AND WEEDS

Producers should have the following basic information:

2.1.1 List of relevant pests, diseases, and weeds in the target crop for that specific area, region, or country

2.1.2 Basic information (fact sheets) about the biology of the relevant pests, diseases, and weeds and about their natural enemies, such as:

- Information about their life cycle:

  - Different life stages and their approximate dates of appearance
  - Development requirements (minimum temperature threshold for development, number of flights per season, season of the year when they attack or develop, etc.)
  - Over-wintering places (in case of pests)
- Photo guides of relevant pests (different stages), diseases, and weeds and of their typical damage
- Photo guides of relevant natural enemies (different stages)
- Economic injury levels (EILs) and action thresholds
- Knowledge about organisms that have a quarantine status in target, export markets

2.2 PLANT PROTECTION PRODUCTS

Producers should have the following basic information:

2.2.1 List of pesticides that can be legally applied against the relevant pests, diseases, and weeds in the target crop

2.2.2 Basic information (fact sheets) about their:

- Chemical family
- Contact route (systemic, translaminar, vapor activity, contact, stomach)
- Dose rates
- Maximum residue levels (in own country and in target export countries)
- Persistence:
  - Re-entry interval
  - Harvest interval
- Optimal application technique
- Optimal timing of application
- Maximum number of applications per season
- Selectivity for natural enemies and for pollinators
- Mode of action

2.3 OTHER PROTECTION METHODS

- Similar information should be available for other protection methods

2.4 TRAINING

Training of relevant personnel (own personnel or specialized consultant) in the following topics:

- Recognition of pest, diseases, weeds, and relevant natural enemies
- Scouting and monitoring techniques, including record keeping

- IPM principles, techniques, methods, and strategies
- Knowledge about crop protection products and application techniques

3 POTENTIAL IPM MEASUES BEFORE PLANTING

Preventive and hygienic measures are an essential part of an IPM approach. Many preventive measures can be taken before planting the crop, in order to prevent or reduce future problems with pests, diseases, and weeds during the cropping period.

3.1 RISK ASSESSMENT

Make a risk assessment of the plot:

3.1.1 History of the Plot

- Which crops have been previously grown on this plot for the last three years?
- What were the main problems with pests, diseases, and weeds on this plot during the past?
- Although it is not always possible, it could be advisable to gather information on previous usage of PPPs:
  - Which PPPs have been used on this plot in the past?
- Could the pesticide usage on this plot in the past:
  - Create problems with residues on your crop? (E.g. because of pesticide accumulation in the soil).
  - Cause pest or disease outbreaks during the next cropping season? (E.g., because all natural enemies have been exterminated in perennial crops such as trees and vines).

3.1.2 Surrounding Crops and Vegetation

Evaluate the potential influence of the surrounding crops and vegetation on your crop:

- What are the IPM practices on neighboring crops?
- What is the pesticide usage on neighboring crops and what is the risk for pesticide drift?
- What is the potential of pest or disease problems created by surrounding crops and vegetation?

3.1.3 Soil and Water Samples

Take and analyze soil and water samples in order to check for:

- The presence of diseases and pests (including nematodes)
- The presence of pesticide residues, heavy metals, or other toxins
- The nutritional level of the soil

3.1.4 Analysis and Evaluation of the Risk Assessment

Based on an analysis of this risk assessment, and of the monitoring records of the previous years (see 4.2.) (if such records exist for this new plot), identify the measures that should be taken in order to prevent or reduce problems with specific and relevant pests, diseases, and weeds in this particular crop.

3.2 PREVENTION

Where relevant, the following preventive measures should be considered for new plots:

3.2.1 Soil

For the prevention of (soil) pests, nematodes, (root) diseases, and weeds the following measures could be taken:

- Crop rotation according to a crop rotation program, and depending on the crop
- Year of rest, fallow, depending on the crop
- Disinfection of the soil, or of the growing substrate (e.g., solarization, fumigation, inundation, steaming, hot water)
- Promotion and/or augmentation of beneficial macrobial and microbial soil organisms
- Clean tillage or sanitation of crop residues (including fruits in the case of tree crops) to reduce overwintering populations of certain pests or diseases

3.2.2 Water

Preventive measures should be taken in order to ensure:

- Clean water (meeting local regulations about pests, diseases, and chemical residues, or reduce their content if applicable)
- Optimal irrigation methods and/or use of fertigation

3.2.3 Plants

Preventive measures that can be taken to reduce problems with pests, nematodes, and diseases are:

- Choice of optimal, resistant varieties
- Use of resistant rootstock (grafting)
- Pest and disease free starting material (seeds or plants). This may include testing for pests and pathogens in the rhizosphere
- Optimal plant spacing or plant density

3.2.4 Climate

Climatic conditions can have a big influence on the development of diseases, as well as on pests and weeds. Therefore, consider:

- Cultural measures to prevent or reduce the development of pests and/or diseases
- The establishment of an agro-climatological monitoring station or subscription to an information or warning service

3.2.5 Timing

With respect to the (first) appearance of key pests, diseases and weeds during the cropping season, consider:

- The possibility of choosing an optimal planting date to reduce (avoid) problems with key pest, diseases, and weeds
- The choice of early maturing varieties, or short-season varieties, in order to avoid periods with high infestation pressure from certain pests or diseases

3.2.6 Location and Plot Selection

Analyze if neighboring crops could be a source of especially problematic harmful pests or diseases.

4 POTENTIAL MEASURES FOR IPM DURING CROPPING

4.1 PREVENTION

Preventive measures are an essential part of an IPM approach. Their goal is to keep pest, disease, and weed populations below the action threshold. In any case, producers must consider the most suitable preventive measures, according to their particular situation, and to the relevant pests, diseases, and weeds for their crop and location.

4.1.1 Cleanliness of the Farm (Hygiene and Sanitation)

Hygienic measures are aimed at preventing pest, diseases, and weeds from entering the field and from further spreading or dispersing in the crop.

4.1.1.1 Prevent transmission of pests, diseases, and weeds by vectors by:

- Identifying vectors, such as insects, animals, pets, rodents
- Identifying actions to keep these vectors out of the crop
- Identifying if weeds in the borders or adjacent areas can be hosting pests

4.1.1.2 Prevent transmission of pests, diseases, and weeds by people by:

- Working from healthy to diseased plants and areas
- Wearing suitable clothing, gloves, shoes, hairnets (depending on the crop)
- Disinfecting hands, shoes, clothes before entering the field, especially after visiting plots from other producers (depending on the crop)

4.1.1.3 Prevent transmission of pests, disease, and weeds by equipment or materials by:

- Cleaning all equipment (incl. machines) and materials after working and before entering a new field
- Using different, dedicated equipment and materials in different fields (if possible), depending on the crops
- Using clean harvesting boxes and crates

4.1.1.4 Prevent transmission of pests, diseases, and weeds by managing crop residues:

- Clean the orchard after pruning, harvest, leaf picking or any other task that has produced organic residues
- Don’t keep any crop residues near the field

4.1.1.5 Prevent pesticide drift from neighboring plots.

Make agreements and organize communication with producers from neighboring plots in order to eliminate the risk for undesired pesticide drift.

4.1.2 Cultural and Technical Measures

4.1.2.1 Optimal Crop Care (fertilization, irrigation, etc.)

Remember, too much fertilization can be as detrimental to pest management as too little, because over-fertilization can result in free amino acids in the phloem and xylem, resulting in increased breeding potential of pests such as aphids. Optimal crop care results in a healthier crop, which is better able to resist pests and disease attack.

4.1.2.2 Canopy Management and Micro-Climate

Use cultural measures, such as pruning, canopy management and leaf picking, in order to assure an optimal micro-climate (humidity, temperature, light, air) in the crop canopy to prevent or reduce the development of pests and/or diseases.

4.1.2.3 Cropping Systems

Different cropping systems can be used to prevent or reduce problems with pests, diseases, and weeds:

- Cover crops to prevent weeds and to stimulate natural enemies
- Special types of cropping systems: Mixed crops, strip cropping, strip harvesting, and permaculture
- Other practices related to the cropping system (e.g., fallow field margins to prevent immigration of pests such as slugs and snails)

4.1.2.4 Exclusion Techniques (in protected crops)

Especially in protected crops, different techniques can be used to exclude harmful pests from the crop, such as insect proof netting or UV-cut foils in plastic tunnels to reduce immigration of certain pests, air locks, and double entry doors.

4.1.2.5 Mulching

Evaluate if mulches could help to minimize problems with certain pests, diseases, or weeds (plastic mulches, reflective mulches, straw mulches, etc.).

4.1.2.6 Other technical measures

- Analyze which other preventive technical measures could be undertaken
- Prevent mechanical plant and product damage

4.1.3 Conservation Biological Control

4.1.3.1 Measures to increase populations of natural enemies and pollinators in and around the crop:

- Use of different cropping systems (strip cropping, strip harvesting, mixed crops, permaculture, other)
- Use of border crops (including hedgerows) (pollen producing plants, nectar producing plants, plants that harbor alternative hosts for natural enemies (banker plants))
- Use cover crops inside the field (pollen producing plants, nectar producing plants, plants that harbor alternative hosts for natural enemies (banker plants))
- Use of attractants for natural enemies
- Providing hiding and nesting places for natural enemies and pollinators

- Providing food sources when the crop is dormant in the case of deciduous fruits
- Use of selective chemicals, selective placement and/or timing of sprays where and when chemical control is necessary
- Use of push-pull technology (attract-and-kill, use of repellents)

4.1.3.2 Provide nesting places for predatory birds to control rodents
4.1.3.3 Prevent population reduction of natural enemies by using pesticides

- Use of selective pesticides that are compatible with natural enemies
- Use of selective application techniques (spot treatments, soil application of systemic products, bait sprays on the tree skirt, attract-and-kill, etc.)

4.2 MONITORING AND DECISION SUPPORT TOOLS

Monitoring is a major tool for reducing the number of interventions with chemical PPPs and is fundamental for a reliable and sustainable IPM program. Monitoring is preferably used in combination with the decision support tools.

4.2.1 Organization

- Nominate a responsible person for scouting and monitoring
- This person must receive training in:
  - Recognizing pests, diseases, and weeds
  - Scouting and monitoring techniques
  - Record keeping

This training should be refreshed on a regular basis.

4.2.2 Observation

Organize a monitoring and scouting program for the farm:

- Identify which pests, diseases, and weeds should be monitored and why
- Establish how they should be monitored (direct observation in the crop on key plant parts, traps, indicator plants, etc.)
- Establish during which period of the year, and at which life stages of the pest, monitoring should occur
- Participate in existing area-wide monitoring/warning systems
- Identify the monitoring frequency
- Establish the area that constitutes a monitoring unit
- Establish the amount of sampling points per unit area

4.2.3 Record Keeping

- Establish record sheets (computer or paper based), which include:
  - Identification of the plot and crop being monitored
  - Name of the monitor

- Date of monitoring
- Name of the pest, disease or weed being monitored
- Number of samples
- Number of findings
- Life cycle stage of the findings (in case of pests)
- Comparison with thresholds
- Location inside the plot
- Decision taken

- Record sheets should be archived in order to allow comparison of records from different years and different plots.

4.2.4 Warning Systems and Decision Tools

- Use of predictive models and decision support systems (e.g., temperature-driven phenological computer models, degree-day models) in combination with information from monitoring and weather forecasts
- Use of area-wide warning systems

4.2.5 Evaluation/Decision Making

- Use action thresholds for the relevant pests, diseases, and weeds to decide whether or not an intervention is needed
- Document the decisions that were taken to perform a certain intervention
- Make an analysis of the records at the end of the season, draw conclusions and plan adaptations of the IPM program for the following season

4.3 INTERVENTION

In case interventions have to be made, there are several non-chemical methods that can be applied. In case pesticides have to be applied, their use can be minimized by using optimal application techniques and by preventing the development of pesticide resistance.

In some cases, such as the need to obtain pest quarantine compliance for a quarantine pest, disease or weed, a phytosanitary requirement is made by third countries. In such cases the use of PPPs often cannot be avoided. If the producer is forced to use chemical PPPs because of specific quarantine issues, he must use and supply information about prevention and monitoring methods to support the necessity of such application.

4.3.1 Mechanical/Physical Control

Before resorting to chemical methods, a producer should evaluate mechanical or physical techniques to kill or remove harmful pests, diseases, or weeds such as

- Pests:
  - Rouging and isolating infested leaves, fruits, or plants (sanitation)
  - Vacuuming of pests (e.g., *Lygus spp*.)
  - Other

- Diseases:
  - Rouging and isolating damaged and infected leaves, fruits, or plants (sanitation)
- Weeds:
  - Mowing
  - Hand removal of weeds
  - Mechanical weeding
  - Etc.

4.3.2 Semiochemicals

Semiochemicals can be used in different ways to control pests:

- Attract-and-kill (a.k.a. lure-and-kill), including:
  - Mass-trapping with semiochemicals
  - Trap crops
  - Bait spraying techniques
- Chemosterilization (this technique can be an alternative to the SIT technique): the males of a wild population of a pest are attracted to bait that is laced with a chemosterilant
- Repellents
- Mating disruption (mating confusion)

4.3.3 Augmentative Biological Control

Different natural enemies and microbial products can be released or applied to manage populations of pests and also of diseases:

- Seasonal inoculative or inundative releases of mass-reared natural enemies to control harmful insects and mites
- Use of insect-pathogenic viruses (NPV or baculo viruses), fungi, bacteria, or nematodes to control harmful insects and mites
- Use of antagonistic fungi and bacteria to control root and leaf diseases

4.3.4 Sterile Insect Technique (SIT)

This area-wide technique is successfully used in many areas of the world to manage populations, for example; fruit flies (*Tephritidae*, such as the Mediterranean fruit fly: *Ceratitis capitata*), certain species of *Lepidoptera* (e.g., cotton bollworm: *Pectinophora gossypiella*; codling moth, *Cydia pomonella*) and certain species of flies of veterinary importance (e.g., screwworm fly: *Cochliomyia hominivorax*) by frequently releasing mass-reared sterile insects of the target pest (note: In the case of the screwworm and others, both sexes are released).

4.3.5 Use of Natural Products

Different natural products can be used to control pest, diseases, and weeds. Also in this case, diligent care should be taken to make sure that they are compatible with an IPM approach and do not pose any health or food safety issues.

- Oils (mineral oils and vegetable oils)

- Botanicals (e.g., natural pyrethrum, azadirachtin, etc.)
- Soaps
- Diatomaceous earth
- Etc.

Note: Care should be taken that these products are properly registered as PPPs in the country of production, where applicable.

4.3.6 Chemical Plant Protection Products

In the case an intervention where a chemical (PPP) is needed, the product must be selected in advance. The next considerations should be included:

4.3.6.1 Warning Systems and Decision Making

In order to make an optimal decision on timing and targeting the following information is needed:

- What is the optimal timing of application in order to obtain the maximum effect on the target pest, disease, or weed?
- Information about the re-entry interval and about the harvest interval
- Information about the correct application frequency
- A weather forecast with information about:
  - Wind and temperature conditions in order to avoid problems during the applications
  - The possibility for rain during the post intervention period
- The use of predictive models and field observations in order to determine whether the pest is in a sensitive stage of its life cycle. This can be important for optimizing applications so as to avoid additional applications

4.3.6.2 Action Threshold

Document the action threshold for the relevant pests, diseases and weeds.

4.3.6.3 Product Selection (See 2.2. 'Plant Protection Products')

- Before applying a chemical product, determine the goal–total cleanup, spot treatments, population correction, compatibility with natural enemies, etc.–and select a product according to your goal.
- In the case of applying tank mixes, identify whether or not there are any known negative cocktail effects that should be avoided.

4.3.6.4 Anti-Resistance Management

Development of pesticide resistance (1) reduces the number of available pesticides and (2) often leads to more frequent application of higher dosages and therefore increased risk of exceeding the MRL. Therefore, it is very important to have an anti-resistance management plan so as to prevent the development of resistance against chemical pesticides.

4.3.6.5 Application

Optimal application of pesticides can drastically reduce pesticide usage while maximizing the effect of a pesticide application.

- Identify and use the optimal spraying equipment (including type and size of nozzles) and technique:

- Pressure
- Driving speed
- Amount of water
- pH of the water, if relevant to the PPP
- Use of adjuvants (effective stickers and spreaders)

- Periodic calibration of the spraying equipment
- Keep records of calibration
- Use of application techniques that are selective for natural enemies

Note: See 4.1.3.1 and 4.1.3.3 - Use of selective chemicals, selective placement, and/or timing of sprays where and when chemical control is necessary.

Evaluate the possibility of using selective ways by which a chemical PPP could be applied without disturbing the populations of natural enemies in the crop and to integrate it into an IPM program, such as:

- Low rate, electrostatic application
- Spot treatments
- Strip applications
- Treatment of only a part of the plants
- Timing of applications when the pest and natural enemy(ies) are not active in the crop
- Bait spraying
- Use of baits and traps (e.g., against fruit flies (*Tephritidae*))

4.3.6.6 Nominate a person who is responsible for the application of crop protection products. Such a person must have:

- Periodic training in pesticide application
- Knowledge in calibration of the equipment

4.3.6.7 Obsolete Plant Protection Products

- Obsolete PPPs have to be securely maintained, identified, and disposed of, by an authorized or approved channel.

4.3.6.8 Empty Plant Protection Containers

- No re-use of empty plant protection containers
- Three times rinsing before disposal
- Safe and secure storage of empty containers
- Disposal according to legal requirements/good practices

5 POTENTIAL MEASURES FOR IPM POST-HARVEST

5.1 POST-HARVEST TREATMENTS

When post-harvest intervention is needed, the following factors should be taken into account:

5.1.1 Selection of Techniques and Products

When selecting an intervention technique or product:

- Priority must be given to the use of non-chemical techniques, such as the use of heating, freezing, irradiation, washing, CO2, etc.
- In the case chemical PPPs have to be used, they must be selected in advance while giving priority to products with short persistence.

5.1.2 Application Technique

In order to minimize the amount of chemical PPPs to be applied, the following points should be taken care of:

- The application equipment has to be calibrated (volume applied to volumes of produce in the packing line).
- The dose has to be prepared by using calibrated measuring equipment.

5.1.3 Record of Applications

Records of the applications should be kept according to PFA CPCC.

5.2 STORAGE AND TRANSPORTATION

5.2.1 Monitoring

- Look for sheltering sites for rodents, birds, and insects
- Look for evidence of their presence (feces, hairs, feathers)
- Revise the conditions of the cargo area and transport media such as lorries and boats

5.2.2 Prevention

Different measures can be taken to eliminate pests and diseases during storage and transportation:

- Optimal storage and transport packaging
- Optimal storage and transport conditions
  - Optimal climatic conditions (temperature, relative humidity, air movement, ventilation, etc.).
  - Atmosphere (e.g., ULO, …)
- Clean boxes, crates, climate rooms, trucks...
- Prevention of stored product pests and diseases (including rodents) by for example exclusion techniques

5.2.3 Intervention

Different intervention techniques can be used to control pests and diseases during storage and transportation:

- Trapping techniques

- Semiochemicals
- Biological pest control
- Chemical control
- Freezing or heating
- Controlled atmosphere
- Other

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ANNEX CB 3 GUIDELINE: PLANT PROTECTION PRODUCT USE IN COUNTRIES THAT ALLOW EXTRAPOLATION

Registration Scheme in Country of Use	Safe Use Criteria (Operator and Environment)	Authorization of PPP for Use on Individual Crops
No registration scheme exists: Some control over PPP imports may be in place.	PPPs that are used shall have clear guidance for the user to allow for the safe use of the product in line with the 'International Code of Conduct on the Distribution and Use of Pesticides' (FAO Rome 2002).	Extrapolated uses are permitted.
A registration scheme exists: Imported PPPs are permitted for sale with the label of the country of origin. This may be in addition to the national labels for the PPPs.	The user of the PPP, which is a direct import, shall be provided with clear guidance to allow for the safe use of the product. This guidance could be in the form of label translations or notes provided by the distributor.	1. The imported PPP carries a label that matches the national approval.
		2. The imported PPP carries a label that is different to the current national approval. In this case this PPP can be used on the crop where the national approval is valid.
		3. The crop is not covered on the national label. Extrapolated uses are permitted, if the national scheme explicitly allows this practice.

EXCEPTION:
Where field trials are performed by producers in cooperation with the government as the final trials before approval of PPPs, the producer can still comply with PFA requirements, even though part of the product will be destroyed or used for further analyses. There shall be clear traceability and information on the area (size) used for the trials. The producer shall also have available meaningful documents indicating that the producer is taking part in a legal field trial in full conformity with the legislation of the country of production. Furthermore, clear procedures shall exist on the management of these trials. The PPPs that are being trialed are not allowed for use on the product to be assessed and the residue testing shall not show residues of this product.

ANNEX CB 4 GUIDELINE: CB 6.6 – RESIDUE ANALYSIS

Control Point	Interpretation
CB 6.6.1	1. In all cases, evidence of the list of the current applicable MRLs for the country (ies)/region (even if it is the country of production itself) where the produce is intended to be traded in shall be available, or any other documentation that shows that the producer (or his direct customer) has incorporated this information. 2. Communication with clients presented by the producer can be in the form of letters or other verifiable evidence. These can be present or future clients. 3. As an alternative to 2., where for example the producer does not yet know with whom trading will take place, the producer can participate in a residue screening system that meets the strictest MRLs (or import tolerances if they exist and are different) in the country or region where produce is intended to be traded in. Where there is a harmonized MRL for that region, it must be conformed to. If the producer sells the product on the market of the country of production, the current applicable (national) MRL list shall still be available as in 1. above. 4. Internal segregation and traceability is needed if trying to meet MRLs of different markets for different batches of produce (i.e., simultaneous production for US, EU, country of production). 5. This control point must be cross-referenced with the information given at the registration of the producer and any updates sent to the CB/VB since registration, i.e., to verify if the producer sells his/her product exclusively on the market of the country of production and declares this at registration.
CB 6.6.2	1. Guidance shall be sought from PPP industries/grower organizations or technically responsible advisers on how to adapt production methods (e.g., to increase pre-harvest interval) that are necessary to take the stricter MRLs into account. 2. If the producer sells his product exclusively on the national market of the country of production and he declares this at registration, this control point is considered complied with (since legislation on G.A.P. such as pre-harvest interval, dosage, etc. in the country of production covers this point already). 3. This control point must be cross-referenced with the information given at the registration of the producer and any updates sent since registration.

ANNEX CB 5 GUIDELINE: CB 6.6.3 – MAXIMUM RESIDUE LIMIT EXCEEDANCE RISK ASSESSMENT

THIS ANNEX INCLUDES MANDATORY MINIMUM CRITERIA FOR RESIDUE MONITORING SYSTEMS

1. Background

Today, consumers are used to choosing year-round from a diverse variety of fresh and processed food products of high quality at affordable prices. To satisfy this demand, in many cases plants have to be protected during growth against pest and diseases through the application of PPPs according to the principle, “as little as possible, as much as necessary”.
In order to have a set of standards on PPP residues on food and feed to enable trade in food commodities to take place, to check compliance with good agricultural practices (G.A.P.) and to ensure that human health is protected, legally applicable maximum residue limits (MRLs) are set.
It is in the interest of all persons working in primary agricultural production and the food chain, to ensure that practical measures are taken to ensure compliance with these trading standards. A key tool is the PFA standard and its correct implementation.
However, despite many due diligence measures in place at producer level, it is not always possible to achieve 100% compliance to MRLs; yet it is the responsibility of all in the food production chain to avoid exceedances of MRLs.
In order to deliver improved compliance to PFA protocols, producers shall assess the risk associated with use of PPPs. The enclosed document provides examples of how MRL exceedances can occur so that producers can modify their on-farm production procedures during production.

2. Key Reasons Why MRL Exceedances May Occur

- Non-compliance with good agricultural practices and label instructions, including improper or illegal use of PPPs.
- No proper quality assurance standard applied to check production methods.
- Differences in MRLs between the country of production (COP) and country of destination (COD), and other legal challenges in the application and communication of MRLs, such as occasional changes to MRLs midway through the growing season which fail to allow a producer to change his G.A.P. to ensure the final product complies with the modified MRL.
- Exceptional circumstances, where abnormal crop conditions, climatic or agronomic conditions are experienced.

I. PRODUCER LEVEL (Field Level)

Cases that can be controlled by producers

- Failure to observe and comply with the on-label use instructions of PPPs:
  - Application method
  - Pre harvest interval
  - Handling and mixing
  - Errors in calculating concentration or spray volumes
  - Growing practices (covered vs. open production)
- Application of non-registered PPPs (e.g., on minor crops).
- No proper use of additives or oils.
- Application of illegal PPPs or use of formulation from non-authentic sources.
- Failure to comply with general good agricultural practices (e.g., cleaning of equipment, discharge of spray mixture, management practices, including water management) and PHI.
- Wrong delivery system, improper use of the application equipment or poor condition of the equipment (e.g., calibration, wrong nozzles).
- Use of compost produced from treated plants.

- Residues in the following (rotational) crops.
- Sampling methods (by producer):
  - Cross-contamination during sampling in field/pack-house
  - Incorrect sample taken due to human error in field/pack-house.

Cases where control by producer is minimal

- Rapid plant growth after application, leading to earlier harvest than foreseen and hence reduced PHI.
- Spray drift from very closely planted neighboring crops

II. OFF FARM LEVEL (Post Farm Gate)

Cases that can be controlled by producers

- Non-compliance with label instructions for post harvest-treatment used in downstream processing (e.g., pack houses) (see above).
- Poor management practices (e.g., failure to follow instructions and rules regarding hygiene/sanitation, safe storage and transport of PPPs which are designed to avoid direct contact of produce and PPPs)

No direct control by producer

- Lack of a complete set of globally harmonized MRLs
  - PHI not applicable to COD MRL (not relevant for produce of EU origin)
  - Lowering of MRL or withdrawal of AI (active ingredients)–combined with insufficient communication of changes
  - Different MRLs in COP and COD
  - Confusion regarding which MRL to comply with, given use of many several legal and private standards each with various MRL requirements
- Sampling methods (by third parties):
  - Cross-contamination during sampling:
    - In field
    - At depot
    - In store
  - Incorrect sample taken due to human error:
    - In field
    - At depot
    - In store
  - Dry matter not divided homogenously in soil and in plant material
  - Sample size too small
  - No harmonized sampling methods
- Testing and laboratory
  - Inherently large error margin to residue analyses
  - Wrong analytical method used
  - False positives (interference from plant-made actives or poor labs procedure or matrix effect
  - Contrasting ability of certified and approved labs
- Statistical methods used, and conservatism in the way MRLs are set.
  - According to EU regulations, MRLs are set based on a limited number of field trials using specified statistical methods, and in this context the ALARA (as low as reasonably achievable) principle is employed

- Due to the conservative way in which MRLs are set, and the statistical procedures that are in place, it is a mathematical inevitability that there will be a certain small percentage of MRL exceedances. The statistical possibility of such exceedances could only be eliminated by revising the legislation.

TO HELP YOU ASSESS YOUR RISKS THE "GLOBALG.A.P. TOOLKIT FOR PRODUCERS" (available on the website) WILL GUIDE YOU THROUGH THE PROCEDURE.

A) GUIDELINES TO UNDERTAKE A RISK ASSESSMENT TO DEFINE A SAMPLING PLAN TO ENSURE COMPLIANCE WITH THE MRLs

1. Background and Principles

- This risk assessment should conclude:
  - If PPP analyses are needed or not and how many
  - Where and when to take the samples
  - What type of analysis to perform
- The usual output of this risk assessment is a sampling plan that indicates how many, where and when samples are taken and what analysis to perform. The risk assessment is the process followed to reach these conclusions and should include the reasoning and considerations done.
- Producers shall have systems to verify the correct implementation of the G.A.P.s and the compliance of the product with the legal MRLs. PPP residue analysis is a very efficient verification system.
- The sampling program should:
  - Be a robust verification system of the G.A.P. implementation at farm and produce handling level.
  - Be a robust verification system that the residues in the product comply with the legal MRLs and customer specifications, if applicable.
  - Control there is no cross-contamination from neighbors, adjacent fields or though the environment (water, soil, application equipment, etc.).
  - Control that only authorized products are used (i.e., only products registered for the crop are used in case the country of product has a PPP registration scheme; for organic products, control that only products allowed in organic farming are used).
- The risk assessment should be done per crop (or group of similar crops, as can be the case of herbs), since the type of crop normally has a major impact on the risk.
- The risk assessment shall be documented and reviewed annually.

2. Number of Samples

Factors to take into account to define the number of samples should include at least the following:

- **Crop**: The type of crop can have a major impact on the risk. The risk is very different in a mushroom production, a chestnut tree plantation, or a table grape crop. In a mushroom or chestnut tree plantation, the risk assessment could conclude no residue analysis or a minimal number of analyses is needed, while in the grape plantation, a much higher number of samples would be expected.
- **Country of production**: The country where the area of production is located can have an impact. The historical data for each crop and country should be known in order to assess the risk.
- **Size**: Surface or tons of production. The bigger the size, the bigger the risk.
- **Number of production sites:** The higher the number of production sites, the bigger the risk.
- **PPP use Intensity**: This factor is normally related to the type of crop (some crops require more PPP use than others), the location of the production (in some areas there are more advanced IPM techniques, in other areas there is more pest pressure, etc.), and the skills and expertise of each individual producer.

- **Producer historical data**: The historical data on PPP issues related to each individual producer should be taken into account.
- For **producer groups**, in addition to the factors above, the number of producers should be taken as a main factor. The bigger the number of producers, the bigger the risk.

The number of samples needs to be decided on a case per case scenario.

Note: A rule of thumb that could serve as a guideline: in many cases the value of the sampling + analysis is around 0.1- 0.5% of the value of the crop.

3. When and Where to Take the Samples

Once the number of samples is defined, it is important to decide when and where to take the samples.

- **When**: For each crop the most risky periods should be identified. To identify these periods, historical data for that crop and area should be considered. Also, it is important to have a good understanding of the crop agronomy and PPP use. In some cases, it is useful to identify at which points in the cycle there are more problems to comply with the pre-harvest intervals.
- **Where** to take the samples: this includes varieties and also locations.
    - Crop varieties: Probably the risk of the different varieties is not the same. Some varieties tend to have more spraying than others; or PPPs are applied closer to harvest; or are more sensitive to pest or diseases.
    - Sampling point: Should be considered if samples should be taken in the field, in the pack-houses, in transit, in destination, etc.
    - Origin of product: Also it should be considered whether some fields have bigger risks than others, as well as possible cross-contaminations from adjacent fields, previous crops, etc., and fields with more pest pressure, etc.

4. Type of Analysis

There are multiple analyses available on the market and it is important to select those that are most appropriate and economical-affordable. Considerations that should be made are:

- If **post-harvest treatments** are used, these should also be covered by the analysis.
- The analysis should cover all (or at least most) of the active ingredients used as well as other active ingredients not used but that could be present in the environment (sprayed by the neighbor in another crop, cross-contamination, etc.).
- *Active ingredients used that are not covered by the analysis due to technical or economic reasons should be identified and the risk of each one of these active ingredients should be assessed*.
    - Those active ingredients used at the beginning of the season, far away from harvest, not persistent, and for which the industry (laboratories, customers) has detected no problems could be considered a low risk. In these cases, the risk assessment could conclude that these active ingredients do not need to be included in the analysis scope.

Other active ingredients with higher risks should be included in the analysis screening wherever possible. This could be done at origin in other laboratories, at destination by the customers, or in specific analysis undertaken not on a routine basis but just spot validation of the use of this PPP.

B) MANDATORY MINIMUM CRITERIA OF A RESIDUE MONITORING SYSTEM (RMS)
Background
In the framework of PFA control point and compliance criterion *CB 6.6.4 and based on the outcome of the risk assessment, residue analysis* ***or participation in a*** *>second or<* ***third party plant protection product residue monitoring system*** *is required.*
In order to ensure a harmonized interpretation and level of consistency across the residue monitoring systems used by producers, the following have been established as the minimum requirements that all residue monitoring systems shall comply with in order to be considered compliant with the PFA requirements.

Having these criteria defined also makes it possible to reduce the need for multiple assessments of one and the same residue monitoring system, which may be servicing several PFA producers.

Definition of first-, second- and third-party sampling:

1. First-party sampling: When the producer (Option 1) or a producer group member (Option 2 member) takes the product sample from its own production. For PFA compliance, the first-party sampling (self-sampling) is acceptable, but an RMS cannot be based on first-party sampling.

2. Second-party sampling body: The sampling organization is a 2nd party sampling body when it is a separate, but identifiable part of an organization that is involved in production, supply, purchase and/or or ownership of the products sampled by the RMS (e.g., the option 2 QMS runs an RMS for their members; a customer's sampling program on their supplier, an independent laboratory runs an RMS). Second-party sampling bodies supply sampling services only to their related organization. A second-party sampling body may form a part of a user or supplier organization, or an intermediate or end customer of the products sampled.

3. Third-party sampling body: The sampling organization is a 3rd party sampling body when it is a separate organization that is not involved in production, supply, purchase or ownership of the products sampled (e.g., an independent company, an inspection body or a CB/VB runs an RMS). It shall demonstrate that it does not have common ownership with the sampled producer, nor have common ownership appointees on the boards (or equivalent) of the organizations, is not directly reporting to the same higher level of management, does not have contractual arrangements, informal understandings or other means that may have an ability to influence the outcome of the sampling.

When an RMS uses different combinations of the above; it shall be classified according to the lower level (e.g., an RMS is using partly 2nd and partly 3rd party sampling, it shall be classified as a 2nd party sampling RMS).

When the CB/VB publishes their evaluated RMS, the following needs to be included as the minimum:
1. Residue monitoring system name
2. CB/VB performing the evaluation
3. Sampling type (second party sampling/third party sampling)
4. Link or contact details where to get information of producers/LGNs under the scope of the RMS
5. Territorial scope of activity (i.e., country)
6. Date of evaluation and validity (valid from and valid to date)

Multiple CBs/VBs in a country or in a region may agree to publish the evaluated RMS with the help of the local National Technical Working Group (NTWG).

1. Basic Requirements

1.1 The objective of the residue monitoring system is to provide evidence that the use of PPPs by producers complies with the MRLs in the country of destination of the produce.

1.2 The system shall be independent from the participating producer(s). A producer group as defined by PFA is allowed to operate its own monitoring system.

1.3 The operator of the monitoring system shall keep current data of the participating producers. This data shall at a minimum include producer name, identification code or LGN where available, address and crop specifications (i.e., product and area).

1.4 The RMS operator and the participating producer shall have a mutual agreement on service conditions (e.g., a signed application form). These conditions shall specify rights and duties regarding the usage of the monitoring system.

1.5 Registration is producer and crop specific. The producer needs to arrange other sampling means for those products not included in the RMS and the CB/VB needs to evaluate that during the inspection accordingly.

2. Risk Assessment

2.1 A risk assessment shall be carried out by the operator of the RMS, not by each producer participating in it.

2.2 The risk assessment shall take all relevant factors into consideration (e.g., crop/product, climatic conditions, history, active ingredients (AI), size of company and number of Production sites, continuous harvest, country of production PPP registration restrictions, country of destination MRLs, etc.). Reference to sources (data) as evidence for an adequate risk analysis is required. The most critical period and locations should be determined for each crop.

2.3 The sampling frequency (number of samples to be taken per crop per season) shall be based on this risk analysis and clearly described. (CB 6.6.4. and this same Annex CB 5 above)

2.4 The analysis method to be used by the laboratories shall be determined. The range of AI to be analyzed by the laboratory shall be defined based on a crop specific risk assessment. The risk assessment shall take into consideration:
- PPPs that could have been applied on the crop
- PPPs actually applied
- Any other contaminants (e.g., persistent environmental residues)

2.5 The risk assessment shall be carried out annually and result in an annual monitoring plan that includes the products, number of participants, number of samples, period of sampling and type of analysis.

3. Sample Taking

3.1 Sampling shall take place according to the instructions of the EU Directive 2002/63/EC or other applicable local regulations. Where these do not exist, ISO 7002 ('Agricultural Products'), ISO 874 (Fresh Fruit and Vegetables), or Codex Alimentarius CAC/GL 33-1999 shall be followed.

3.2 Inert bags shall be used which shall be identified correctly (Annex CB 5). Samples shall be traceable to individual producers. Preferably, the sampling location shall also be recorded (e.g.: lot number, field number, greenhouse number, etc.). Mixed or pool of samples that contains sampled materials from more producers in sample is not allowed.

3.3 Sampling shall take place from harvestable or harvested produce.

4. Testing Results

4.1 The laboratory that carries out the produce analysis shall be ISO 17025 accredited for the relevant testing methods (e.g., GCMS, LCMS).

4.2 The test results shall be compared with the applicable legislation (country of production and/or country of destination).

4.3 The test results shall always be reported in writing to the producer concerned.

4.4 Test results shall be traceable to the farm concerned. Tests carried out by the producer's client are only valid if they are traceable to the producer.

5. Plan of Action (Annex CB 5)

5.1 Producers shall have a procedure (action plan) for situations when MRLs are exceeded or use of illegal/not approved PPPs is detected. This procedure can be part of AF 8.1. 'Recall/Withdrawal Procedure'.

5.2 Producers shall keep records of all actions carried out in connection with incidences related to PPP residues.

5.3 The RMS shall inform the producer and the CB/VB in case of an exceedance of the legal limit. This shall not lead to an automatic sanctioning of the producer; however, the CB/VB shall investigate each case.

6. Records

6.1 Records (e.g., test results, correspondence with producers and, if applicable, actions taken because of non-compliances) shall be kept for a minimum of 2 years.

6.2 Records shall include:

i. System documentation including the risk assessments
ii. Annual update of the risk assessments including the determination analysis method, the list of active ingredients to be analyzed
iii. The annual monitoring plan
iv. Analysis reports
v. Records of follow up actions
vi. Communication with producers
vii. Annual summary of the result

6.3 Producers do not need to keep the records on the farm but they shall be available during the assessment (e.g., made available by the RMS operator on request).

ANNEX CB 6 GUIDELINE: VISUAL INSPECTION AND FUNCTIONAL TESTS OF APPLICATION EQUIPMENT

1. There shall be no leakages from the pump, spray liquid tank (when the cover is closed), pipes, hoses, and filters.
2. All devices for measuring, switching on and off, adjusting pressure and/or flow rate shall work reliably and there shall be no leakages.
3. The nozzle equipment shall be suitable for appropriate application of the plant protection products (PPPs). All nozzles shall be identical (type, size, material and origin), form a uniform spray jet (e.g., uniform shape, homogeneous spray), and there shall be no dripping after switching off the nozzles.
4. All the different parts of the equipment (sprayer), e.g., nozzle holder/carrier, filters, blower, etc. shall be in good condition and work reliably.

Control Points and Compliance Criteria

PRIMARY FARM ASSURANCE – Intermediate Level

FRUIT AND VEGETABLES

Based on IFA CPCC V5.2

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TABLE OF CONTENTS: PRIMARY FARM ASSURANCE – INTERMEDIATE LEVEL

Note:

Implementation for Fruit and Vegetables for Primary Farm Assurance (PFA) compliance in version 5 will include compliance with modules AF, CB, and FV.

Nº	Control Points	Compliance Criteria	Level
FV	**FRUIT AND VEGETABLES**		
FV 1	**SITE MANAGEMENT**		
FV 1.1	**Rısk Assessment**		
FV 1.1.1	Does the risk assessment for the farm site carried out as identified in AF 1.2.1 make particular reference to microbial contamination?	As part of their risk assessment for the farm site (see AF 1.2.1), producers shall identify the locations of nearby commercial animal operations, composting and potential sources for ingress by domestic and wild animals, and other contamination routes such as floodwater intrusion and dust.	Major Must
FV 1.1.2	Has a management plan that establishes and implements strategies to minimize the risks identified in FV 1.1.1 been developed and implemented?	A management plan addresses the risks identified in FV 1.1.1 and describes the hazard control procedures that justify that the site in question is suitable for production. This plan shall be appropriate to the products being produced and there shall be evidences of its implementation and effectiveness.	Major Must
FV 2	**PRE-HARVEST** (REFER TO 'ANNEX FV 1 GUIDELINE: MICROBIOLOGICAL HAZARDS DURING GROWING AND HANDLING')		
FV 2.1	**Quality Of Water Used on Pre-Harvest Activities** (This Applies to Water Used on all Farm Activities and on the Product Itself Before it is Harvested)		
FV 2.1.1	Is there evidence of a risk assessment covering the microbiological quality of the water used in all pre-harvest operations?	A written risk assessment of microbiological quality of the water is conducted. It includes water source, proximity to potential sources of contamination, application timing (growth stage of the crop), application method, and placement of application (harvestable part of the crop, other parts of the crop, ground between crops, etc.).	Major Must

Nº	Control Points	Compliance Criteria	Level
FV 2.1.2a	In case of leafy greens (also called potherbs, greens, vegetable greens, leafy greens, or salad greens); is water used on pre-harvest activities analyzed as part of the risk assessment and at a frequency in line with that risk assessment (FV 2.1.1) and no less than indicated in Annex FV 1?	PFA producers shall comply with the local applicable limits for microbiological contaminants in the water used on pre-harvest activities, and in their absence use the WHO recommendations as a reference for the decision-making process for preventive and/or corrective actions (see Annex FV 1). Compliance with the applicable thresholds shall be verified through water tests carried out in a frequency as indicated by the decision tree in Annex FV 1 (risk assessment). Water testing regime shall reflect the nature and extent of the water system as well as the type of product. Where substantially different water sources are used, they shall be considered separately with regard to sampling. Where one water source services multiple systems or farms it may be possible to treat this as the single origin for sampling purposes. Samples from field level shall be taken from places that are more representative of the water source, usually as close to the point of application as possible.	Major Must

Nº	Control Points	Compliance Criteria	Level
FV 2.1.2b	For all crops not mentioned under FV 2.1.2a; is water used on pre-harvest activities analyzed as part of the risk assessment, at a frequency in line with that risk assessment (FV 2.1.1), and no less than indicated in Annex FV 1?	PFA producers shall comply with the local applicable limits for microbiological contaminants in the water used on pre-harvest activities, and in their absence use the WHO recommendations as a reference for the decision-making process for preventive and/or corrective actions (see Annex FV 1). Compliance with the applicable thresholds shall be verified through water tests carried out in a frequency as indicated by the decision tree in Annex FV 1 (risk assessment). Water testing regime shall reflect the nature and extent of the water system as well as the type of product. Where substantially different water sources are used, they shall be considered separately with regard to sampling. Where one water source services multiple systems or farms, it may be possible to treat this as the single origin for sampling purposes. Samples from field level shall be taken from places that are more representative of the water source, usually as close to the point of application as possible.	Minor Must
FV 2.1.3	In the case the risk assessment or the water tests require it, has the producer implemented adequate actions to prevent product contamination?	When the risk assessment based on the water testing indicates risks of product contamination, action shall be required. Possible strategies to reduce the risk of product contamination arising from water use include, but are not limited to: • Treating water before use • Preventing water coming into contact with the harvestable portion of the crop • Reducing the vulnerability of the water supply • Allowing sufficient time between application and harvest to ensure an appropriate decline in pathogen populations Producers implementing these strategies shall have an adequate and reliable validation process to demonstrate that product contamination is being avoided.	Major Must

Nº	Control Points	Compliance Criteria	Level
FV 2.2	**Application of Organic Fertilizer of Animal Origin**		
FV 2.2.1	Does the interval between the application of organic fertilizer and the product harvest not compromise food safety?	Records show that the interval between use of composted organic fertilizers and harvest does not compromise food safety (see also CB 3.4.2). When raw animal manure is used, producers shall conduct a risk assessment (CB 3.4.2) and incorporate the raw manure into the soil: • For tree crops: Prior to bud burst, or exceptionally it may be incorporated in a shorter interval based on the risk assessment but never shorter than 60 days prior to harvest; • For all other crops: At least 60 days prior to harvest for all other crops. In the case of leafy greens (also called potherbs, greens, vegetable greens, leafy greens, or salad greens) it cannot be applied after planting even if the growing cycle is longer than 60 days. Refer to Annex FV 1.	Major Must
FV 2.3	**Pre-Harvest Check**		
FV 2.3.1	Is there lack of evidence of excessive animal activity in the crop production area that is a potential food safety risk?	Appropriate measures shall be taken to reduce possible contamination within the growing area. Example subjects to be considered include: Livestock near the field, high concentrations of wildlife in the field, rodents, and domestic animals (own animals, dog walkers, etc.). Where appropriate buffer areas, physical barriers, fences should be used.	Minor Must

Nº	Control Points	Compliance Criteria	Level
FV 3	**HARVEST AND POST-HARVEST (PRODUCT HANDLING) ACTIVITIES** Control points covered in FV 3.1.1 to FV 3.8.7 may be applicable during harvest and/or handling at the point of harvest (on field) and/or handling in packinghouse (facility) and/or during storage/cooling. All these points shall be evaluated in all cases when and where applicable.		
	Four main activities may take place after the growing season: ***harvest, handling at the point of harvest (on field), handling in a packinghouse (in facility), and storage/cooling****. Although not all of these activities are carried out on every farm, the need to follow the appropriate hygiene principles and to maintain the tools, equipment and facilities are common and equally important for all these activities with regard to food safety. Producers shall evaluate the requirements aggregated in this section considering all the applicable activities on the farm.*		
FV 3.1	**Principles of Hygiene** (refer to 'Annex FV 1 Guideline: Microbiological Hazards During Growing and Harvest')		
FV 3.1.1	Has a hygiene risk assessment been performed for the harvest, pre- and post-farm gate transport process, and post-harvest activities including product handling?	There is a documented hygiene risk assessment covering physical, chemical (incl. allergens) and microbiological contaminants, spillage of bodily fluids (e.g., vomiting, bleeding), and human transmissible diseases, customized to the products and processes. It shall cover all harvest and product handling activities carried out by the producer, as well as personnel, personal effects, equipment, clothing, packaging material, transport, vehicles and product storage (also short-term storage at farm). The hygiene risk assessment shall be tailored to the activities of the farm, the crops, and the technical level of the business and be reviewed every time risks change and at least annually. No N/A.	Major Must
FV 3.1.2	Are there documented hygiene procedures and instructions for the harvest and post-harvest processes including product handling (also when they take place directly on the field, orchard or greenhouse) designed to prevent contamination of crop, crop production areas, food contact surfaces, and harvested product?	Based on the risk assessment, there are documented hygiene procedures for the harvesting and post-harvesting processes. Procedures shall include evaluating whether workers are fit to return to work after illness.	Major Must

Nº	Control Points	Compliance Criteria	Level
FV 3.1.3	Are the hygiene procedures and instructions for the harvest and post-harvest activities, including product handling, implemented?	The operation shall nominate the farm manager or other competent person as responsible for the implementation of the hygiene procedures by all workers and visitors. When the risk assessment determines that specific clothing (e.g., smocks, aprons, sleeves, gloves, footwear. See Annex FV 1, 5.4.2) shall be used, it shall be cleaned when it becomes soiled to the point of becoming a risk of contamination, and shall be effectively maintained and stored. Visual evidence shows that no violations of the hygiene instructions and procedures occur. No N/A.	Major Must
FV 3.1.4	Have workers received specific training in hygiene before harvesting and handling produce?	There shall be evidence that the workers received specific induction and annual training regarding the hygiene procedures for the harvesting and product handling activities. Workers shall be trained using written (in appropriate languages) and/or pictorial instructions to prevent physical (e.g., snails, stones, insects, knives, fruit residues, watches, mobile phones, etc.), microbiological and chemical contamination of the product during harvesting. Training records and evidence of attendance shall be available.	Major Must
FV 3.1.5	Are signs that communicate the primary hygiene instructions to workers and visitors, including at least instructions to workers, to wash their hands before returning to work clearly displayed?	Signs with the main hygiene instructions shall be visibly displayed in the relevant locations and include clear instructions that hands shall be washed before handling produce. Workers handling ready-to-eat products shall wash their hands prior to start of work, after each visit to a toilet, after handling contaminated material, after smoking or eating, after breaks, prior to returning to work, and at any other time when their hands may have become a source of contamination.	Major Must
FV 3.1.6	Are smoking, eating, chewing, and drinking confined to designated areas segregated from growing areas and products?	Smoking, eating, chewing, and drinking are confined to designated areas away from crops awaiting harvest and are never permitted in the produce handling or storage areas, unless indicated otherwise by the hygiene risk assessment. (Drinking water is the exception).	Major Must

Nº	Control Points	Compliance Criteria	Level
FV 3.2.	**Sanitary Facilities**		
FV 3.2.1	Do harvest workers who come into direct contact with the crops have access to appropriate handwashing equipment and make use of it?	Wash stations shall be available and maintained (hand soap, towels) in a clean and sanitary condition to allow workers to clean their hands. Personnel shall wash their hands prior to start of work, after each visit to a toilet, after handling contaminated material, after smoking, or eating; after breaks; prior to returning to work, and at any other time when their hands may have become a source of contamination. Water used for hand washing shall at all times meet the microbial standard for drinking water. If this is not possible, sanitizer (e.g., alcohol-based gel) shall be used after washing hands with soap and water with irrigation water quality. Handwashing stations shall be provided inside or close to toilet facilities. No N/A.	Major Must
FV 3.2.2	Do harvest workers have access to clean toilets in the vicinity of their work?	Field sanitation units shall be designed, constructed, and located in a manner that minimizes the potential risk for product contamination and allows direct accessibility for servicing. Fixed or mobile toilets (including pit latrines) are constructed of materials that are easy to clean and they are in a good state of hygiene. Toilets are expected to be in a reasonable proximity (e.g., 500m or 7 minutes) to place of work. Failure point = no or insufficient toilets in reasonable proximity to place of work. Not applicable is only possible when harvest workers don't come in contact with marketable produce during harvesting (e.g., mechanical harvesting). Toilets shall be appropriately maintained and stocked. (For guidance, see Annex FV 1, 5.4.1)	Minor Must

Nº	Control Points	Compliance Criteria	Level
FV 3.2.3	Do workers handling the product on the field or in a facility have access to clean toilets and hand-washing facilities in the vicinity of their work?	Hand washing facilities, containing non-perfumed soap, water to clean and disinfect hands, and hand-drying facilities shall be accessible and near to the toilets (as near as possible without the potential for cross-contamination). Workers shall wash their hands prior to start of work, after each visit to a toilet, after using a handkerchief/tissue, after handling contaminated material, after smoking, eating or drinking, after breaks, prior to returning to work, and at any other time when their hands may have become a source of contamination. When handling takes place in a facility, toilets shall be maintained in a good state of hygiene and shall not open directly onto the produce handling area, unless the door is self-closing.	Major Must
FV 3.2.4	Are the harvest containers used exclusively for produce and are these containers, the tools used for harvesting and the harvest equipment appropriate for their intended use and cleaned, maintained, and able to protect the product from contamination?	Reusable harvesting containers, harvesting tools (e.g., scissors, knives, pruning shears, etc.) and harvesting equipment (e.g., machinery) are cleaned and maintained. A documented cleaning (and, when indicated by the risk assessment, disinfection) schedule is in place to prevent produce contamination. Produce containers are only used to contain harvested product (i.e., no agricultural chemicals, lubricants, oil, cleaning chemicals, plant or other debris, lunch bags, tools, etc.).	Major Must
FV 3.2.5	Are there suitable changing facilities for the workers?	The changing facilities should be used to change clothing and protective outer garments as required.	Recom.
FV 3.2.6	Are vehicles used for transport of harvested produce and/or packed product and equipment used for loading cleaned and maintained where necessary according to risk?	Farm vehicles used for loading and transport of harvested produce and/or packed products are cleaned and maintained so as to prevent produce contamination (e.g., soil, dirt, animal manure, spills, etc.).	Major Must
FV 3.3	**Water Quality**		
FV 3.3.1	If ice (or water) is used during any operations relating to harvest or cooling, does it meet the microbial standards for drinking water, and is it handled under sanitary conditions to prevent produce contamination?	Any ice or water used in relation to harvest or cooling shall meet microbial standards for drinking water and shall be handled under sanitary conditions to prevent produce contamination. The only exception is in the case of cranberry fields that are harvested by flooding, where producers shall at a minimum guarantee that the water is not a source of microbiological contamination.	Major Must

Nº	Control Points	Compliance Criteria	Level
FV 3.4.	**Packing and Storage Areas** (N/A When There is no Product Packing and/or Storing)		
FV 3.4.1	Is harvested produce protected from contamination?	All harvested produce (regardless stored bulk or packed) shall be protected from contamination. In the case of produce packed and handled directly in the field, it shall all be removed from the field during the day (not stored on the field overnight in open-air conditions), in accordance with the harvest hygiene risk assessment results. Food safety requirements shall be complied with if produce is stored on a short time basis at the farm.	Major Must
FV 3.4.2	Are all collection/storage/distribution points of packed produce, also those in the field, maintained in clean and hygienic conditions?	To prevent contamination, all on- and off-farm storage and produce handling facilities and equipment (i.e., process lines and machinery, walls, floors, storage areas, etc.) shall be cleaned and/or maintained according to a documented cleaning and maintenance schedule that includes defined minimum frequency. Records of cleaning and maintenance shall be kept.	Major Must
FV 3.4.3	Are packing materials appropriate for use, and are they used and stored in clean and hygienic conditions so as to prevent them from becoming a source of contamination?	Packaging material used shall be appropriate for the food safety of the products packed. To prevent product contamination, packing materials (including re-useable crates) shall be stored in a clean and hygienic area.	Major Must
FV 3.4.4	Are cleaning agents, lubricants, etc. stored to prevent chemical contamination of produce?	To avoid chemical contamination of produce, cleaning agents, lubricants etc. shall be kept in a designated secure area, away from produce.	Minor Must
FV 3.4.5	Are cleaning agents, lubricants, etc. that may come into contact with produce approved for application in the food industry? Are label instructions followed correctly?	Documented evidence exists (i.e., specific label mention or technical data sheet) authorizing use for the food industry of cleaning agents, lubricants, etc. that may come into contact with produce.	Minor Must
FV 3.4.6	Are all forklifts and other driven transport trolleys clean and well maintained and of a suitable type to avoid contamination through emissions?	Internal transport should be maintained in a manner to avoid produce contamination, with special attention to fume emissions. Forklifts and other driven transport trolleys should be electric or gas-driven.	Recom.

Nº	Control Points	Compliance Criteria	Level
FV 3.4.7	Is rejected and contaminated produce not introduced in the supply chain and is waste material effectively controlled in a way that it does not pose a risk of contamination?	Produce that poses a microbial food safety hazard is not harvested or is culled. Culled produce and waste materials are stored in clearly designated and segregated areas designed to avoid contamination of products. These areas are routinely cleaned and/or disinfected according to the cleaning schedule. Only daily accumulations of rejected produce and waste materials are acceptable.	Major Must
FV 3.4.8	Are breakage safe lamps and/or lamps with a protective cap used above the sorting, weighing, and storage area?	In case of breakage, light bulbs, and fixtures suspended above produce or material used for produce handling are of a safety type or are protected/shielded so as to prevent food contamination.	Major Must
FV 3.4.9	Are there written procedures for handling glass and clear hard plastic in place?	Written procedures exist for handling glass and/or clear hard plastic breakages, which could be a source of physical contamination and/or damage the product (e.g., in greenhouses, produce handling, preparation, and storage areas).	Minor Must
FV 3.5	**Temperature and Humidity Control**		
FV 3.5.1	Are temperature and humidity controls (where applicable) maintained and documented?	If packed produce is stored either on-farm or in a packinghouse, temperature and humidity controls (where necessary to comply with quality requirements and also for controlled atmosphere storage) shall be maintained and documented.	Minor Must
FV 3.6	**Pest Control**		
FV 3.6.1	Is there a system for monitoring and correcting pest populations in the packing and storing areas?	Producers shall implement measures to control pest populations in the packing and storing areas appropriate to the farm condition. No N/A.	Major Must
FV 3.6.2	Is there visual evidence that the pest monitoring and correcting process are effective?	A visual assessment shows that the pest monitoring and correcting process are effective. No N/A.	Major Must
FV 3.6.3	Are detailed records kept of pest control inspections and necessary actions taken?	Monitoring is scheduled and there are records of pest control inspections and follow-up action plan(s).	Minor Must

Nº	Control Points	Compliance Criteria	Level
FV 3.7	**Post-Harvest Washing** (N/A When no Post-Harvest Washing)		
FV 3.7.1	Is the source of water used for final product washing potable or declared suitable by the competent authorities?	The water has been declared suitable by the competent authorities and/or a water analysis has been carried out at the point of entry into the washing machinery within the last 12 months. The levels of the parameters analyzed are within accepted WHO thresholds or are accepted as safe for the food industry by the competent authorities.	Major Must
FV 3.7.2	If water is re-circulated for final product washing, has this water been filtered and are pH, concentration and exposure levels to disinfectant routinely monitored?	Where water is re-circulated for final produce washing (i.e., no further washing done by the producer before the product is sold), it is filtered and disinfected, and pH, concentration and exposure levels to disinfectant are routinely monitored. Records are maintained. Filtering shall be done using an effective system for solids and suspensions that have a documented routine cleaning schedule according to usage rates and water volume. Where recording of automatic filter backwash events and changes in dosage rates by automated sanitizer injectors may be impossible, a written procedure/policy shall explain the process.	Major Must
FV 3.7.3	Is the laboratory carrying out the water analysis a suitable one?	The water analysis for the product washing is undertaken by a laboratory currently accredited to ISO 17025 or its national equivalent or one that can demonstrate via documentation that it is in the process of gaining accreditation.	Minor Must
FV 3.8	**Post-Harvest Treatments** (N/A When no Post-Harvest Treatments)		
FV 3.8.1	Are all label instructions observed?	There are clear procedures and documentation available, (e.g., application records for post-harvest biocides, waxes, and plant protection products (PPPs)) that demonstrate compliance with the label instructions for chemicals applied.	Major Must

Nº	Control Points	Compliance Criteria	Level
FV 3.8.2	Are all the biocides, waxes, and PPPs used for post-harvest protection of the harvested crop officially registered in the country of use?	All the post-harvest biocides, waxes, and PPPs used on harvested crop are officially registered or permitted by the appropriate governmental organization in the country of application. They are approved for use in the country of application and are approved for use on the harvested crop to which they are applied as indicated on the labels of the biocides, waxes and crop protection products. Where no official registration scheme exists, refer to 'Annex CB 5 Guideline: Plant Protection Product Use in Countries that Allow Extrapolation' on this subject and the 'FAO International Code of Conduct on the Distribution and Use of Pesticides'.	Major Must
FV 3.8.3	Is the source of water used for post-harvest treatments potable or declared suitable by the competent authorities?	The water has been declared suitable by the competent authorities and/or within the last 12 months a water analysis has been carried out at the point of entry into the washing machinery. The levels of the parameters analyzed are within accepted WHO thresholds or are accepted as safe for the food industry by the competent authorities.	Major Must
FV 3.8.4	Are all records of post-harvest treatments maintained and do they include the minimum criteria listed below? • Identity of harvested crops (i.e., lot or batch of produce) • Location • Application dates • Type of treatment • Product trade name and active ingredient • Product quantity	The following information is recorded in all records of post-harvest biocide, wax and PPP applications: • The lot or batch of harvested crop treated • The geographical area, the name or reference of the farm, or harvested crop-handling site where the treatment was undertaken • The exact dates (day/month/year) of the applications. • The type of treatment used for product application (e.g., spraying, drenching, gassing, etc.) • The complete trade name (including formulation) and active ingredient or beneficial organism with scientific name. The active ingredient shall be recorded or it shall be possible to connect the trade name information to the active ingredient. • The amount of product applied in weight or volume per liter of water or other carrier medium No N/A.	Major Must

Nº	Control Points	Compliance Criteria	Level
	Are records of all post-harvest treatments kept and do they also include the following criteria:		
FV 3.8.5	Name of the operator?	The name of the operator who has applied the-PPP to the harvested produce is documented in all records of post-harvest biocide, wax, and PPP applications.	Minor Must
FV 3.8.6	Justification for application?	The common name of the pest/disease to be treated is documented in all records of post-harvest biocide, wax, and PPP applications.	Minor Must
FV 3.8.7	Are all of the post-harvest PPP applications also considered under points CB 6.6?	There is documented evidence to demonstrate that the producer considers all post-harvest biocides and PPP applications under control point CB 6.6, and acts accordingly.	Major Must

ANNEX FV 1 GUIDELINE: MICROBIOLOGICAL HAZARDS DURING GROWING AND HANDLING

THIS ANNEX INCLUDES THE MANDATORY DECISION TREE FOR THE SAMPLING PLAN OF WATER USED ON PRE-HARVEST ACTIVITIES (5.1.1)

1. INTRODUCTION

Agricultural crops are generally grown in environments that host a wide range of microorganisms. Soils, for example, contain high levels of microflora and are in direct contact with parts of crop plants for much or all of their life cycles. Water, wind, animals, and other vectors provide mechanisms for movement and attachment of microorganisms. Consequently, crops will normally be associated with a natural and harmless microbial population. However, it is possible that other pathogenic organisms (capable of causing illness in humans) are present in the environment and are able to contaminate produce.

Contaminated fresh produce is recognized as a cause of food poisoning outbreaks in many parts of the world. This is reflected in the rising consumption of fresh produce, as well as changes in production, distribution (more concentrated supply chains) and consumption patterns (more produce eaten raw or lightly cooked).

According to the European Food Safety Authority (EFSA), 219 outbreaks of foodborne disease in the EU were associated with food of non-animal origin in the period between 2007-2011, resulting in 10,453 reported cases, 2,798 hospitalizations, and 58 deaths. These figures are likely to be highly conservative because most cases of food poisoning go unreported.

Fruit and vegetables are of particular concern with respect to microbiological contamination for the following reasons:

- They are often eaten raw
- Contamination can occur via many routes during production and packing, including contaminated water, contact with animal and human feces, infected workers handling the crop, and contact with animals and pests
- Washing and disinfection can reduce the microbiological population (including any pathogens present), but it cannot eliminate the microorganisms or guarantee to always reduce the microbial load to an acceptable level

It is, therefore, vitally important to minimize opportunities for the introduction of pathogenic organisms and for cross-contamination to occur during growing, handling and use.

The Primary Farm Assurance (PFA) standard and associated guidance (including this document) recognizes that effective fresh produce safety management must begin in the field with the identification and control of potential microbiological food safety hazards at all stages, in order to minimize harm to the consumer and risk to business.

2. PURPOSE

Fruit and vegetables that are often eaten raw should be produced following agricultural practices that minimize opportunities for the introduction of pathogenic organisms, be it directly or through cross-contamination to occur during growing, handling and use. Effective food safety management shall begin in the field with the identification and control of potential microbiological food safety hazards at all stages.
The purpose of this guideline is to help producers and assessors understand, identify, and respond to the microbiological hazards associated with the production of fruit and vegetables. Whilst the information given in this annex is for guidance, it also supports the control points and compliance criteria of the PFA standard. This document should be

considered together with other, relevant aids produced by GLOBALG.A.P. including the GLOBALG.A.P. toolkit for microbiological risk assessment for primary production of fresh fruit and vegetables.

3. RISK ASSESSMENT

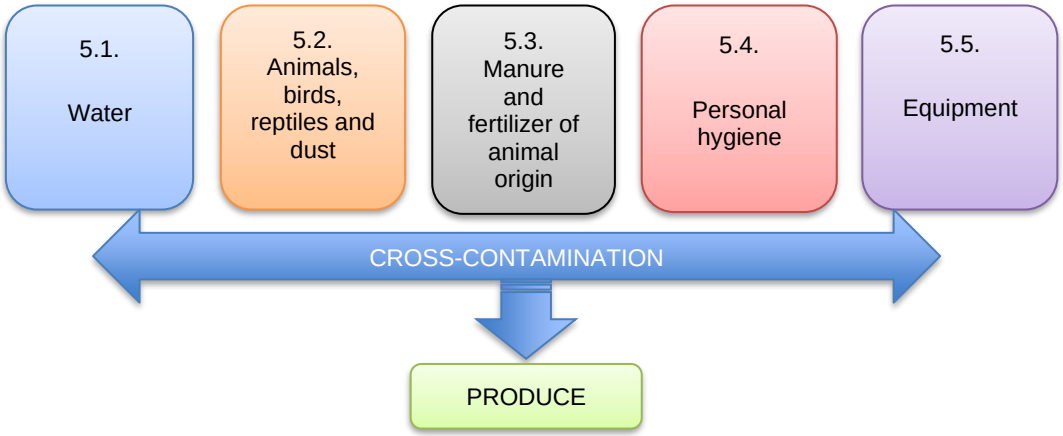
Fresh fruits and vegetables are grown and harvested under a wide range of climatic and geographical conditions, using a wide variety of agricultural inputs and technologies and on farms of varying sizes. Hazards (and risks) may vary significantly from one production system to another. Therefore, risk assessments should be used to determine appropriate practices for the production of safe fresh fruits and vegetables in each specific case. (See Annex AF 1 for guidance regarding the risk assessment process).
PFA requires a risk assessment with respect to possible microbiological hazards under the following control points:

- AF 1.2.1 – Site Management
- AF 3.1 – Hygiene
- CB 3.3 – Organic Fertilizer
- FV 1.1.1 – Site Management (Site Management)
- FV 2.1.1 – Quality of Water Used on Pre-Harvest Operations
- FV 3.1.1 – Principles of Hygiene for Harvest and Post-Harvest (Product Handling) Activities

A risk assessment will establish the need to address identified risks. Procedures designed to manage risk should be elaborated and implemented. Assessing the risk is necessary in order to identify the hazards. Section 4 below describes some of the hazards that may need to be considered.

SPECIFIC HAZARDS

Pathogenic microorganisms can survive and (in some cases) grow in the environment. Consequently, on a farm, contamination can come from a number of sources. All procedures associated with primary production should be conducted under good hygienic practices and should minimize potential hazards to fresh fruits and vegetables. Basically, there are five main sources of microbial hazards to consider when evaluating and managing risk. Each of these sources has the potential to contaminate, as well as cross-contaminate, crops with pathogens (e.g., manures or organic fertilizers can contaminate water sources). Therefore, each hazard must be considered in the context of the whole farm system.



Farm maps are a useful tool and can help locate and understand the hazards present on a farm. It is recommended that, as part of any risk assessment, farm maps be used to record hazards identified and the approach taken to manage risks.
The following considerations are designed to inform and steer the risk assessment process. (A guide to risk assessment is given in Annex AF 1).

4. GUIDE TO IDENTIFYING HAZARDS AND MITIGATION MEASURES IN FARMS

The chapters below help to identify the most common hazards and provide examples of mitigation alternatives that shall be adapted to the farm-specific operations. *Growers shall consider these as guidance that is helpful to prepare the risk assessment, not as a comprehensive list of hazards.*

4.1. Water

Microbiological risk from water arises where water has become contaminated with pathogens to humans, and the water subsequently comes into contact with the crop or harvested product. Water contamination can occur at any point from source to application/outlet and can affect the crop either in the field or during handling/packing.

4.1.1. Water In Pre-Harvest

Producers shall prepare a risk assessment covering the quality of the water used on the crop in all pre-harvest operations (i.e., this is not applicable to water used for drinking or other non crop-related activities). The level of risk will be affected by many factors such as the quality of the water, the cleanliness of the water conduction system, the timing of application, the application method and the type of crop. The table below is guidance and not an exhaustive list of hazards and mitigation alternatives.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Type of crop: Water takes contact with harvestable portion of the plant or tree	• Application method: Do not use irrigation water to directly contact the harvestable part of the crop. • Do not use irrigation water directly for application of plant protection products (PPPs) or fertilizers where the harvestable parts are in contact with water. • For irrigation of crops where the harvestable parts are in contact with water, use treated water with disinfectant as allowed by local regulations. • Quality of water to be used: Standard of <1000cfu *E. coli* per 100ml applies where crops may be eaten uncooked
Water from wells	• Wells should be closed and covered. • Pipes and pumps must be closed and maintained clean.
Water from open channels	• Weekly revision of the cleanliness of the channels and conduction system • Avoid the presence of animals (domestic or not) in the water channels. If necessary, use fences or other methods to prevent the entrance of animals to water sources. • Do not use water channels or conduction systems for washing equipment, harvest tools, etc. • Water channels must be separated from sanitary facilities. • Use of drip irrigation (when feasible for the crop) • Discharge of sewages into the water stream
Water for freeze or heat control that comes into contact with the harvestable portion of the plant or tree	• The quality of water is the same standard as for water in direct contact with the harvestable part of the crop.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
The water source is "vulnerable" i.e., one for which there is a foreseeable risk of contamination by fecal matter	• Avoid animals grazing upstream of a river abstraction point. • In the case of ponds, use fences or other methods to prevent the entrance of animals. • When water is in contact with harvestable portion of the plant/trees, use water treated with sanitizers as allowed by local regulations. • Revise and record the presence of excessive natural fauna near water sources. • Consider the risk of a sewage treatment plant overloading by storm water into the water source.
Cross-contamination	• Manure shall be stored and protected to avoid leachates towards water sources. • Inspect all the water sources at least weekly in order to detect hazards.

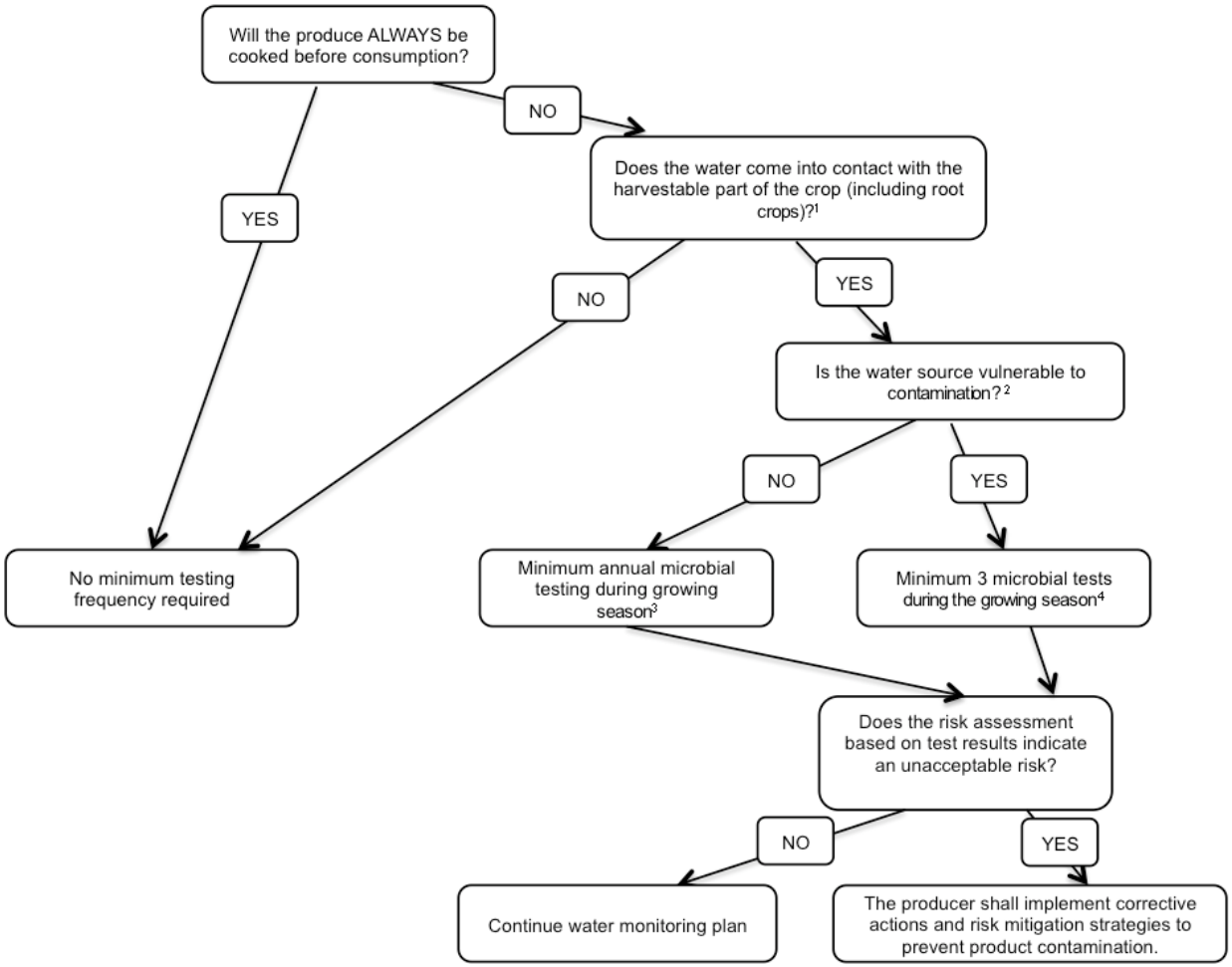
Once the hazards on the farm have been identified and mitigation measures taken, producers are expected to risk-assess their pre-harvest use of water (CB 4.2.2 and FV 2.1.1). A testing program to verify that microbiological quality of water is acceptable and consistent may be required or advisable depending on the type of crops and hazards identified. *E. coli* is widely recognized as an indicator of fecal contamination.

The PFA standard specifies a minimum water testing regime and requires compliance with local applicable limits for microbiological water quality (for fruit and vegetables) in control point FV 2.1.1. According to control point CB 4.2.3, water analysis should be carried out at a frequency according to the results of the risk assessment.

It is important to consider that periodic water testing by itself cannot prove that the water quality is always acceptable. Therefore, good practices to manage the risks in water should always be in place. Water testing can provide reassurance that the source is adequate, that the variability of water quality is understood, and that good practices to maintain water quality are efficient.

If microbial analysis is to be made, samples are to be taken at exit point of the irrigation system or the nearest practical sampling point. Where a grower meets requirements such as those of a specific customer, the grower must be able to show that these requirements are at least as demanding as those required by PFA.

MANDATORY DECISION TREE FOR THE SAMPLING PLAN OF WATER USED ON PRE-HARVEST ACTIVITIES (FV 2.1.2a and FV 2.1.2b) PFA considers the following to be a simple and effective way to identify the need for water analysis:



[1] Water comes into contact with a part of the plant that is harvested, which may be either above the soil or in the soil. For example, irrigation of a carrot crop by rain gun brings the water into contact with the harvestable part of the crop, whereas drip irrigation of apple trees does not. Spray application of pesticides to apple trees once the fruit has formed does bring the water into contact with the harvestable part of the crop.
[2] A vulnerable water source is one for which there is a foreseeable risk of contamination by fecal matter (e.g., animals grazing upstream of a river abstraction point, overloading of a sewage treatment plant by storm water).
Vulnerable sources are e.g., surface water (rivers, lakes, natural ponds), open water channels, reservoirs supplied by well water or rain water, groundwater collected from shallow wells. Other sources may be vulnerable under specific circumstances and the degree of vulnerability shall be established by the grower's risk assessment.
[3] An annual test shall be carried out during the period in which the water is used on the crop.
[4] A test shall be carried out before first harvest in the current production season, then at least another two throughout the production season. Results shall be available for at least two seasons (i.e., minimum 6 analyses, 3 per season) to build the basis of the risk assessment and the decisions on actions to take to prevent product contamination. Once the variability is understood, producers may follow a lower sampling frequency with a minimum of one analysis per year.

When water is treated so as to achieve microbiological standards, minimum annual microbial testing is required except for mains water, in which case consideration shall be given to confirm effectiveness of treatments and no recontamination of water through irrigation equipment. Chemical tests to prove effectiveness of treatment are a valid alternative to microbial testing.

As indicated in FV 2.1.2, producers shall comply with their local applicable limits on microbiological water quality. In the event there is absence of local limits, PFA producers shall observe the WHO* recommended microbiological guidelines for safe use of treated wastewater in agriculture, i.e., use the strictest limit from WHO recommendations in 2006 of 1000cfu (or MPN) *E.coli*/ 100ml (cfu: colony forming units; MPN: Most Probable Number). PFA recognizes *E.coli* as the indicator of fecal contamination.
In the event that the risk assessment based on the results of the water tests indicates a risk of product contamination, producers shall implement adequate measures to prevent and/or mitigate product contamination via water use, but it does not imply that more water tests shall be conducted.
*WHO 2006 Guidelines for the safe use of wastewater, excreta and greywater, Vol. 4: 'Excreta and Greywater Use in Agriculture', p.62.

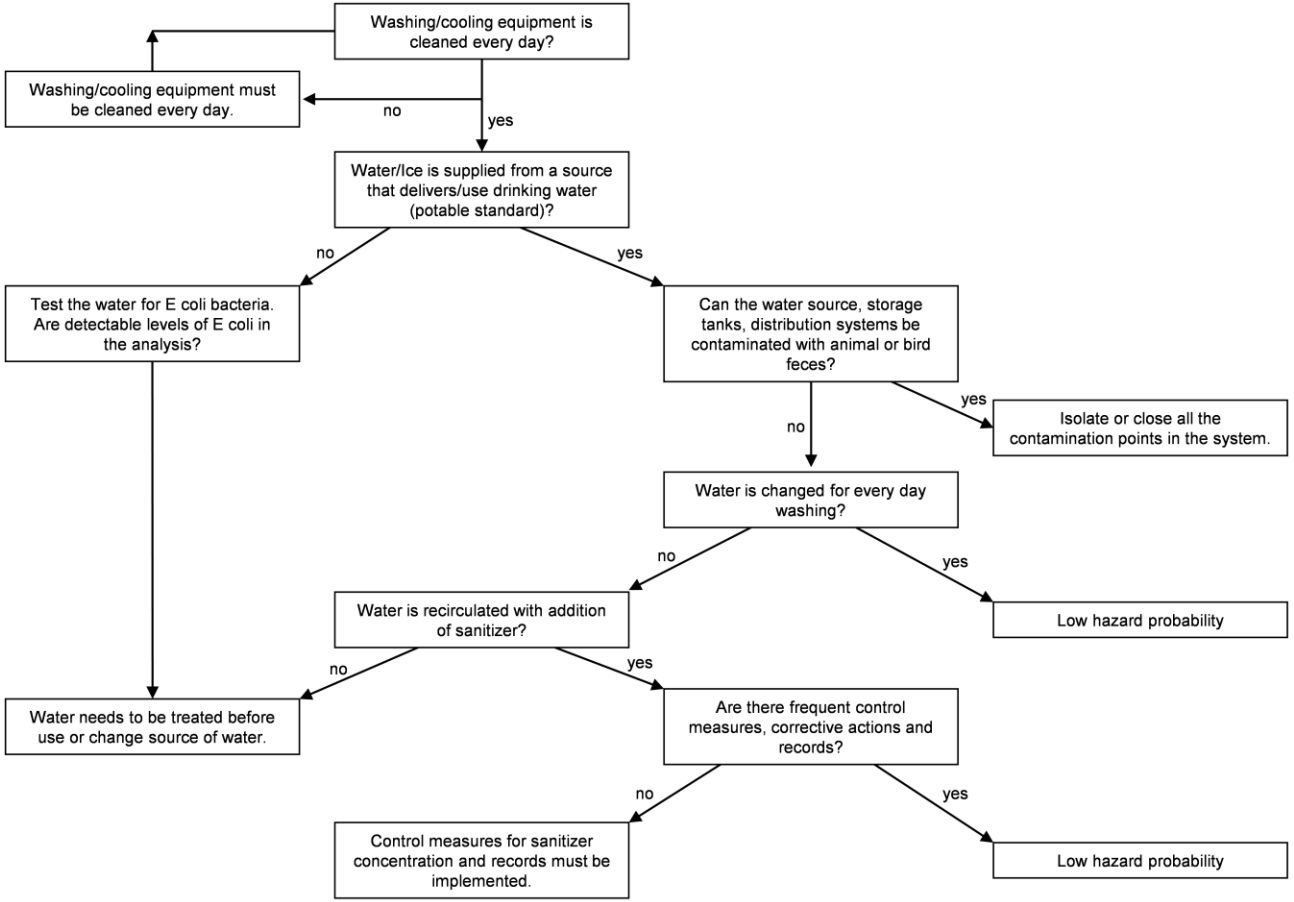
5.1.2. Post-Harvest (and 'At Harvest') Application (including Rehydration, Washing, etc.)

Water used to treat or wash produce at harvest or post-harvest (FV 3.3.1 (M), FV 3.7.1 (M), and FV 3.8.3. (M)) shall be from safe sources that meet the microbial standards for drinking water (or declared suitable by a competent authority). Where water is re-circulated, it shall be treated appropriately. The following table is a tool that helps to identify the most common hazards in post-harvest water and provides some examples of mitigation alternatives that shall be adapted to the farm-specific operations. Producers shall consider this as guidance and not as an exhaustive list of hazards.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Water is not from a mains (or municipal) supply	• Water source should be designed, constructed, and maintained to prevent potential contamination. • Consider adding an authorized disinfectant to water.
Use of Irrigation water, for washing or to "refresh" produce	• Use of irrigation water for wash or refresh produce is not allowed. • The source of water used for wash or refresh produce shall be of drinking (or microbiologically equivalent) quality.
Recirculation of water in equipment	• Water shall be treated by using a disinfectant agent allowed by local legislation (FV 3.7.2 (M). • Consider frequencies of change of water

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Records and controls in water used at post-harvest level	• Monitor the water disinfectant at a frequency that ensures to maintain it in sanitary conditions. • Records of water treatment (disinfectants, etc.) shall be maintained and verified by a supervisor at least every day. • Frequency of monitoring and corrective actions shall be clearly established and complied with.
Cleaning of tanks, pipes and pumps used for washing	• Equipment should be cleaned every day and kept dry up to the next day. • Daily revision of cleanliness of equipment by a supervisor, and the revision shall be recorded.. • Records of cleanliness and sanitation shall be maintained. • Equipment should be sanitized according to a risk assessment considering the type of crop, equipment, water source, etc.
Refills of water	• Refills only by using water that meets the microbial standards for drinking water (FV 3.3.1 (M), FV 3.7.1 (M), FV 3.8.3 (M).
Use of ice for cooling or storage (or in any aspect of the post-harvest process	• Ice shall be sourced from known suppliers. • Suppliers of ice are able to demonstrate that it has been produced with water of appropriate quality (drinking water). • Ice shall always be obtained from water sources that meet the microbial standards for drinking water (FV 3.3.1 (M).
Storage of ice on the farm	• Ice shall be handled under sanitary conditions to prevent contamination (FV 3.3.1 (M). • Ice shall be stored inside a covered tank or similar structure in order to avoid accidental contamination from animals or birds. • Ice shall never contact soil and other potential contamination sources. • All tools used to handle or triturate the ice shall be kept clean and stored appropriately. • Water that does not meet the microbial standards for drinking water shall never be used to wash or maintain ice.

Decision-Making Guideline for Assessing the Hazards of Post-Harvest Microbial Contamination from Water



Based on 'Guidelines for on-farm food safety for fresh produce'. Australian Government. Dept. of Agriculture, Fisheries and Forestry

5.1.3. Water from Uncontrolled Events, such as Flooding, Heavy Rainfall

Hazardous contaminants can be deposited at the crop site by heavy flooding (e.g., toxic waste, fecal material, dead animals, etc.), affecting the growing crop directly or indirectly through the contamination of soil, watercourses, equipment, etc. Where a reasonable risk of flooding exists, producers are required to implement strategies to mitigate these risks. (Note: Pooled water arising from rainfall, broken irrigation pipes, etc., that is not reasonably likely to contain microorganisms of significant public health concern is not considered 'flooding'). The following table is a tool that helps to identify the most common hazards in water from uncontrolled events and provides some examples of mitigation alternatives that shall be adapted to the farm-specific operations.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Flooding during the crop season (and if crops are likely to be eaten raw (i.e., without an effective heat treatment))	• Crops from flooded area are not suitable for harvest for fresh consumption. (Note: the FDA considers any crop that has come into contact with floodwater to be an "adulterated" commodity that cannot be sold for human consumption). • Following a flood event, irrigation water (well, river, reservoir, etc.) should be tested to provide confidence that there is no significant risk of human pathogens in the water as a result of the flooding.
Soils have been flooded prior to planting	• There should be an interval between the floodwater receding and sowing/planting. PFA recommends a minimum interval of 60 days. Other intervals may be appropriate subject to risk analysis.
Cross-contamination.	• Prevent by cleaning or sanitizing any equipment that may have come into contact with previously flooded soil. • Areas that have been flooded at any time of the season should not be used to store produce or packing material.
Sediment or spoil from dredging activity	• The sediment could contain microbiological contamination and, therefore, the spoil should not be deposited on growing or handling areas.

5.1.4. Water-Testing Protocol

If the risk assessment or other requirement indicates that microbiological sampling of water is an appropriate measure, the following aspects should be considered:

- The person responsible for sampling the water should be properly trained so as to ensure a correct sampling technique is applied and to prevent unintentional contamination.
- Sterile containers should be used to collect the samples.
- Keep samples cool (ideally at not more than 2°C).
- Deliver samples within 24 hours to a capable laboratory operating according to ISO 17025 or equivalent standard.

5.2. PRESENCE OF ANIMALS, BIRDS, REPTILES, INSECTS, AND DUST

Animals, birds, reptiles and their feces, insects and dust can transport pathogenic organisms that have the ability to contaminate fresh produce and water sources. Reasonable precautions (see examples in tables below) should be taken to minimize the risk arising from this hazard on the farm during harvest and in post-harvest operations. The site risk assessment required in AF 1.2.1 (m) obliges the producer to consider microbiological hazards. It is important to consider both ***direct and indirect*** contamination routes. Examples of indirect contamination are:

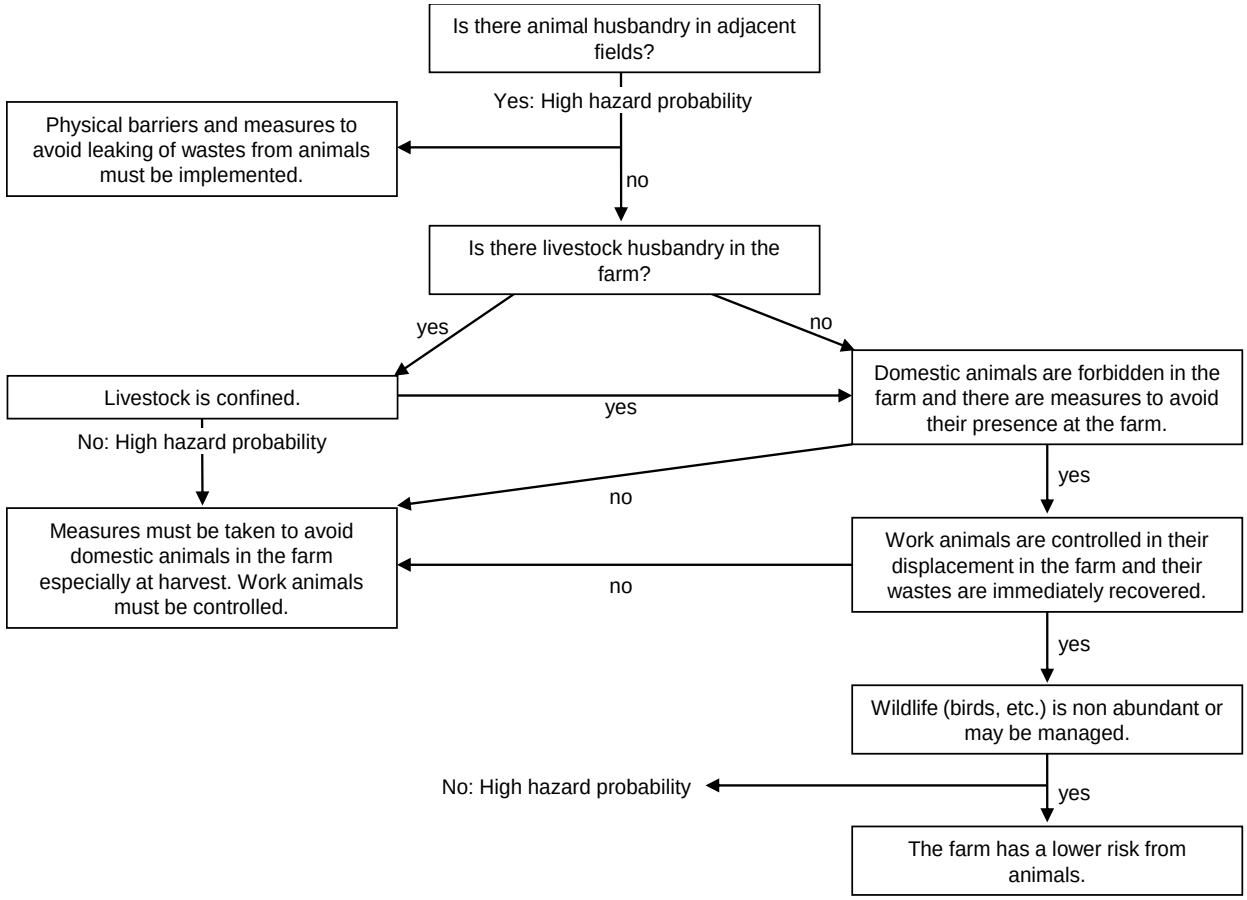
- Accumulations of manure or compost (which may be remote from any animal population) and have the ability to leach waste into crop/handlings areas.
- Contamination of water systems from animal populations or manure: Water may become contaminated prior to its application to crop/produce.

The following table is a tool that helps to identify the most common hazards regarding the presence of animals, birds, reptiles, insects and dust and provides some examples of mitigation alternatives that shall be adapted to the farm-specific operations. It provides guidance only and is not an extensive and unique list. The producer should consider at least if the following hazards are present on the farm:

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Adjacent land use (general)	To prevent the potential contamination of growing areas by adjacent land use, where risks are identified, action shall be taken to manage these risks (AF 1.2.2 (m)). Mitigations strategies might typically include: • Distance: It is reasonable to assume that increasing distance will help to reduce the risk, although distance by itself does not guarantee 'no risk'. • Barriers: Physical barriers such as fences, hedges, retaining walls, ditches, or other types of animal control strategies may be required to mitigate risks. Barriers can be used to contain livestock/restrict access by wildlife and/or to prevent leakage of wastes into crop and product handling areas.
Presence of animal populations or animal activity near the crop from nearby commercial animal operations	• Identify the location of animal populations with respect to crop production, and their distance from these operations. • Identify specific areas of animal congregation (i.e., water troughs/drinking points or feed stations) near the crop and take special measures for the crop area affected, especially in harvest. • Use effective fencing or other barriers. Fencing shall be robust according to the scale of the animal population/farming operation. • Identify potential contamination routes to take specific prevention measures. • Water wells and sources shall be covered and protected to avoid animals nearby. • Permanent revision of fencing to verify its condition.
Presence of composting sites/manure heaps at the farm on/in adjacent lands	• The slope of the adjacent land (i.e., are wastes likely to flow toward or away from the growing area). • The prevailing wind direction. (Is there a significant chance that contamination may be wind-blown toward the cropping site? • Barriers to avoid the sliding of manure/compost into the crop and water source. • Permanent revision of barriers to detect manure sliding
Presence/proximity of activities likely to attract animals, rodents, birds, etc.	• Harvested crop should be maintained in controlled areas. • Harvested crop should be stored at the end of the day.
Domestic/work animals	• Avoid domestic animals in the farm or in crop areas. • Work animals shall be controlled.
Pest species (e.g., rodents, birds, flies)	• Have an up-to-date pest control plan implemented and periodically revised in the farm infrastructure where it could be needed (stores, buildings, machinery storage, etc.).

Decision tree to ascertain hazards due to presence of animals

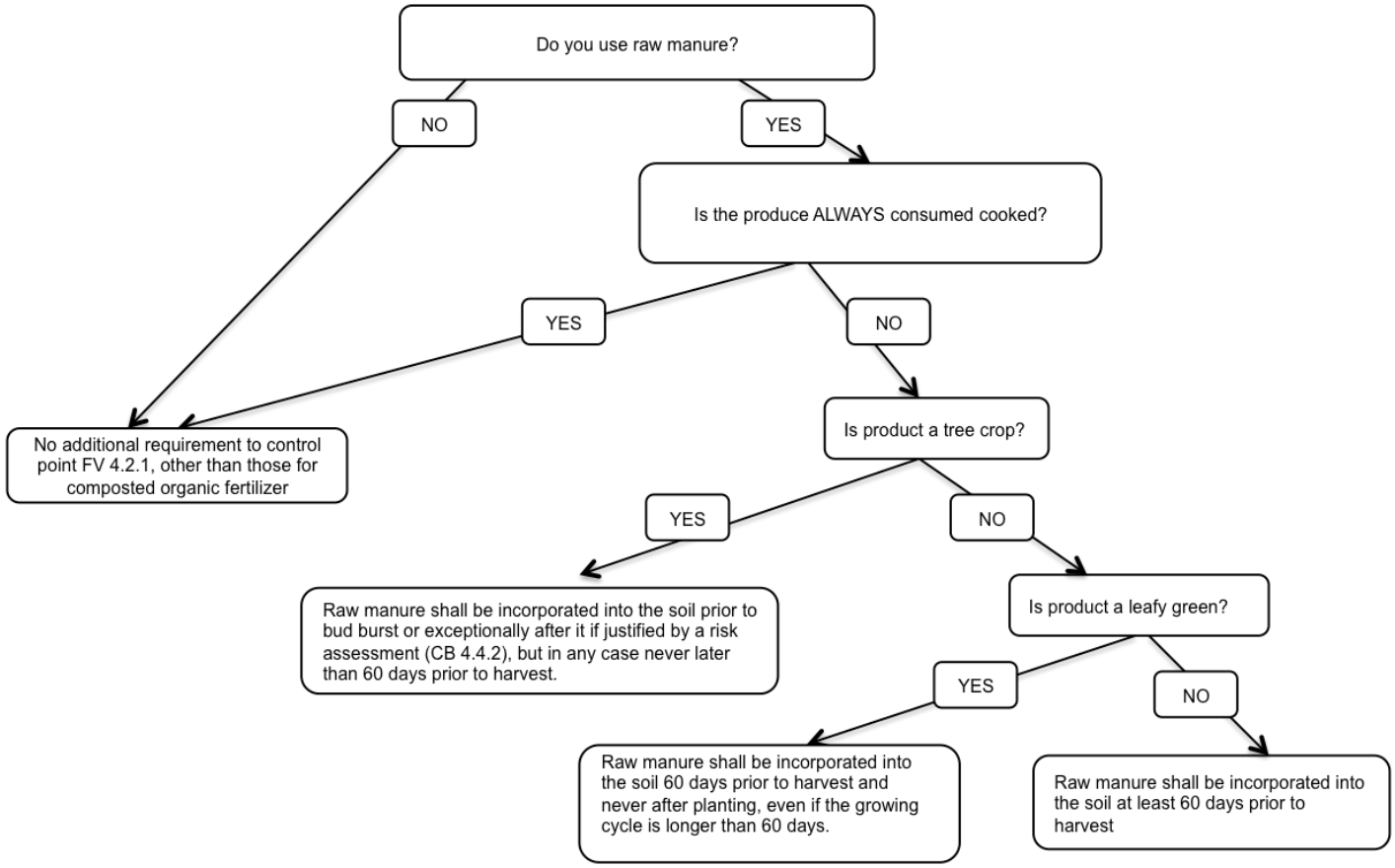
A decision tree may be used to help identify hazards and assess risks. This decision tree is a guideline only. This example might not fit all possible scenarios. In those cases, e.g., when the producer wants to use livestock in combination with the farming activity, producers shall conduct a similar analysis.



Where fruit and vegetable crops are grown or handled in close proximity to potential sources of contamination, producers should be able to explain why the risk is acceptable as well as the mitigating factors that make it so.

5.3. USE OF MANURE AND FERTILISERS OF ANIMAL ORIGIN

Manure and other natural fertilizers are a potential source of microbial hazards. Producers are required to risk assess any use of organic fertilizer (CB 3.4.2 (M)) and take appropriate action to manage risks.
There is a lower pathogen risk associated with the use of manure or compost that has undergone a controlled composting process with an appropriate 'time and temperature' regime. For this reason, composting of these natural fertilizers is the way to reduce the risk of pathogens.
In the event that producers use solid or liquid animal manure that has not been composted or otherwise treated to ensure the destruction of human pathogens (raw manure), the following decision tree shall be followed (FV 2.2.1 (M)).



The following table is a tool that helps to identify the most common hazards in the use of raw or treated manure or organic fertilizers and provides some examples of mitigation alternatives. They shall be adapted to the farm-specific operations. Producers shall consider it as guidance only and not as an extensive and unique list.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Use of raw organic fertilizers (manure)	• Shall be incorporated into the soil prior to bud burst (for tree crops) or at least 60 days prior to harvest for all other crops (FV 2.2.1 (M)). Exceptionally in tree crops, raw manure may be incorporated in a shorter interval provided there is a risk assessment (refer to CB 3.4.2) that justifies such practice and does not compromise food safety. This interval shall, in all cases, never be shorter than 60 daysprior to harvest. See decision tree above. • The slope of the land shall be considered to avoid dissemination of raw manure into water sources or crop. • The incorporation of applied manure into the soil can help reduce run-off and the risk of contamination of watercourses, neighboring fields, etc. This practice is recommended.
Storage of both, raw or treated organic fertilizers, compost, or manure	• Shall be located far from water sources. Physical barriers can help contain leachates to prevent them entering water systems. • Shall be protected against rains for to avoid leachates, dissemination by winds, animals, etc. • Traffic of people, animals or machinery over raw organic fertilizers shall be avoided. • Do not locate the manure storage in proximity to fresh fruit and vegetable production areas or area used for the storage of harvest tools and materials.
Use of compost or treated manure	• During compost, exposure to temperatures above 55°C for 3 days is sufficient to kill pathogenic organisms. The manure heap/pile should be turned to ensure that all parts of the material are exposed to the above temperature regime. • If compost or treated manure is bought, the supplier shall guarantee the treatment. • The incorporation of applied composted manure into the soil can help reduce run-off and the risk of contamination of watercourses, neighboring fields, etc. This practice is recommended. • The interval between application and cropping shall be considered. The time lapse between the application of composted manure and the harvest of fresh fruits and vegetables should be maximized.
Composting or treatment of manure at farm	• Producers should be able to demonstrate that the compost has been subject to a controlled process. Records could include: details of the composting regime, the dates of treatment, temperatures reached in the manure heap. • Do not locate manure storage or treatment sites in proximity to fresh fruit and vegetable production areas or area used for the storage of harvest tools and materials. • Physical barriers can help contain leachates to prevent them to enter in water systems.
Equipment used in raw or composted manure treatment and applications	• Equipment (such as tractors, trucks and transporters) and tools can contaminate crops by moving from treatment areas or stores or areas treated with manure. All equipment that has come into contact with untreated manure (e.g., tractors, tools) should be cleaned prior to access to harvest areas.
Use of manure (treated or untreated in neighboring land.	• Avoid possible contamination from manure use on neighboring land. Look for leachates or contamination through irrigation channels. Heavy rainfall onto a manure pile can result in leachate reaching growing areas prior to, or at, harvest.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Type of crop.	• Low growing crops that may be splashed with soil during irrigation or heavy rainfall shall be considered to be 'at higher risk' because pathogens from manure (or other sources) can persist in the soil. Produce where the harvestable portion of the crop generally does not come into contact with soil has less probability of contamination.

5.4. PERSONAL HYGIENE (Workers and Visitors)

Proper hygiene among employees (and visitors) is an important element of food safety for every fresh produce production operation. Notably, the relevant risk assessment is covered by AF 3.1 (m) and, for harvest operations, required by FV 3.1.1 (M).
Compliance with proper hygiene measures by employees can be facilitated if:

- Sanitary infrastructure and facilities are available for employees.
- Information and training in hygiene and health is given to all employees.
- Supervision ensures that instructions are complied with.

5.4.1. Sanitary infrastructure for employees

To comply with the basic aspects of hygiene, employees should have access to the use of specific installations and equipment.
a) Toilet and hand-washing facilities (sanitary field stations). All workers in the field should have access to proper sanitary facilities in order to prevent hazards and harvest workers *shall* have access to clean toilets in the vicinity of their work (FV 3.2.2 (m)).

The following table is a tool that helps to identify the most common hazards in sanitary infrastructure for employees and provides some examples of mitigation alternatives. They shall be adapted to the farm-specific operations. Producers must consider it as guidance only and not as an exhaustive list of hazards.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Quantity of toilet facilities	• Toilet facilities should be of adequate number according to the amount of people working in the field and in compliance with any local regulations.
Location of toilets	• The location and system of toilets to use on field may depend on local legislation. • Toilets should be within reasonable proximity to the workplace. • Toilets facilities must be located far from water streams, wells, ponds, and tanks. • Toilet facilities should not be located in areas prone to floods.
Accessibility	• Toilet facilities should be easily accessible to employees and in compliance with any local regulations. • All workers should be authorized to use the toilets whenever necessary.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Condition of toilets	• Toilets should be constructed or covered with washable material. • Facilities should be regularly inspected to ensure that they are clean and adequately supplied (e.g., with clean water, paper towels, etc.) Ideally, records of these inspections should be available. • Sanitary stations should be in good and clean condition to avoid a threat to contamination of soil, water, crops and the workers themselves.
Hand-washing stations	• Hand-washing stations should be provided inside or adjacent to the toilet facilities and in other locations, as required. • Clean water should be in place for the workers to wash their hands, as well as soap. This is required for harvest workers (FV 3.2.1 (M)), and workers in handling areas (FV 3.2.3 (M)). • Signs indicating that hands must be washed after the use of the toilet facility should be in place. • Supervisors shall check the compliance of this instruction.
Waste and wastewater	• Waste and wastewater from the toilets and hand-wash stations should be captured for disposal in such a way that does not contaminate the crop, land, produce or materials. • Removal should be daily or as necessary depending on the number of workers and the capacity of the system. • The waste tank should be thoroughly washed at a frequency according to the specific conditions in the farm. • Waste shall never be disposed on water streams, ponds, etc.

5.4.2. Personal Protective Clothing

Appropriate outer garments shall be worn by all staff (FV 3.1.3 (M)). There should be a policy in place to ensure that clothing appropriate for the job is specified for relevant operations (including planting, pre-harvest inspection, harvest, post-harvest inspection, etc.).

The following table is a tool that helps to identify the most common hazards related to personal protective clothing and provides some examples of mitigation alternatives. They shall be adapted to the farm-specific operations. Producers must consider it as guidance only and not as an exhaustive list of hazards.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Work clothes	• At harvest, systems should ensure that the clothing is clean according to the type of work and prevented from acquiring significant potential contamination during daily activities. • If clothing becomes soiled with agrochemicals, feces, mud, blood, etc., it should be changed (replaced) to prevent contamination of produce.
Cuts, lesions, and bleeding	• People and supervisors shall be informed on what to do in case of blood spillage due to accidental cuts, etc.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Foreign matters	• The wearing of jewelry, body piercings and other loose objects can represent a physical (or potentially microbiological) contamination risk. At harvest, rules should prevent their presence where appropriate. • If appropriate, depending on the crop, at harvest, the protective use of hair coverings to prevent contamination of produce should be addressed.

5.4.3. Information and Training in Hygiene and Health for all Employees

Instruction and training on basic hygiene should be given to all the employees and supervisors, considering the following aspects:

a) The basic set of instructions on hygiene should include all the hygiene aspects that could be of importance according to the farm, crop, and harvest condition.
b) Workers should be trained in understanding the risks of handling produce while ill and the importance of reporting their conditions to the farm manager. Agreements should be made about returning to work after illnesses.
c) Supervisors should also be trained on how to handle relevant conditions and how to detect un-sanitary conditions in the field (birds, rodents, and evidence of their presence, domestic animals, how to handle garbage).
d) Supervisors should have a clear responsibility to follow up the application/implementation of the hygiene procedures and instruction given.

5.5 EQUIPMENT

Equipment includes harvest machinery, containers, and tools. If equipment has contact with microbial hazards, they can transfer it to produce through cross-contamination. For this reason, they shall be kept clean and in good condition.

5.5.1 Harvest Containers and Tools

The next table is a tool that helps to identify the most common hazards in harvest containers and tools and provides some examples of mitigation alternatives. They shall be adapted to the farm-specific operations. Producers shall consider it as guidance only and not as an extensive and unique list.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Use of containers and tools not cleaned	• Shall be kept clean and in good condition so they cannot contaminate or damage the produce (FV 3.2.4 (M)). A visual inspection should be used to check their suitability. • Containers for produce should be revised before use and washed where an inspection detects they are dirty. • Tools used for harvest and any trimming of the harvested produce should be periodically disinfected when needed and according to the characteristic of the operation, crop, etc. (Note that wood-handled tools cannot be fully sanitized). • Damaged harvest containers that are no longer cleanable or would present a risk of introducing foreign material, should not be used for produce.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Contact of containers and tools with soil	• Tools and containers used for harvest and any trimming of the harvested produce should not be allowed to have direct contact with the soil. Cardboard sheets, plastic sheets or other barriers can be used to help keep packaging material off the ground.
Workers not trained	• Workers should be trained to use only those containers and tools that are clean and in good condition. They should remove all dirt as practicable from trailers and boxes between harvest uses.
Contact with contaminants	• Any container or tool suspected to have come into contact with manure, animal/human feces, blood or having bird droppings should be washed and disinfected before re-use.
Other uses of harvesting containers	• Harvesting containers should not be used for carrying any material or substance other than harvested fruits and vegetables. • Agricultural workers should be trained in this aspect.
Trash/waste	• Trash/waste arising from field packing operations should be handled in such a way that does not pose a contamination hazard. • Harvest containers should not be used for waste/trash. • Containers for waste, by-products and inedible or dangerous substances, should be identified. • Containers used for waste should not be used for maintain fresh fruits or vegetables or packaging material that is used for fresh fruits and vegetables.

5.5.2 Harvest machinery and equipment

The next table is a tool that helps to identify the most common hazards regarding harvest machinery and equipment and provides some examples of mitigation alternatives. Producer must consider it as guidance only and not as an extensive and unique list.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Damage to produce	• When harvest machinery is used, it should be properly calibrated and handled to prevent physical damage to produce.
Cleanliness of harvest machinery	• Harvest machinery should be cleaned and washed according to the manufacturer's recommendations and the specific working conditions. • Harvest equipment must be able to protect the product from contamination (FV 3.2.4 (M)). • Every day the machinery should be reviewed to assure that no produce is left inside the equipment.
Cleanliness of transportation	• Any vehicle should be adequately cleaned, and where necessary, disinfected to avoid cross-contamination. • A dirty vehicle should never be used.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Cross-contamination	• Equipment and transport vehicles should be prevented from traveling through potentially contaminated areas (e.g., areas associated with untreated manure) to reach field or harvesting locations. • Vehicles used for transport of fresh and packed fruit and vegetables should not be used for the transport of hygienically hazardous substances.

5.5.3 Temporary Storage of Harvested Produce

The storage of fresh produce should be carried out in areas where the produce is under controlled conditions as to avoid hazards, damages, and contamination. A risk assessment should consider all produce storage and handling areas.

The following table is a tool that helps to identify the most common hazards regarding the temporary storage of harvested produce and provides some examples of mitigation alternatives. They must be adapted to the farm-specific operations. Producers shall consider it as guidance only and not as an extensive and unique list.

Source of Hazard (Examples)	Mitigation Alternatives (Examples)
Uncontrolled storage	• All produce packed and handled directly in the field, orchard, or greenhouse should be removed from the field overnight.
Cleanliness of the area	• Harvested produce should be always be kept in a clean area and protected from heat, animals, and other sources of possible contamination. • Periodic inspection of the premises should be used to ensure that conditions are appropriate.
Maintenance of buildings or sheds where produce is stored	• Buildings should be maintained in such a way that they do not pose a hygiene risk to the harvested produce. • Ducts, pipes, and overhead structures, if any, should be installed and maintained so that drips and condensation do not fall over produce, raw materials or food contact surfaces. • Water from refrigeration drip pans should be drained and disposed of away from product and product contact surfaces. • Air intakes should not be located near potential sources of contamination (to avoid introducing microbiological hazards). • Roof leaks should be promptly identified, controlled, and repaired.
Wastes	• Rubbish/waste receptacles/bins should be closed and (as far as possible) located away from facility entrances and produce handling/storage areas.
Pests in produce storage area/produce-handling operation	• The fruit storage area/fruit-handling operation shall maintain a pest control log according to control point FV 3.6.3 (m). • Applications of pesticides (e.g., insecticides, rodenticides) shall be performed in compliance with all regulations than can apply. • Pest control duties should be performed by a trained pest control operator (or licensed operator, where required by prevailing regulation). • Storage areas should be free of objects/items that may provide harborage for pests/animals (e.g., is there adequate weed control around the perimeter of the site?)

6. OTHER USEFUL INFORMATION

6.1. TYPES OF PATHOGEN

Foodborne illness caused by the consumption of fruit and vegetables is rare. Where instances have occurred, they have typically been associated with a relatively small group of microorganisms–bacteria, viruses, or parasites. Table 1, below, provides some examples of the most common microorganisms that have caused outbreaks. (Note that this list is not exhaustive).

Table 1: List and Characteristics of some Microbial Pathogens that have been Linked to Outbreaks in Produce

MICROORGANISM	COMMON MAIN SOURCE
BACTERIA	
Escherichia coli O157:H7 and other strains	Animal feces, especially cattle, deer and human. Cross-contamination through water used for irrigation or other purposes that has been contaminated. People not washing hands after use restrooms.
Salmonella spp.	Animal and human feces. Cross-contamination through water used for irrigation or other purposes that has been contaminated.
Shigella spp.	Human feces; contaminated water used for irrigation or other purposes.
Listeria monocytogenes	Soil, food production environments that maintain wet conditions.
VIRUSES	
Hepatitis A	Human feces and urine. (There is no known animal reservoir for this pathogen). Contaminated water used for irrigation or other purposes. People not washing hands after use restrooms.
Norovirus (previously known as Norwalk virus)	Human feces, vomitus. (There is no known animal reservoir for this pathogen). Contaminated water used for irrigation or other purposes. People not washing hands after use restrooms.
PARASITES	
Cryptosporidium spp.	Animal and human feces.
Cyclospora spp.	Human feces from people carrying the parasite. Contaminated water used for irrigation, application of PPP or other purposes.

Based on: www.fda.gov