International Association for Food Protection WEBINAR

Impact of Water Use and Reuse in Food Production and Processing on Food Safety at the Consumer Phase: Focus on the Fresh Fruit and Vegetable Products Sector

Organized by IAFP's Water Safety and Quality PDG, International Food Protection Issues PDG, and Fruit and Vegetable Safety Quality PDG

Moderator: Leon Gorris, Food Safety Futures, Past Chair of Water Safety & Quality PDG

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International Association for Food Protection

Webinar Housekeeping

- It is important to note that all opinions and statements are those of the individual making the presentation and not necessarily the opinion or view of IAFP.
- All attendees are muted. Questions should be submitted to the presenters during the presentation via the Questions section at the right of the screen. Questions will be answered at the end of the presentations.
- This webinar is being recorded and will be available for access by IAFP members at www.foodprotection.org within one week.

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Presenters

Zhou Kang - Development of international scientific advice on water (re-)use and food safety

Elisabetta Lambertini - Risk-based, fit-for-purpose water (re-)use in fresh fruit and vegetable supply chains

Rob de Jonge - Bringing the fit-for-purpose approach into operation; water (re-)use case studies

Ana Allende - Field testing the JEMRA guidance

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

Development of international scientific advice on water (re-)use and food safety

Dr Kang Zhou

Food Safety Officer
Food Systems and Food Safety Division
Food and Agriculture Organization of the United Nations (FAO)

Background on safety and quality use of water in food at the FAO

- Many Codex documents make reference to the use of **portable** or '**clean**' water

Challenge

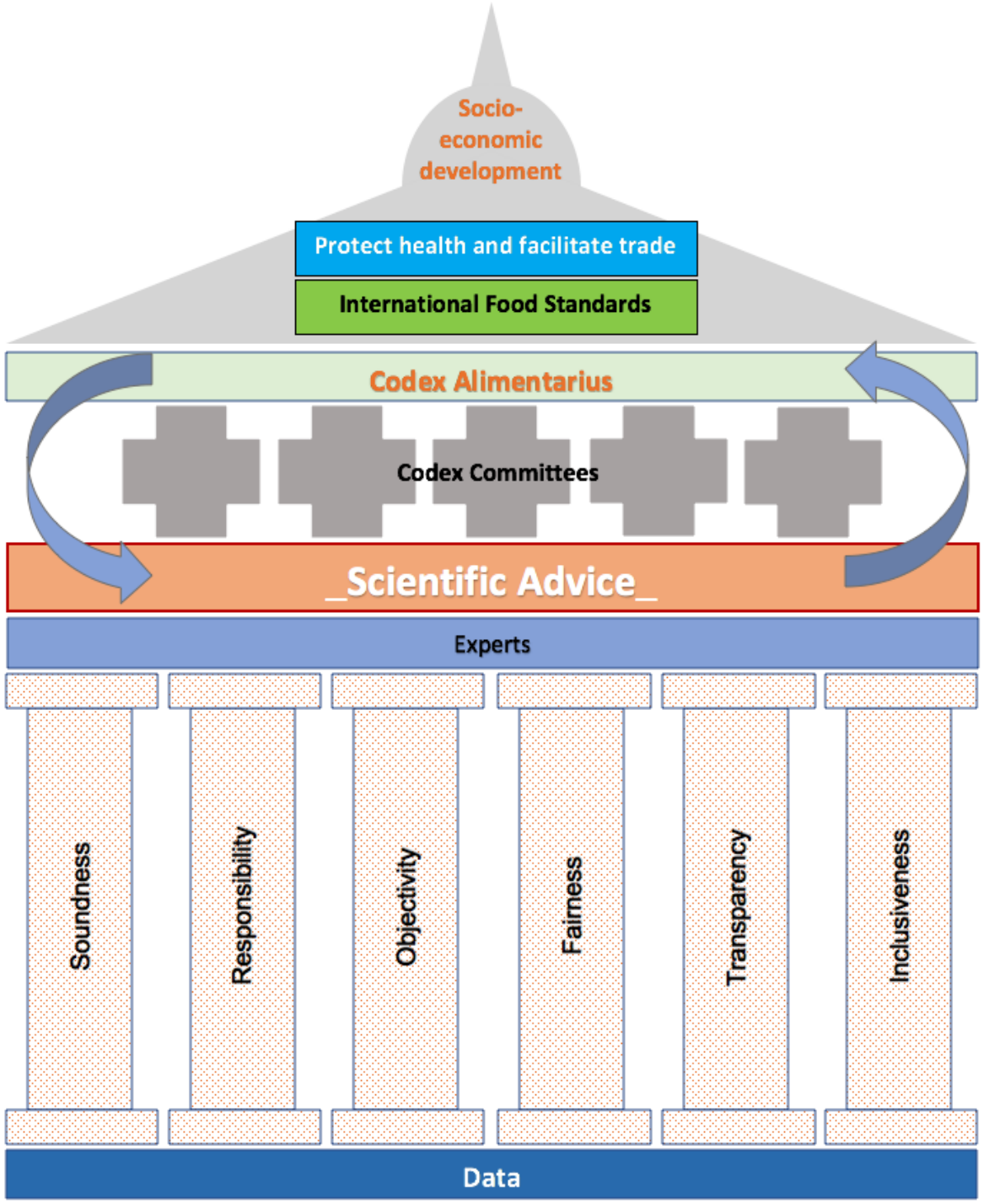
How to turn the Codex current definition clean water "*water which does not compromise the safety of food in the context of its use*" into operational guidance/target for water use and re-use by food producers and processors

- Water is a **dwindling resource** worldwide and not all food producers and processors have access to safe water sources, or this access may be limited.

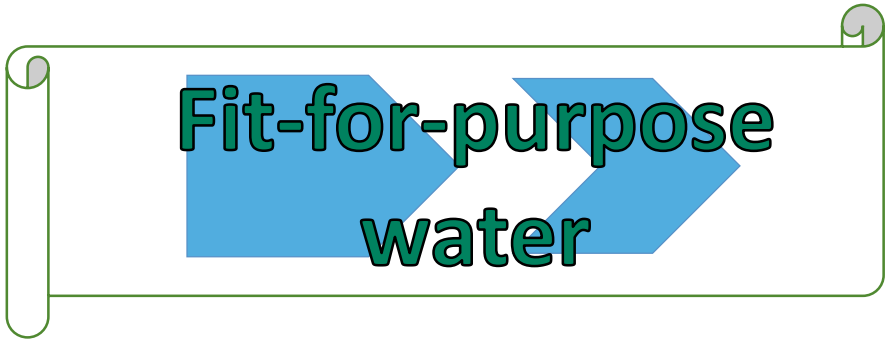
- Codex Committee on Food Hygiene (CCFH) noted the importance of water quality in food production and processing (48th session in November 2016), requested JEMRA to provide guidance processing water, in particular, "clean water" for irrigation water, clean seawater, and on the safe reuse of water

Joint FAO/WHO Scientific Advice Programme

- **JEMRA**: Joint FAO/WHO Expert Meeting on Microbiological Risk Assessment
  - Established in 2000
  - Scientific advice on microbiological risk assessment
  - Expert meetings based on requests from Codex (CCFH) and as we deem necessary
- JECFA, JMPR, JEMNU, ad hoc

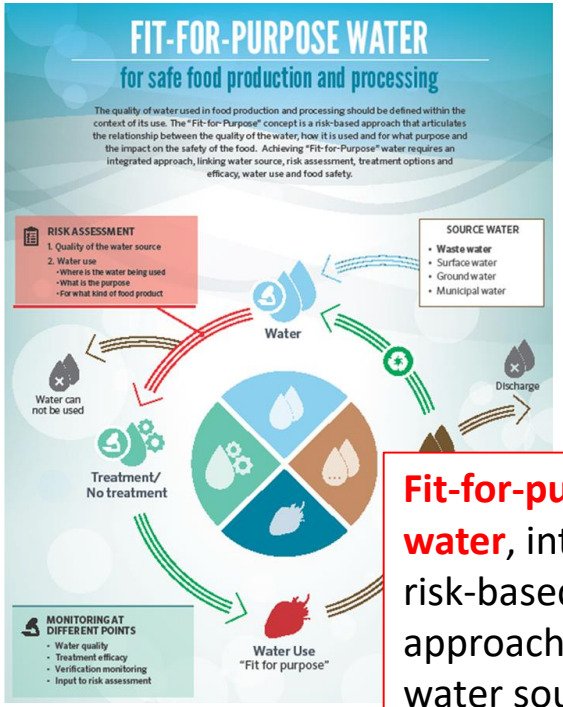


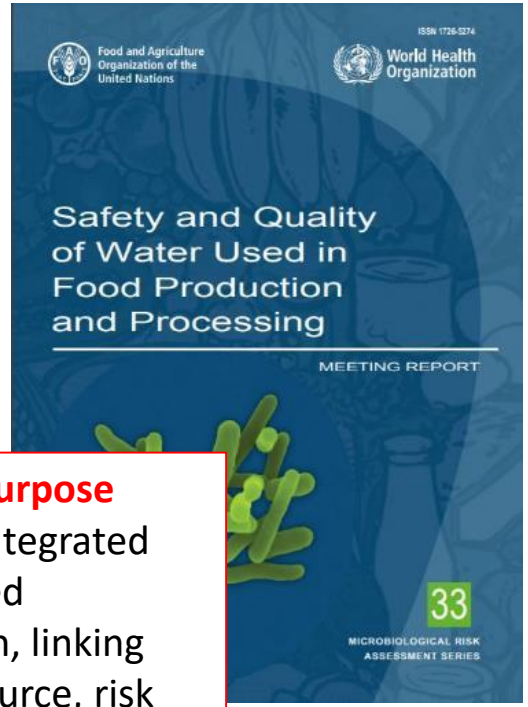
- Place a greater emphasis on a *risk-based approach to safe water* use.
- Instead of specifying use of potable water (or in some instances other water quality types) a risk-based approach and assessment of the fitness of the water *for the purpose* intended should be articulated.
- One size does not fit for all.

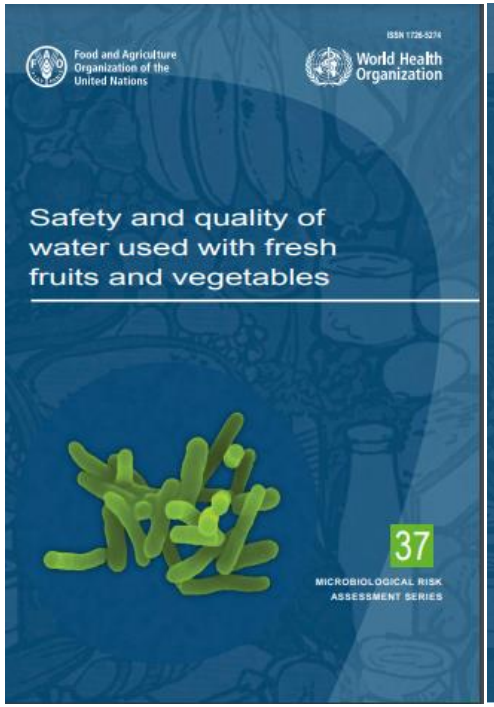


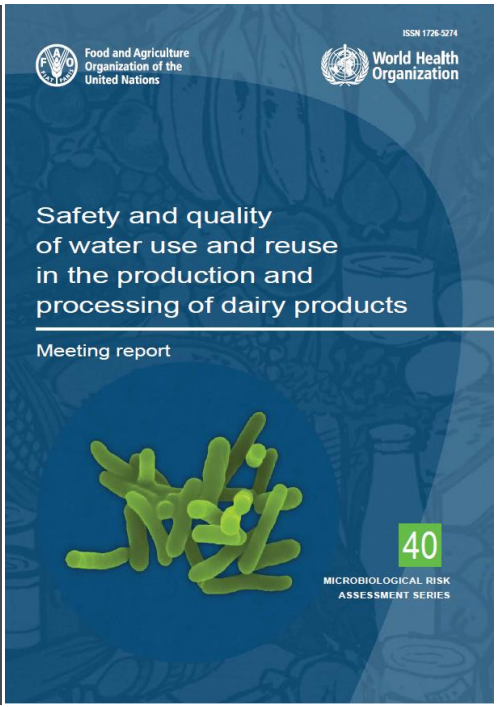
Pathway Forward

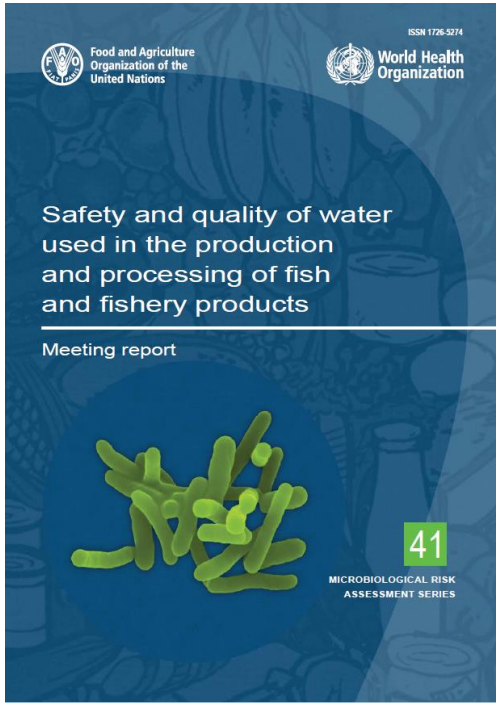
Workshop in **Honduras** to evaluate the decision tree and concepts from JEMRA, in October 2022











Fit-for-purpose water, integrated risk-based approach, linking water source, risk assessment, treatment options and efficacy, water use and food safety.

2017 meeting and infographic

2018 meeting 2019 report

2019 meeting 2021 report

2021 meeting 2022/2023 report

Codex Alimentarius – international food standards

- **General Principles of Food Hygiene (2022)**
- **Guidelines for the safe use and reuse of water in food production and processing (2023)**
  - Provide guidance for **food business operators** (FBOs) and **competent authorities** on the application of a risk-based approach for the use and reuse of water that is fit for purpose.
  - Provide practical **guidance and tools** (e.g. DTTs) and risk-based microbiological **criteria** as examples to help FBOs evaluate risks and potential interventions of water as part of their food hygiene system.
  - Annexes: **fresh produce**, **fishery products**, **dairy products**.

Risk-based, Fit-for-Purpose Water (Re)Use in Fresh Fruit and Vegetable Supply Chains

IAFP Webinar, 14 Dec 2023
Elisabetta Lambertini
Global Alliance for Improved Nutrition

gain Global Alliance for Improved Nutrition

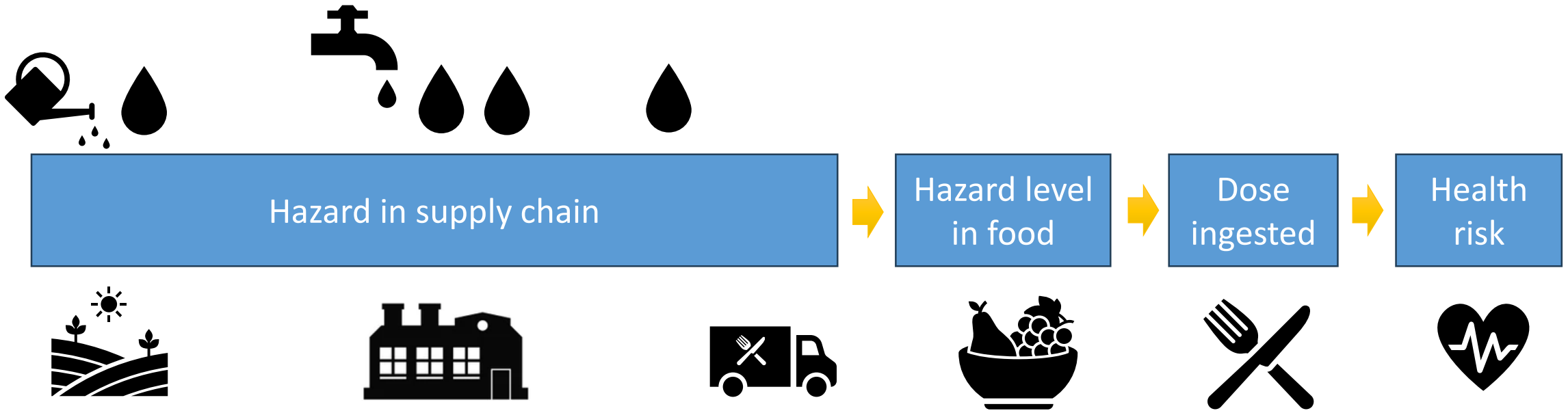
OUTLINE

- **PRINCIPLES**: What is “risk-based”? What is “fit-for-purpose”?
- **RISK-BASED APPROACHES** to assess “fit-for-purpose” quality
- **DECISION TOOLS**

PRINCIPLES

Risk-based standards

- Starting from a health risk target
- “back-calculating” how to achieve the target



Potable water quality

(GDWQ, WHO 2022)

Health risk targets:

- *Microbial pathogens*:

  upper reference risk of **10^{-6} DALY pppy** (~ 1 case diarrhea per 1,000 people per year). Tiered approach towards target.

- *Chemical carcinogens*:

  upper limit cancer risk of **1 excess case per 100,000** people from lifetime exposure

- *Threshold chemicals*:

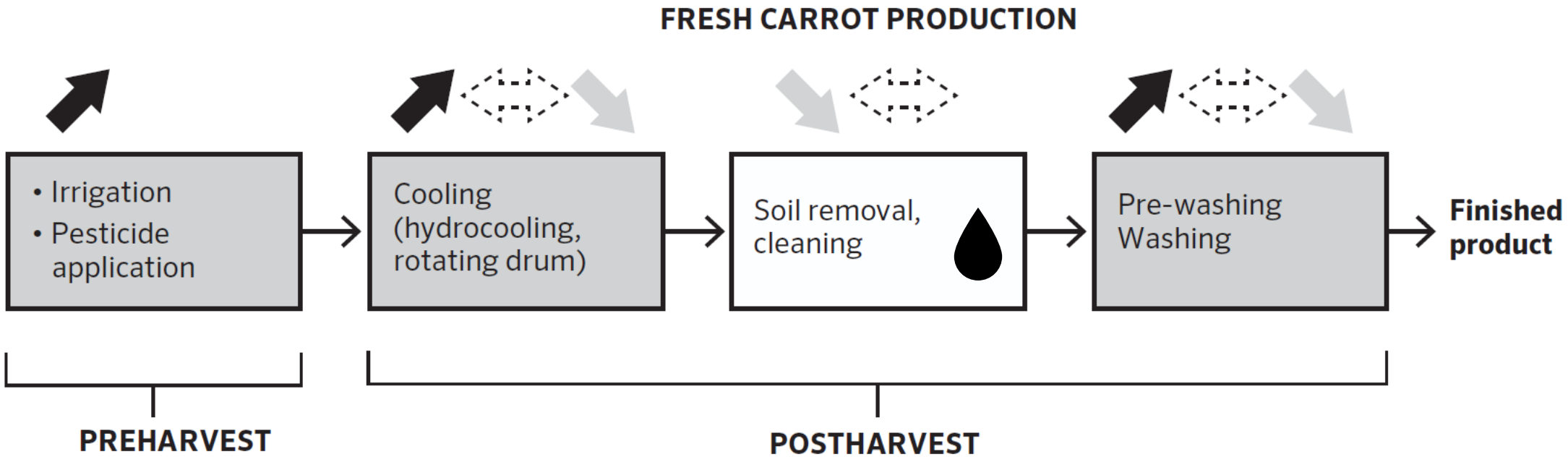
  no or lowest-observed-adverse-effect levels (NOAEL or LOAEL), benchmark dose (BMD), or lower confidence limit on benchmark dose (BMDL) (e.g. fluoride, copper)

What is **fit-for-purpose** (FFP) water quality?

"does not compromise the safety of the final product for the consumer"

- Does not increase risk from product consumption
- Water quality standard should be risk-based

Fit-for-purpose water quality



(MRA 37 - FAO and WHO, 2021)

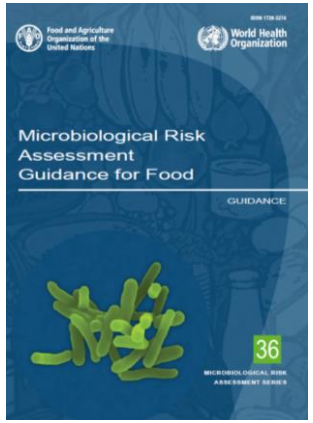
RISK ASSESSMENT APPROACHES

Address risk management questions

Which water source should I use/reuse?

Should I treat the water? How much?

(WHO 2016)



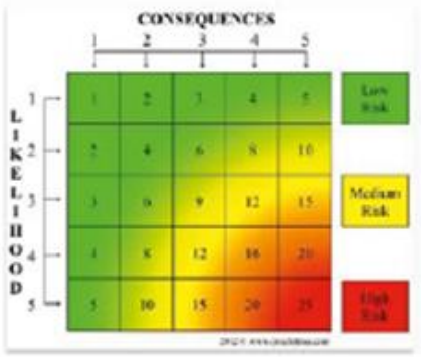
(MRA 36, FAO and WHO 2021)

Risk Assessment approaches

Qualitative

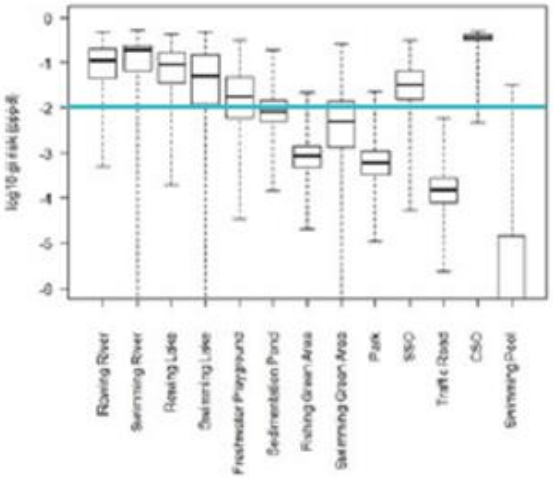
SANITARY INSPECTION
HACCP

Semi-quantitative



RISK CATEGORIZATION
RISK RANKING

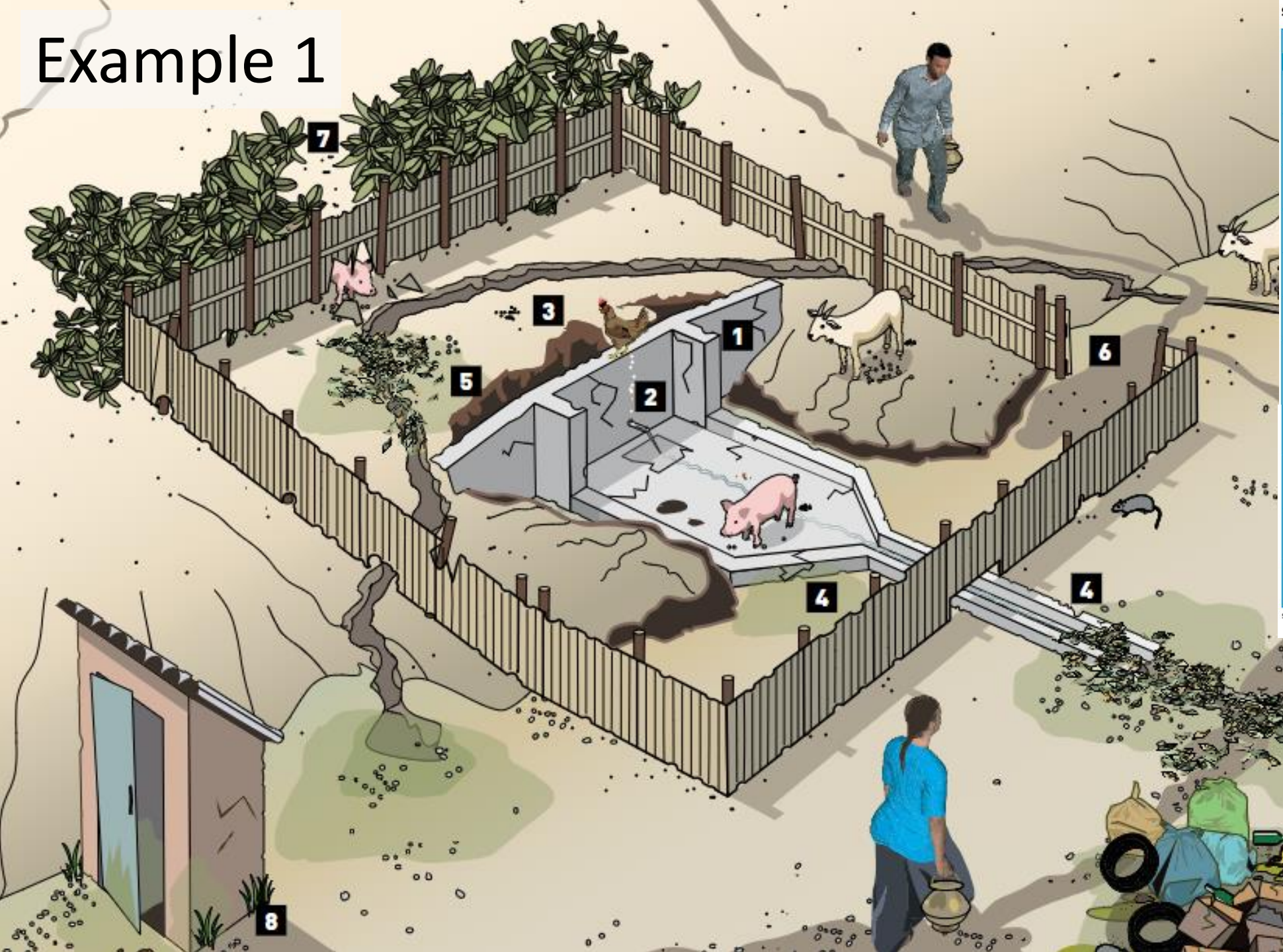
Quantitative



QUANTITATIVE RISK ASSESSMENT
SCREENING/IN-DEPTH

- Same best practices
- Can be complementary

Example 1



Sanitary Inspection Form **DRINKING-WATER**

	Sanitary inspection questions	NO	YES (risk)	What action is needed?
	Answer the following questions 1-11 for all types of spring structures			
1	**Is a protective wall or spring box structure missing or inadequate to prevent contaminants entering the spring?** The absence of a protective structure, or the presence of a poorly maintained one (e.g. damaged, eroded or with deep cracks) may allow contaminants to enter the spring.	❑	❑	
2	**Is the outlet pipe unclean or inadequately positioned to prevent contaminants entering the spring?** An unclean and/or poorly maintained outlet pipe may introduce contaminants into the spring water. If the outlet pipe is positioned too close to the ground, there is a risk of contaminants entering the spring via backflow of surface water or entry of vermin.	❑	❑	
3	**Is the backfill area eroded or prone to erosion due to the absence of vegetation?** If the backfill area becomes eroded (e.g. due to the absence of vegetation), it may act as a direct pathway for contaminants to enter the shallower groundwater as it approaches the spring structure.	❑	❑	
4	**Is the drainage inadequate, which may result in stagnant water in the spring area?** A missing, damaged or blocked drainage channel, and/or the absence of a downward slope for water to drain away from the spring structure, could result in ponding and stagnant water contaminating the spring area.	❑	❑	
5	**Is a storm water diversion ditch above the spring missing or inadequate to prevent contaminants entering the spring?** If the diversion ditch is missing or inadequate (e.g. blocked or lacks sufficient capacity to divert heavy surface water flows), contaminated surface water may enter the spring area.	❑	❑	
6	**Is the fencing or barrier around the spring missing or inadequate to prevent animals entering the spring area?** If the fencing or barrier around the spring is missing, broken, or poorly constructed (e.g. with wide gaps), animals could enter and damage or contaminate the spring area.	❑	❑	
7	**Is the fencing or barrier upstream of the spring missing or inadequate to prevent contaminants entering the spring?**[a] If the fencing or barrier upstream of the spring is missing, broken, or poorly constructed (e.g. with wide gaps), animals could enter and contaminate the shallower groundwater as it approaches the spring structure. Contaminating activities such as agriculture or open defecation could also be practiced in this area without the protection of a fence or barrier.	❑	❑	
8	**Is there sanitation infrastructure within 15 meters[b] of the spring?** Sanitation infrastructure (e.g. a latrine pit, septic tank or sewer line) close to groundwater supplies may affect water quality (e.g. by seepage or overflow and subsequent infiltration). You may need to visually check structures to see if they are sanitation-related, in addition to asking residents.	❑	❑	
9	**Is there sanitation infrastructure on higher ground within 30 meters[b] of the spring?** Groundwater may flow towards the spring from the direction of the sanitation infrastructure. Pollution on higher ground poses a risk, especially in the wet season, as faecal material and other pollutants may flow into the spring.	❑	❑	
10	**Can signs of other sources of pollution be seen within 15 meters[b] of the spring (e.g. animals, rubbish, human settlement, open defecation, fuel storage)?** Animal or human faeces on the ground close to the spring constitute a serious risk to water quality. Presence of other waste (e.g. household, agricultural, industrial etc.) also constitute a risk to water quality.	❑	❑	
11	**Is there any point of entry to the groundwater that is unprotected within 100 meters[b] of the spring?** Any point of entry to the groundwater aquifer that is unprotected (e.g. uncapped/open well or borehole) is a direct pathway for contaminants to enter the spring.	❑	❑	

[(WHO 2022 GDWQ)]

[(WHO 2020 Sanitary Inspection Package)]

Example 2: comparing hazards (semi-quantitative)

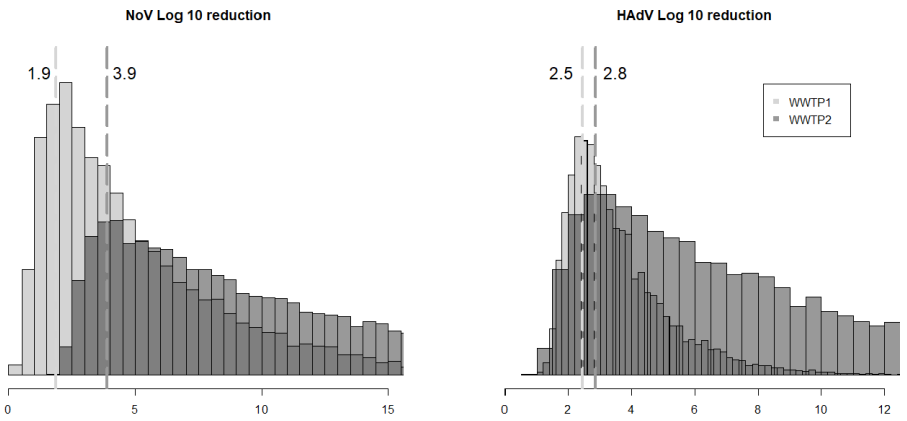
TABLE 34. Example of a Probability-Severity table for individual hazards (indicated by the numbers in the grid) per year (NIL=None, VLO = Very Low; Lo = Low; Med = Medium; Hi = High; VHI = Very High)

Severity	Zero	VLO	LO	MED	HI	VHI
VHI			6			13,2
HI	14				15	12
MED		5		4	1	
LO						
VLO	11	7	3			
NIL			8,9		10	
Probability						

(MRA 36, FAO and WHO 2021)

Example 3: scenario analysis (quantitative)

Comparing treatments for wastewater reuse for irrigation



			HAdV		NoV GII	
	Outputs	Unit	Mean	95%	Mean	95%
WWTP1	Concentration after tertiary treatment	GC/ml	6.70×10^{0}	3.30×10^{1}	6.45×10^{2}	2.83×10^{3}
	Concentration at consumption	virus/g	2.33×10^{-5}	8.64×10^{-5}	5.90×10^{-2}	1.60×10^{-1}
	Dose	pppd	4.51×10^{-4}	1.15×10^{-3}	1.14×10^{0}	1.59×10^{0}
	Daily Probability of infection	pppd	2.86×10^{-4}	7.45×10^{-4}	3.90×10^{-2}	3.52×10^{-1}
	Daily probability of disease	pppd	1.45×10^{-4}	3.73×10^{-4}	2.80×10^{-2}	2.47×10^{-1}
	Yearly probability of disease	pppy	3.06×10^{-2}	7.01×10^{-2}	9.97×10^{-1}	9.99×10^{-1}
	DALYs	DALYs/year	1.44×10^{-3}	3.31×10^{-3}	1.94×10^{-3}	2.00×10^{-3}
WWTP2	Concentration after tertiary treatment	GC/ml	9.40×10^{-1}	4.30×10^{0}	2.50×10^{0}	5.40×10^{0}
	Concentration at consumption	virus/g	3.27×10^{-6}	7.60×10^{-6}	2.31×10^{-4}	2.53×10^{-4}
	Dose	pppd	6.27×10^{-5}	6.95×10^{-5}	5.02×10^{-3}	1.87×10^{-3}
	Daily Probability of infection	pppd	4.02×10^{-5}	4.49×10^{-5}	1.11×10^{-3}	8.25×10^{-4}
	Daily probability of disease	pppd	1.98×10^{-5}	2.30×10^{-5}	7.75×10^{-4}	5.78×10^{-4}
	Yearly probability of disease	pppy	4.23×10^{-3}	1.19×10^{-2}	1.53×10^{-1}	3.82×10^{-1}
	DALYs	DALYs/year	2.09×10^{-4}	5.87×10^{-4}	2.99×10^{-4}	7.47×10^{-4}

pppd: per person per day; pppy: per person per year; GC: genome copies

(Gonzales-Gustavson et al., 2019)

Risk-based standards

Health risk targets (e.g. DALYs)

Water quality standards (e.g. concentration of hazards, indicators)

Performance standards (e.g. Log reduction needed)

Prescribed technology (e.g. tertiary treatment)

DECISION TOOLS

From Risk Assessment to Decision support

Choosing a fit-for-purpose irrigation water source

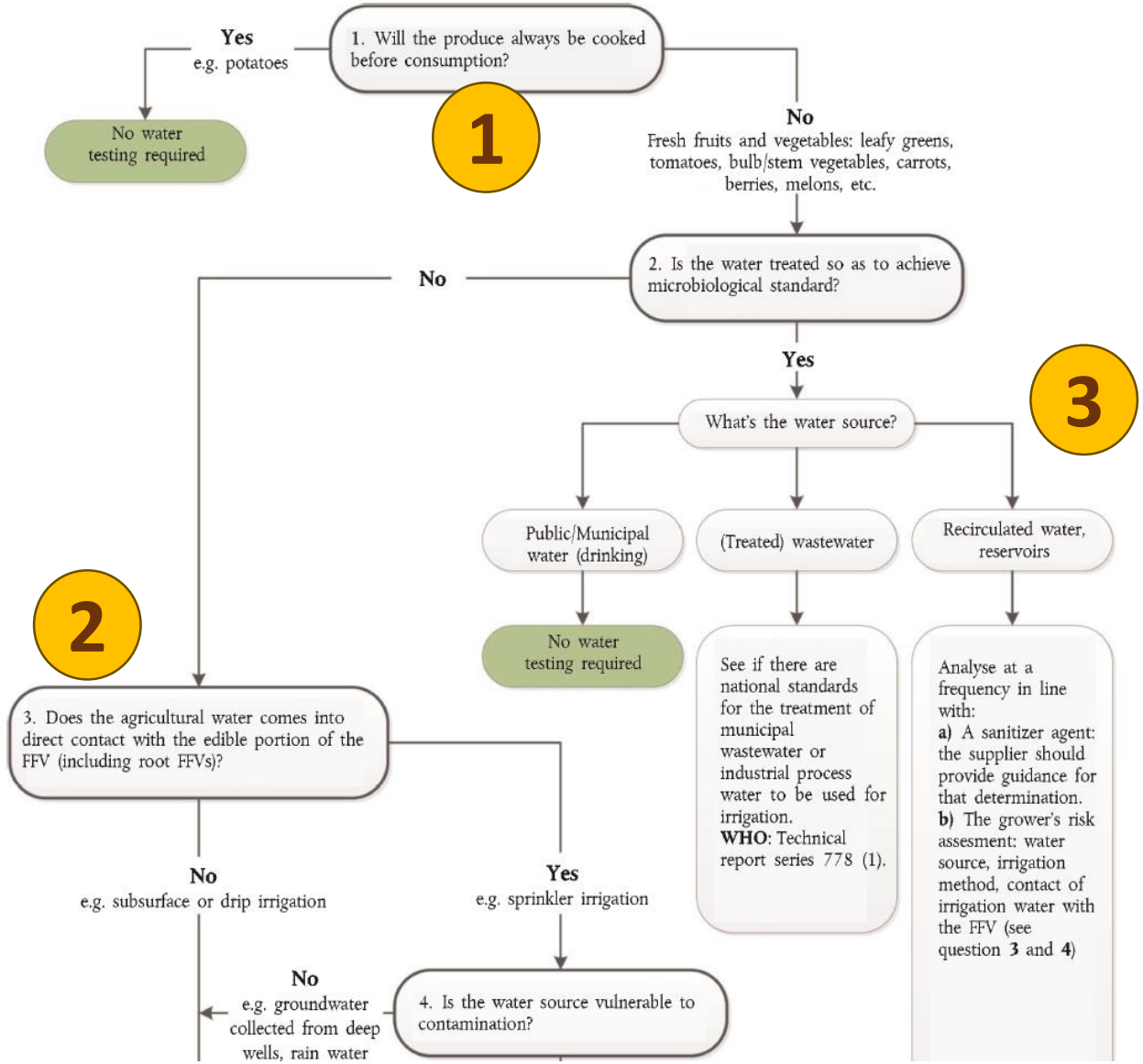
1 Intended use of produce	2 Contact with edible plant portions	Water source 3				
		Wastewater	Surface and groundwater of unknown quality	Groundwater collected from protected wells	Collected rainwater	Potable water Deep groundwater
READY-TO-EAT	contact with the edible portion	HR/?	HR/?	MR	MR	LR
	not contact with the edible portion	HR/?	HR/?	LR	LR	LR
COOKED	contact with the edible portion	LR	LR	LR	LR	LR
	not contact with the edible portion	LR	LR	LR	LR	LR

FIGURE 2. Matrix to support microbiological risk assessment of irrigation water used during pre-harvest of fresh produce

LEVEL OF ACTION REQUIRED

(MRA33, FAO and WHO, 2019)

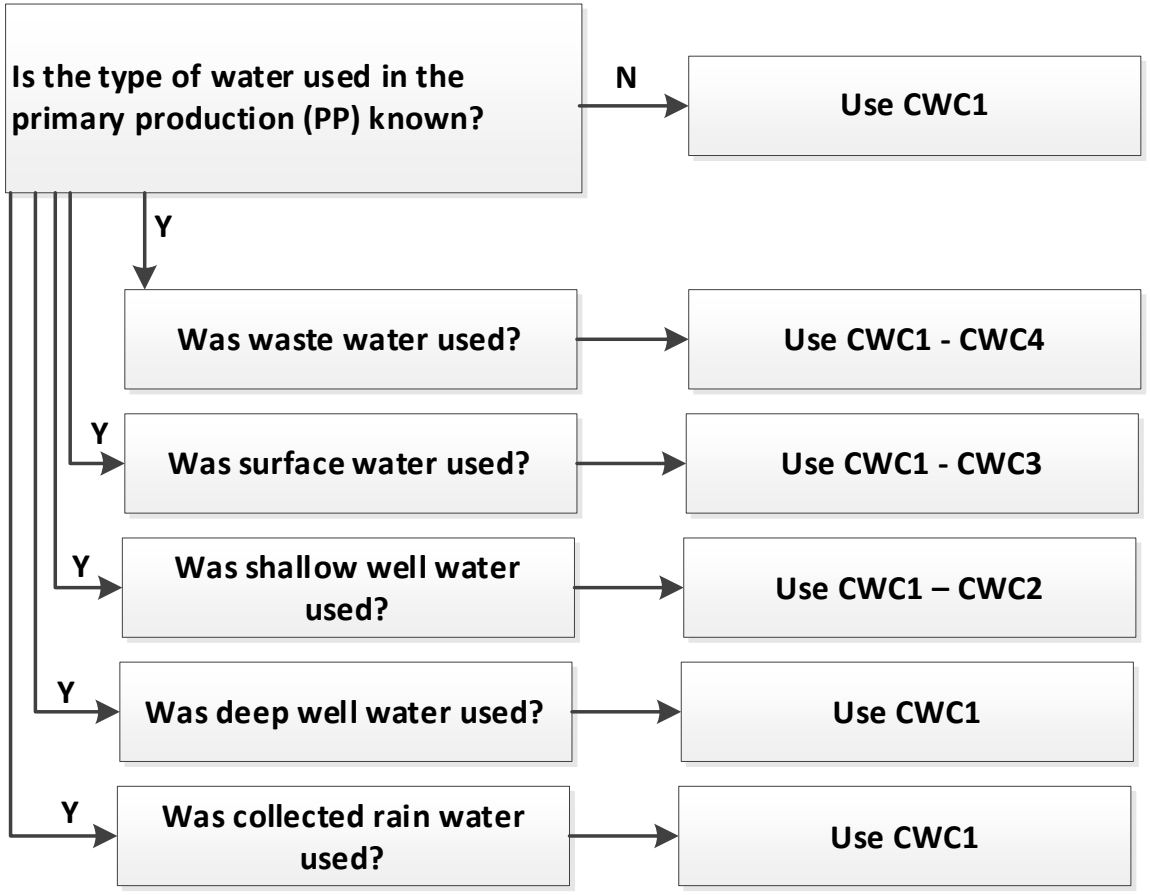
Decision trees: irrigation water quality



[(EC 2017/C 163/01)]

Decision trees: post-harvest processing

Choice of water source based on relative risk contribution



Clean Water Categories (CWC):

The risk of microbial contamination of different water sources generally increases according to the following ranking, from low to high risk:

CWC1: rainwater,
CWC2: groundwater collected from deep wells,
CWC3: groundwater collected from shallow wells,
CWC4: surface waters, and
raw or inadequately treated wastewater.

In summary

- “Fit-for-Purpose” water quality = does not increase risk (or better)
- Needs risk to be assessed
- Several risk assessment approaches are available
- Results of risk assessments can be translated into decision support tools
- Context of continuous improvement

THANK YOU

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Fit-for-Purpose into operation

The use of water that is FfP in the production and processing of fresh fruits and vegetables

Rob de Jonge

Water in the production and processing of FFV is used for

irrigation

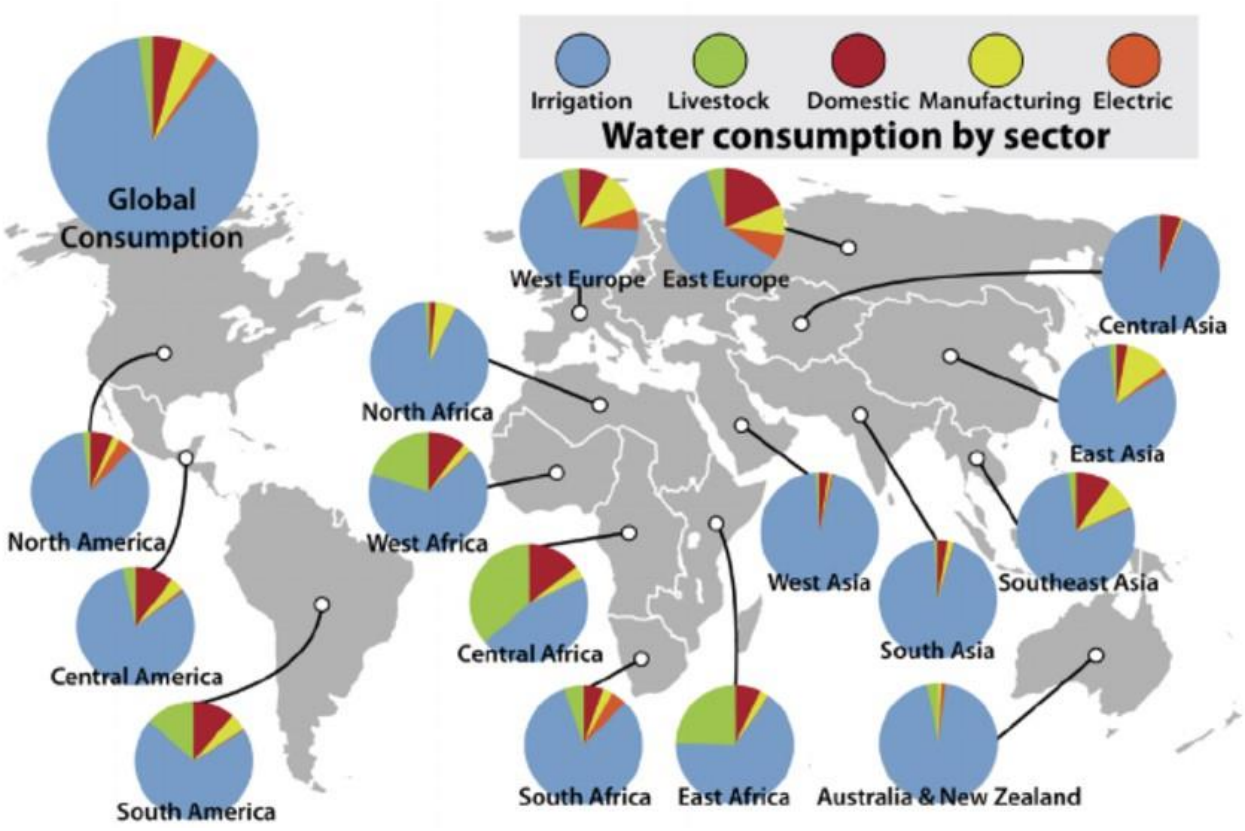
application of ppp/fertilizers

washing

transport

rinsing

Water consumption worldwide



Brauman et al, 2016: DOI: 10.12952/journal.elementa.000083

GENERAL PRINCIPLES OF FOOD HYGIENE (CXC 1-1969)

OBJECTIVES

Primary production should be managed in a way that ensures that food is safe and suitable for its intended use. Where necessary, this will include:

- an assessment of the suitability of water used where it may pose a hazard, for example, crop irrigation, rinsing activities, etc.;

Suitability: Source of water

Suitability: Type of irrigation

Suitability:Type of crop

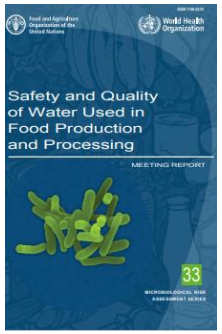
Water that is **Fit-for-Purpose**




Intended use of produce	Contact with edible plant portions	Water source				
		Wastewater	Surface and groundwater of unknown quality	Groundwater collected from protected wells	Collected rainwater	Potable water Deep groundwater
READY-TO-EAT	contact with the edible portion	HR/?	HR/?	MR	MR	LR
	not contact with the edible portion	HR/?	HR/?	LR	LR	LR
COOKED	contact with the edible portion	LR	LR	LR	LR	LR
	not contact with the edible portion	LR	LR	LR	LR	LR

FIGURE 2. Matrix to support microbiological risk assessment of irrigation water used during pre-harvest of fresh produce





9789241516402-eng.pdf (who.int)

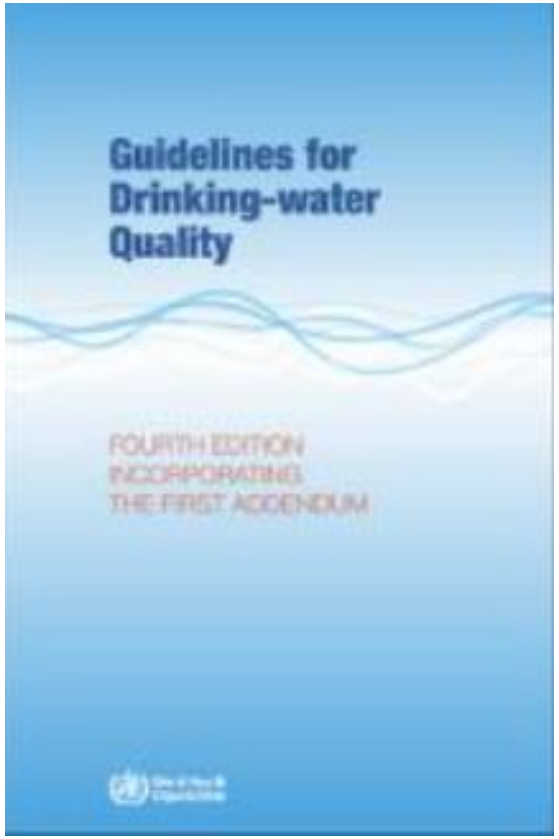
REGULATION (EU) 2020/741 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 25 May 2020
on minimum requirements for water reuse

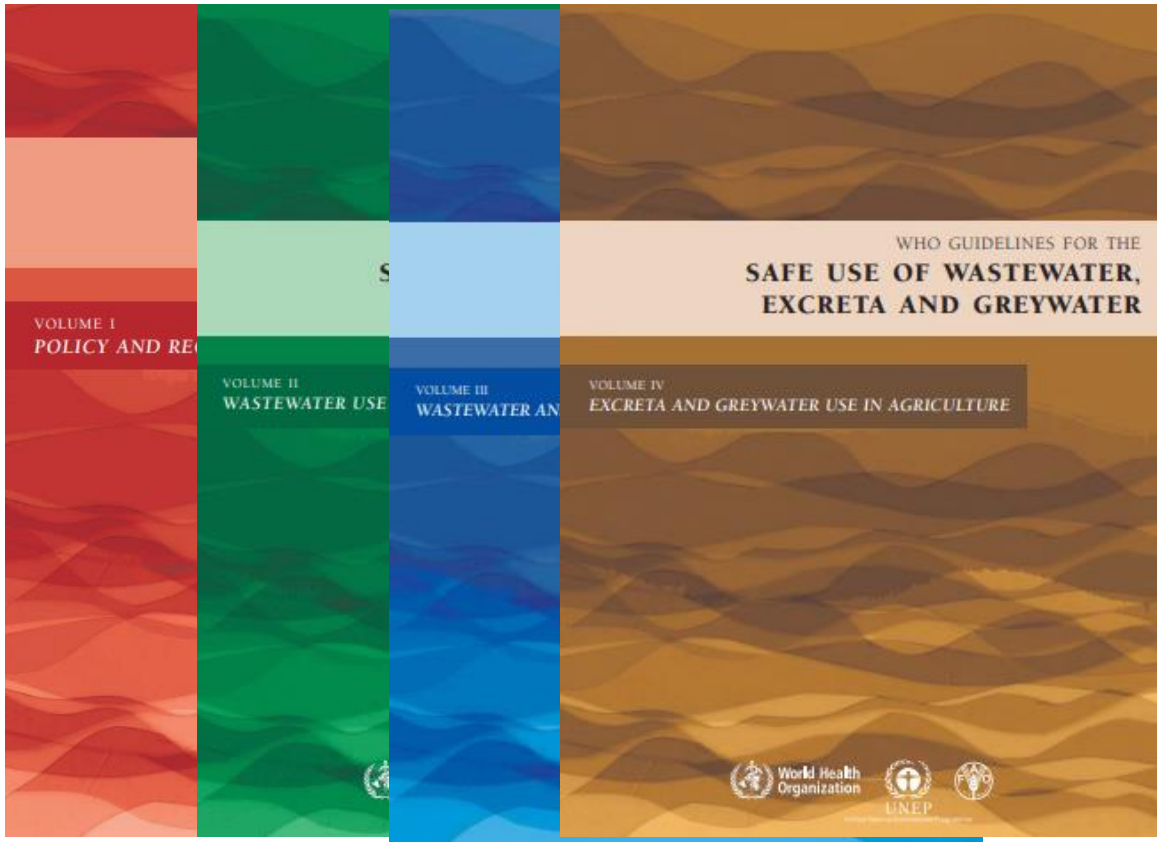
Treated waste water that is **Fit-for-Purpose**

Class A:	*E. coli*	<100 cfu/L	all types of irrigation/crops
Class B:		<1000 cfu/L	all types of irrigation/raw but no direct contact
Class C:		<10.000 cfu/L	drip irrigation/no contact with edible part/processed
Class D:		<100.000 cfu/L	all types of irrigation/crops restricted

eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0741

More about use of waste water in primary production……





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Handling and processing of FFV

The use of water that is F4P

GENERAL PRINCIPLES OF FOOD HYGIENE (CXC 1-1969)

Water, as well as ice and steam made from water, should be fit for its intended purpose based on a risk-based approach.[6] They should not cause contamination of food. Water and ice should be stored and handled in a manner that does not result

…. should not cause contamination…

- Potable water:
  - as an ingredient
  - Ice making
  - For C&D

GENERAL PRINCIPLES OF FOOD HYGIENE (CXC 1-1969)

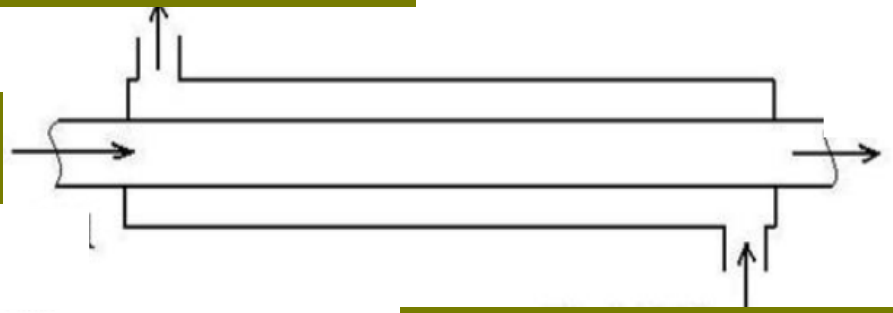
contact food) should have a separate system that does not connect with or allow reflux into the system for water that will contact food. Water recirculated for reuse and water recovered from e.g. food processing operations, by evaporation and/or filtration, should be treated, where necessary, to ensure that the water does not compromise the safety and suitability of food.

…., to ensure that water that is **FfP**.

Re-used water which has received no further treatment

Washing water out

Produce in



Washing water in

Produce out

….clean water could be used for initial washing stages, whereas water used for final rinses should be of potable quality. (CAC/RCP 53-2003)

Example: tomato processor

First wash → Final wash → slicing → Combining/portioning → packing

Tomato juice extraction → Pasteurization of juice → packing

Tomato pulp concentration and water extraction → Commercial sterilization of paste → packing

Example: tomato processor

Recirculate

First wash → Final wash → slicing → Combining/portioning → packing

Tomato juice extraction → Pasteurization of juice → packing

Recover water from surplusjuice & condensate(s)

R Reconditioning?

Tomato pulp concentration and water extraction → Commercial sterilization of paste → packing

Final rinse/reclaimed water → initial rinse → irrigation

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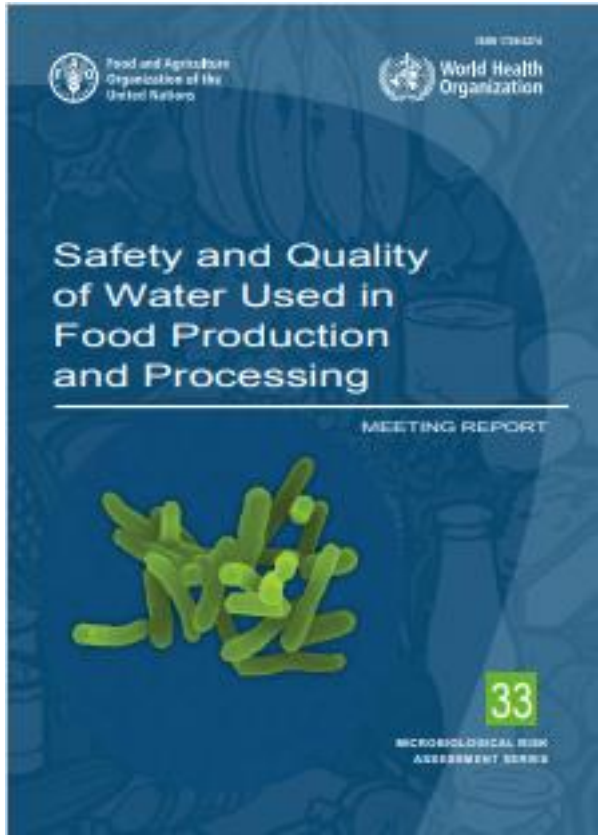
Non-potable:

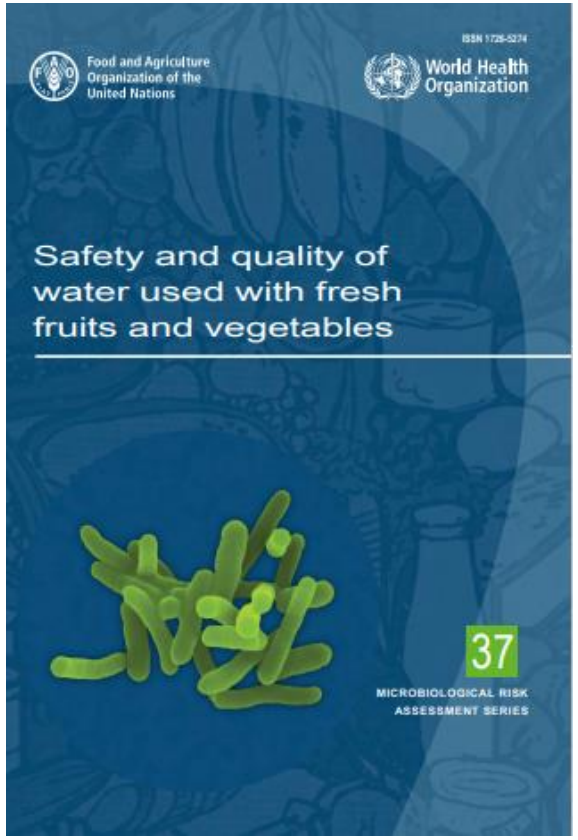
… is possible
… is allowed
… could be useful

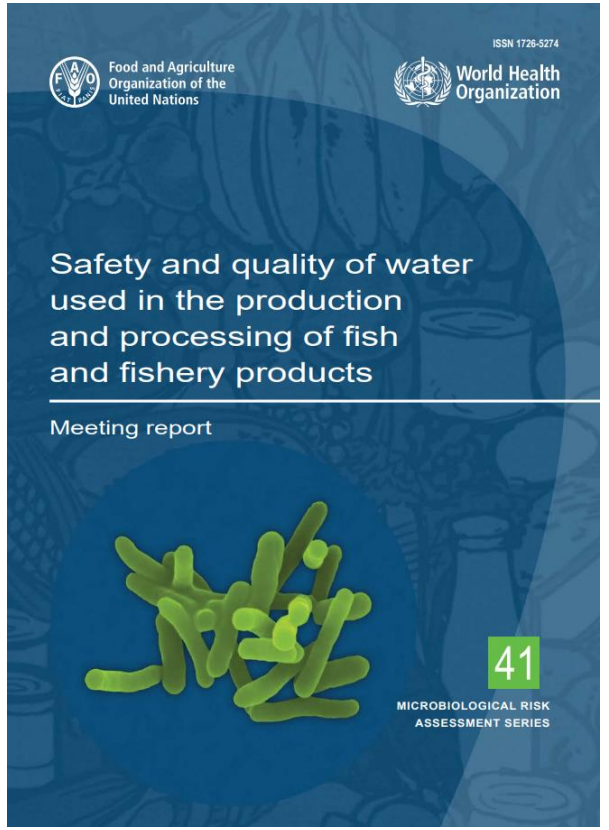
As long as:

Water quality criteria for use in FFV supply chains is **risk-based** and established within the framework of national food and water regulations, as long as water is **FfP**

Safety and quality of water







[Microbiological Risk Assessment series (who.int)]

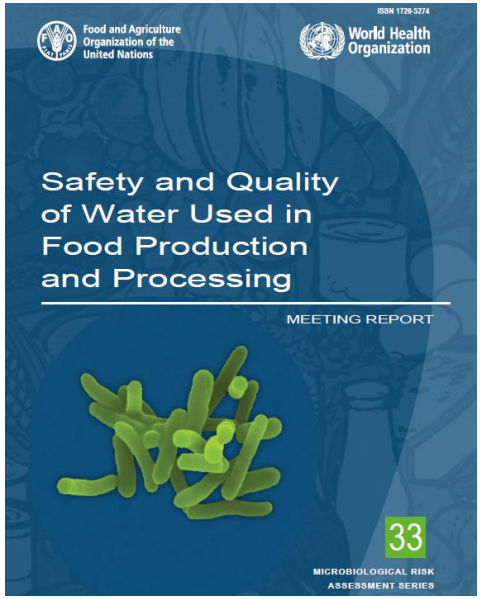
Field testing the JEMRA guidance

Ana Allende (CEBAS-CSIC)

International Association for Food Protection®
WEBINAR

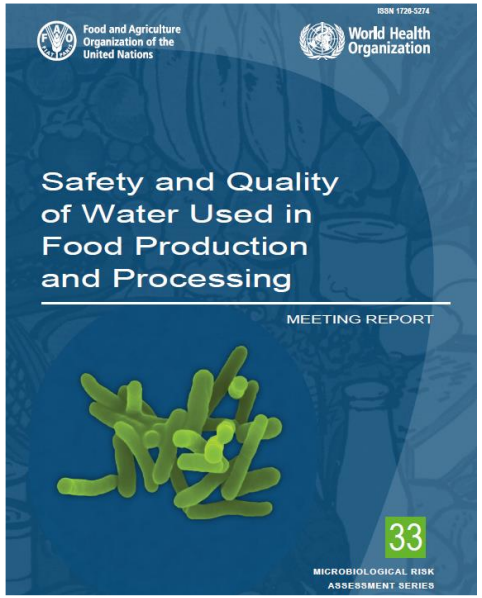
Impact of Water Use and Reuse in Food Production and Processing on Food Safety at the Consumer Phase:Focus on the Fresh Fresh Fr

Thu, Dec 14, 2023 9:00 AM - 10:00 AM EST



The New Codex Alimentarius Framework for Safe Water Reuse in Food Production and Processing

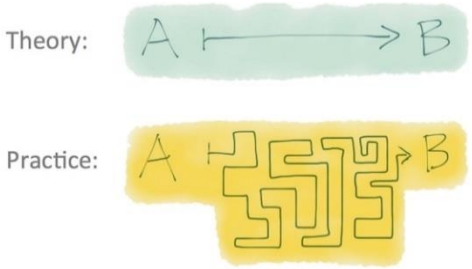
6 Decision trees: Reports from the meeting breakout groups



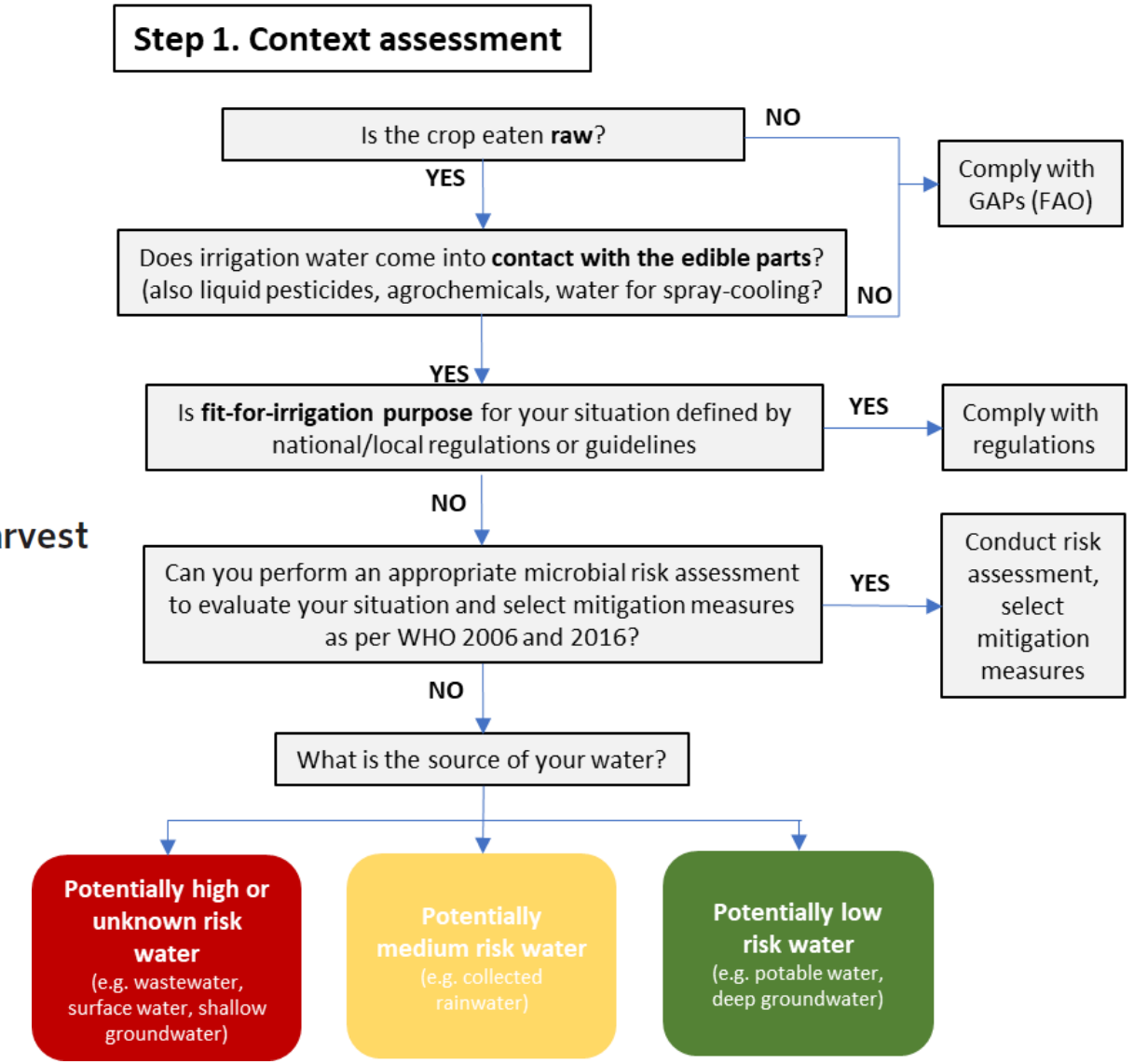
d. Decision tree approach

For practical guidance, a decision tree (DT) approach with underlying risk assessment (RA) will be considered a useful decision support systems (DSS) tool to identify opportunities for levels of log microbial reduction required for water to be considered fit for purpose. In view of the importance of building on existing work, a review will be conducted of existing documents on this approach and key points relevant to food safety managers extracted.

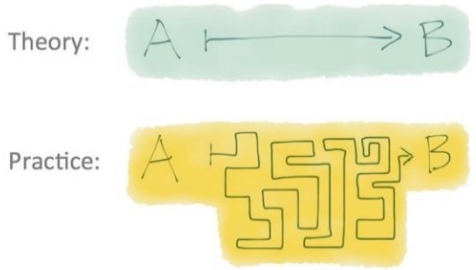
6 Decision trees

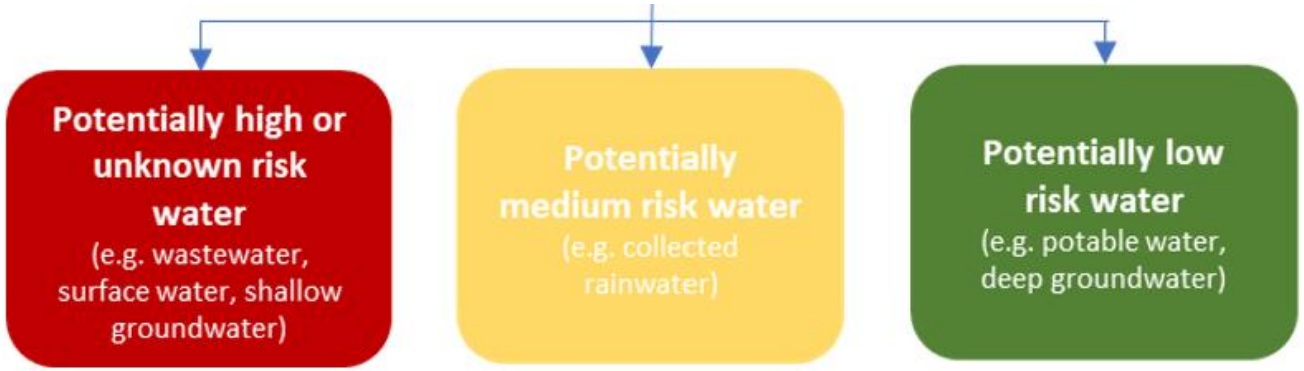


6.1 Fresh produce pre- and post-harvest



6 Decision trees



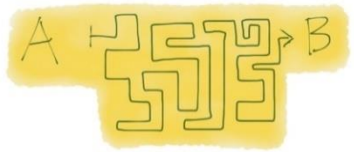


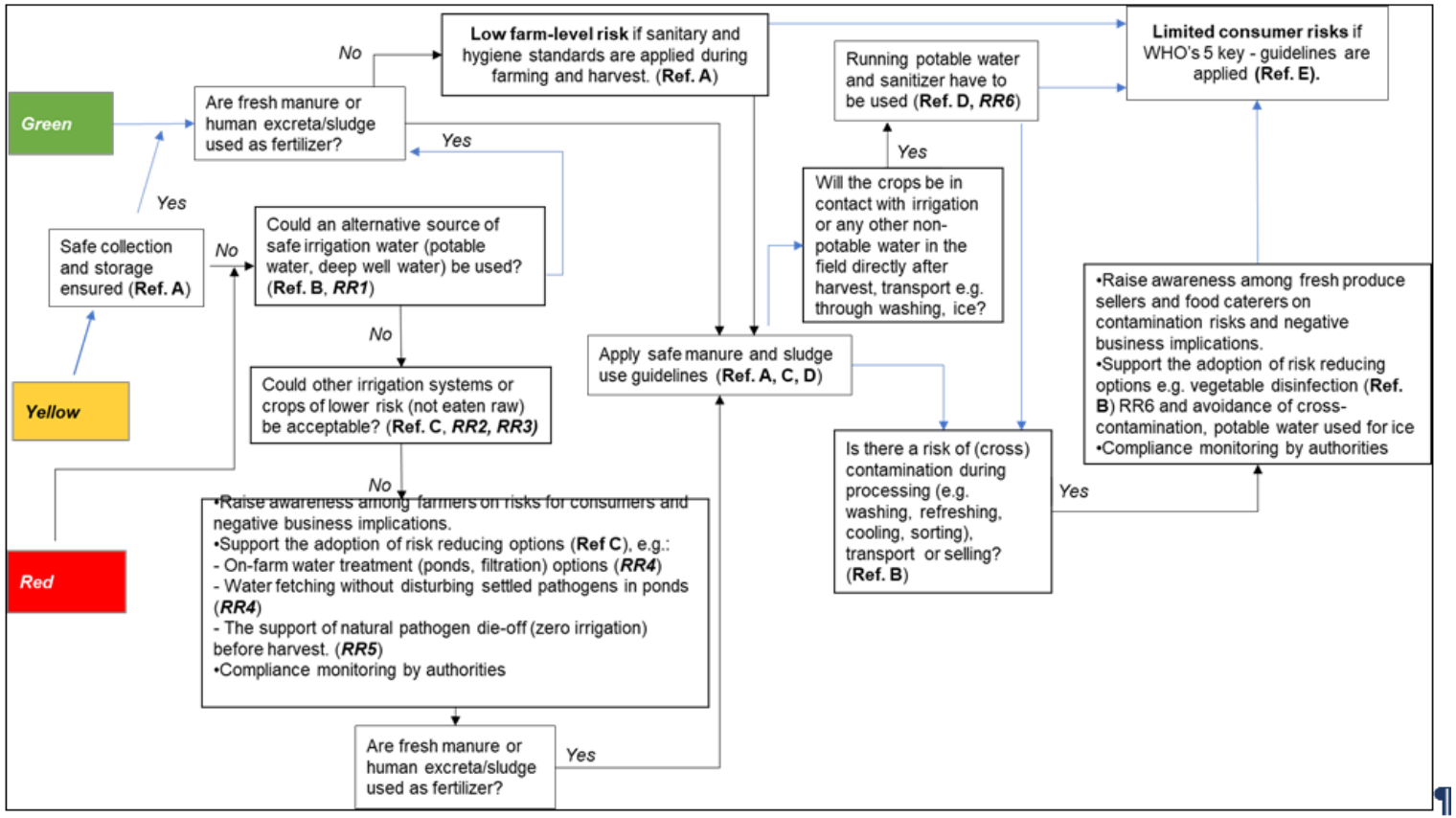
- Key elements of DTs identified were:
  - > characterization of water sources and the distribution and use systems to identify the risks linked to the site-specific water source;
  - > identification of the risk based on the type of application (foliar or non-foliar) and the type of crop (e.g. leafy greens versus fruit trees);
  - > testing/monitoring based on quantification of generic *E. coli*;
  - > frequency and stringency of sampling, in some cases defined according to the identified potential risks.

6 Decision trees

Theory:

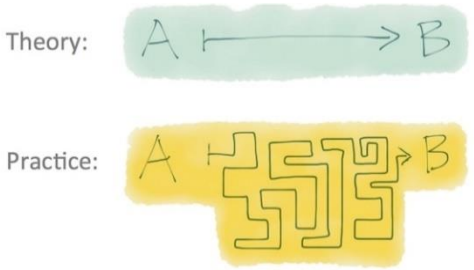
Practice:



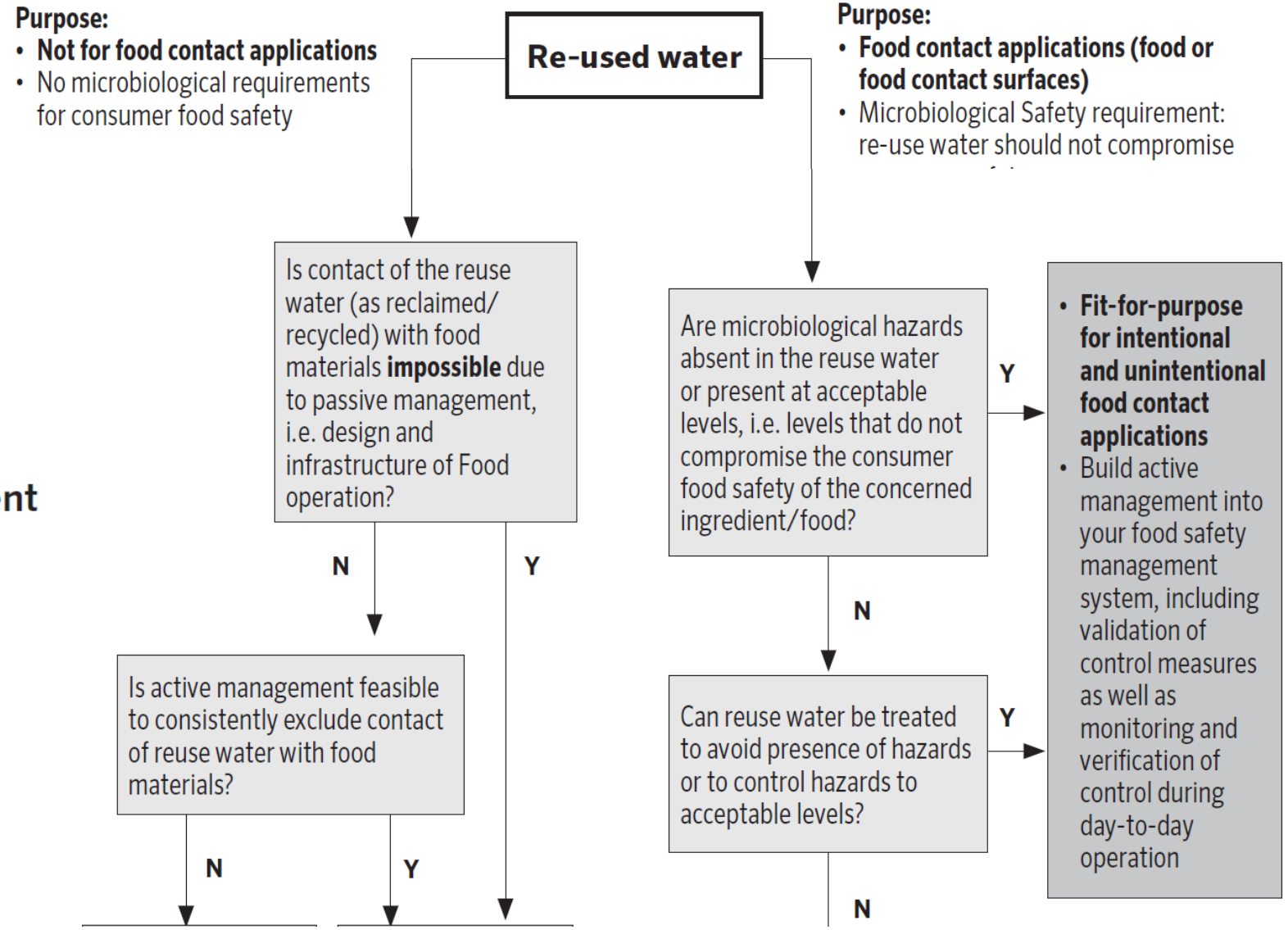


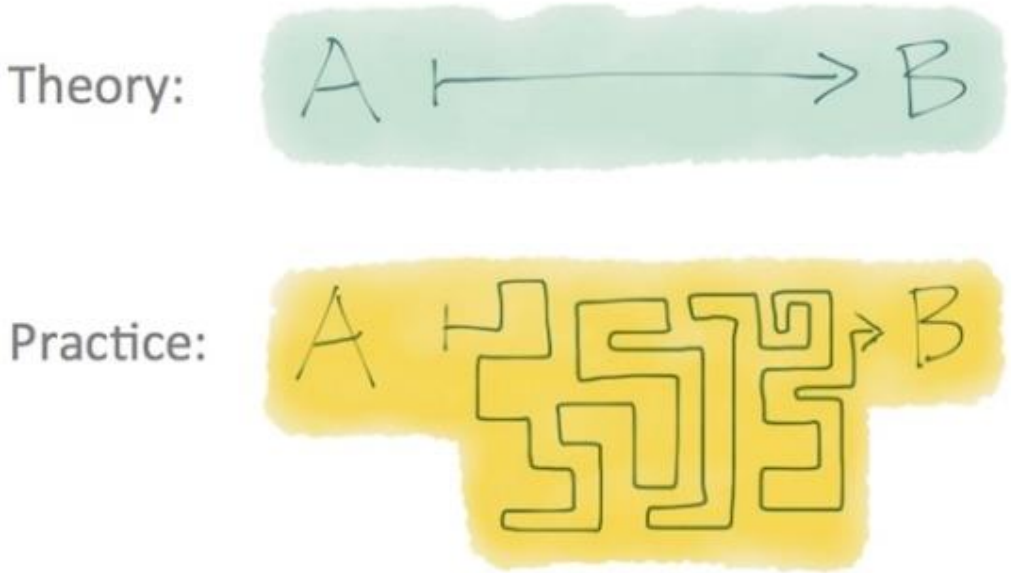
- Most DTs include simple yes/no answers. The most complex ones include identification of critical control points (CCPs) in water reuse systems.
- DTs can be designed with additional information to help the growers understand the risks and the potential interventions that are available; this approach is highly recommended.

6 Decision trees



6.3 Reuse of water in a food establishment




Theory:
A
B
Practice:
A
B

HONDURAS, October 2022

CEBAS-CSIC

CENTRO DE EDAFOLOGÍA Y BIOLOGÍA APLICADA DEL SEGURA

IAFP

International Association for Food Protection

WEBINAR

Organización de las Naciones Unidas para la Alimentación y la Agricultura

World Health Organization

CODEX ALIMENTARIUS HONDURAS

Taller del trabajo conjunto de la FAO/OMS sobre la inocuidad y calidad del agua utilizada en la producción y procesamiento de alimentos

AGENDA PROVISIONAL

Comayagua, Honduras, 11-13 de octubre de 2022

Visiting industries:

- Growers (Irrigation water)
- Producers (water reuse)

Questions made to the growers:

- Which is your source of water?
- Is the water re-circulated?
- Do you use any chlorine treatment?
- Which type of irrigation system you use?
- Is the crop in contact with irrigation or any other non-potable water in the field directly after harvest?
- Is there any risk of cross-contamination during handling and processing?

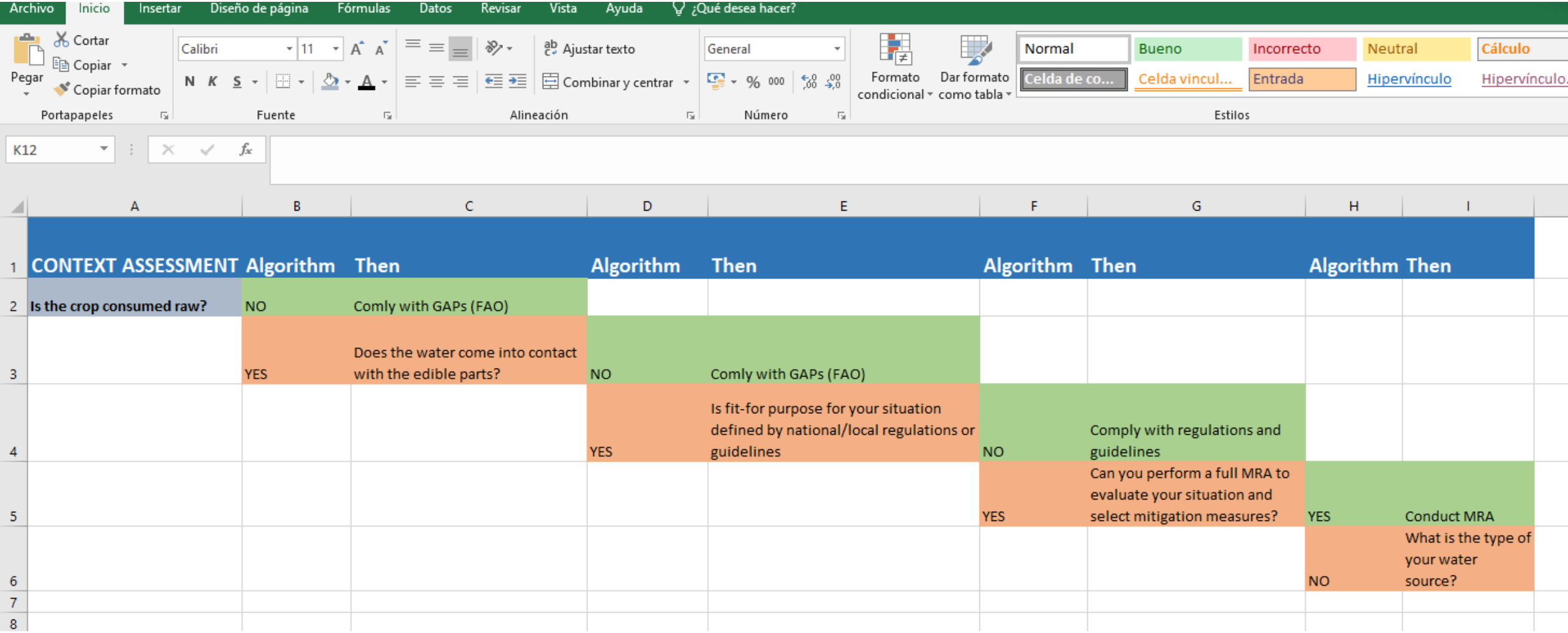
People was divided in 5 groups:

- Irrigation system in greenhouse (3 groups)
- Water-reuse (2 group)

Based on their notes they followed the DTs to assess the water source:

- Primary production
- Water reuse

Context and Qualitative Risk Assessment Irrigation water

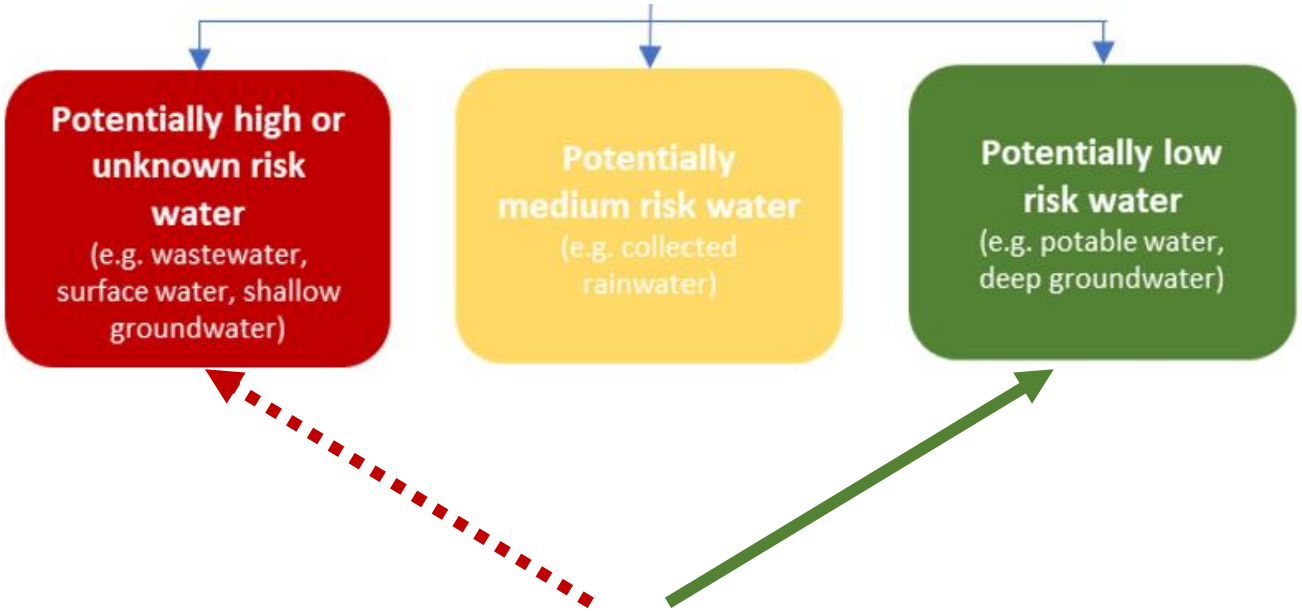


Archivo Inicio Insertar Diseño de página Fórmulas Datos Revisar Vista Ayuda ¿Qué desea hacer?

Pegar Cortar Copiar Copiar formato — Portapapeles
Calibri 11 — Fuente
Ajustar texto Combinar y centrar — Alineación
General — Número
Formato condicional Dar formato como tabla
Normal Bueno Incorrecto Neutral Cálculo
Celda de co... Celda vincul... Entrada Hipervínculo Hipervínculo. — Estilos

K12

	A	B	C	D	E	F	G	H	I
1	CONTEXT ASSESSMENT	Algorithm	Then	Algorithm	Then	Algorithm	Then	Algorithm	Then
2	Is the crop consumed raw?	NO	Comly with GAPs (FAO)						
3		YES	Does the water come into contact with the edible parts?	NO	Comly with GAPs (FAO)				
4				YES	Is fit-for purpose for your situation defined by national/local regulations or guidelines	NO	Comply with regulations and guidelines		
5						YES	Can you perform a full MRA to evaluate your situation and select mitigation measures?	YES	Conduct MRA
6								NO	What is the type of your water source?
7									
8									



- The water source was groundwater and surface water collected in a water reservoir
- Most of the participants interpreted it as Potentially high or unknown risk water
- However, a chlorine treatment was given to the water before entering the greenhouse
- This control measure was not considered as this was not an option included in the DT.

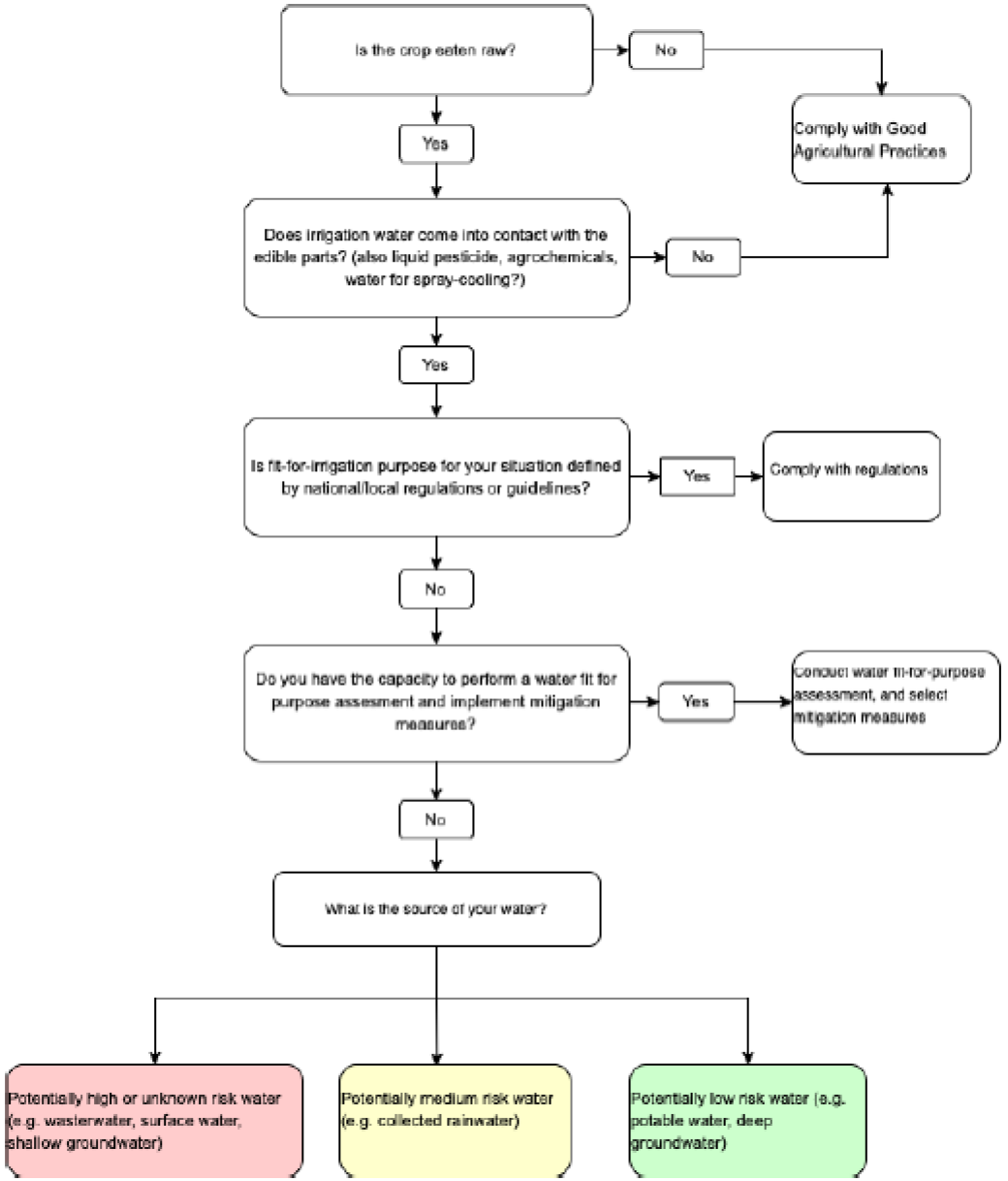
Note: Although multiple options have been given in the DT, control measures applied at the water source have not been included in the first DT, which makes it difficult to classify those water sources

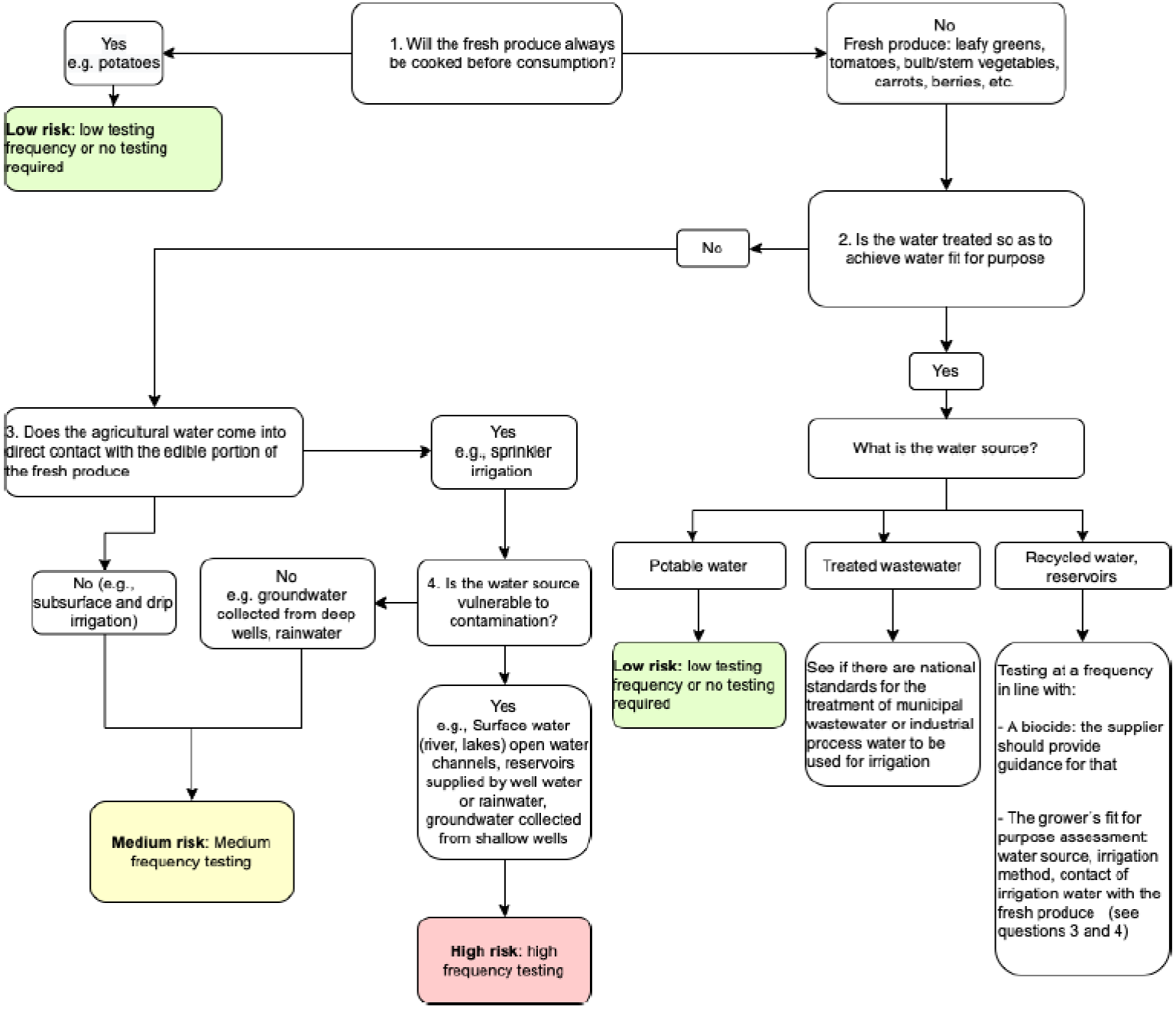
TABLE 1. Qualitative effectiveness of selected control measures for produce, with focus on a small-scale production context

Risk mitigation options	Effectiveness rating	Step 2 cross-reference
Alternative water source such as deep well or potable water	·····	RR1
Change from raw eaten vegetables to boiled vegetables	·····	RR2
Change from overhead irrigation (sprinklers, watering cans) to: Furrow irrigation Drip irrigation	· ···	RR3
On-farm water treatment ponds with 18+ hrs sedimentation period Water fetching without disturbing pond sediment	·	RR4
Filtering water before irrigation (e.g. fine sand, biochar)	·	RR4
Irrigation cessation for three days (no watering before harvest) Note: in hot climates, prolonged irrigation cessation is not feasible.	··	RR5
Peeling fresh produce (e.g. root crops, fruits, removal of cabbage outer leaves)	··	RR5
Washing salad with running potable water	·	RR6
Washing salad with running potable water and added sanitizer	··	RR6
TARGET FOR RISK REDUCTION (RR)	·····	
Example: assuming a target of 6 stars, assuming reduction is additive Filtering water + Drip irrigation + Produce washing with sanitizer = · + ··· + ·· = ·····		

APPENDIX IV

GUIDELINES FOR THE SAFE USE AND RE-USE OF WATER IN FOOD PRODUCTION AND PROCESSING





Example of a decision tree for water testing frequency

Examples of decision support system (DSS) tools

Context and Qualitative Risk Assessment of Water Reuse

Decision tree for deciding if te-used water can be used in either a food contact or non-food contact application

1 Is contact of the reuse water with food materials impossible due to the design and infrastructure of the food business operation? — YES — Fit-for-purpose for all not-for-food contact applications

NO — Are validated control measures in place taht consistenltly exclude contact of reuse water with food materials — YES — Fit-for-purpose for all nont for-food contact aplications

NO — Not fit for purpose

2 Are microbiological hazards absent in the reuse water or present — YES — Fit-for-purpose for all not-for-food contact applications

NO — Can reuse water be treated to avoid prsencd of hazards or to control hazards to acceptable levels? — YES — Fit-for-purpose for food contact applications

NO — Can reuse water be limited to applications other than as food ingredient? — YES — Fit-for-purpose only for food applications other than as ingredient or final cleaning/washing

NO — not-fit for purpose

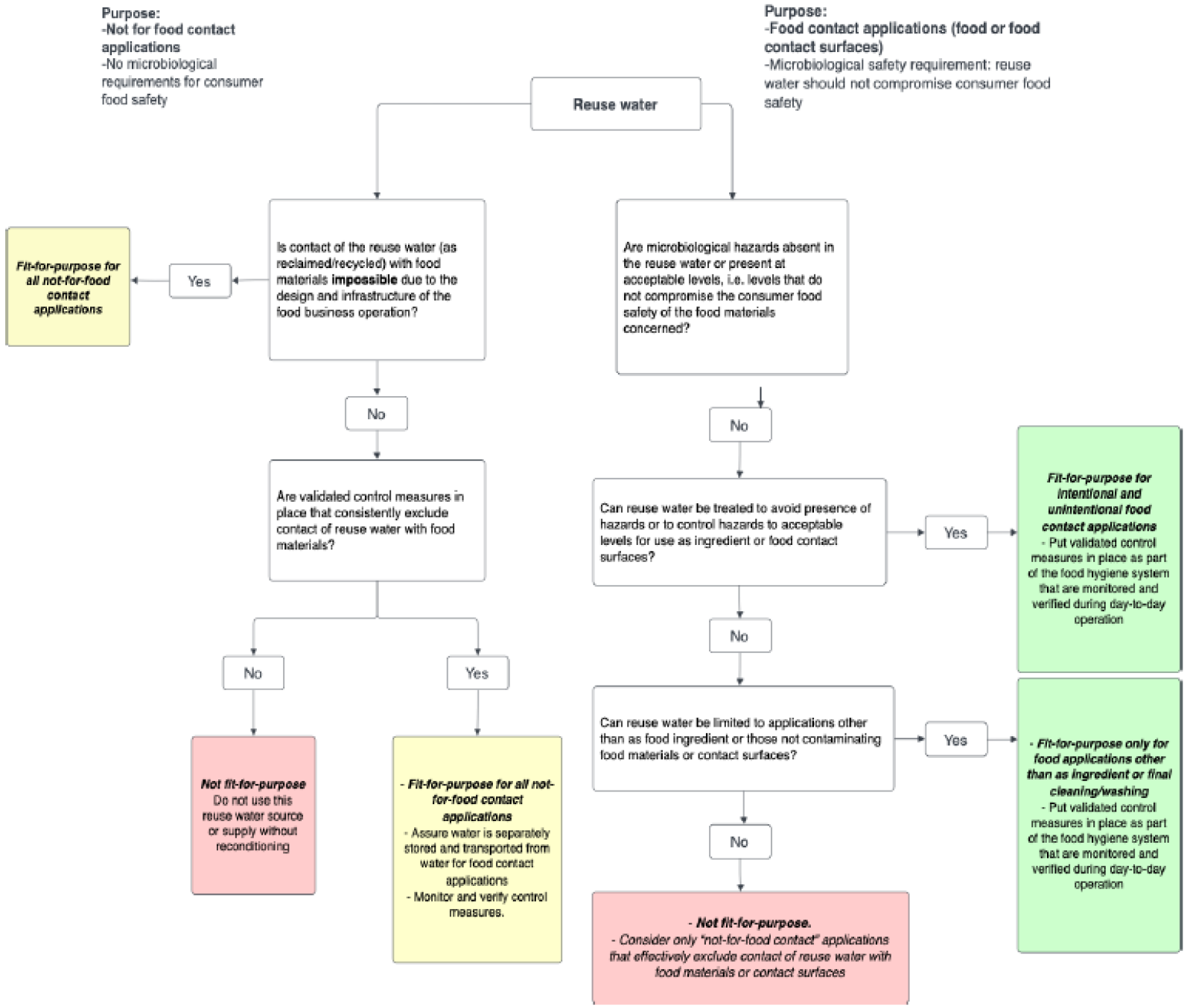
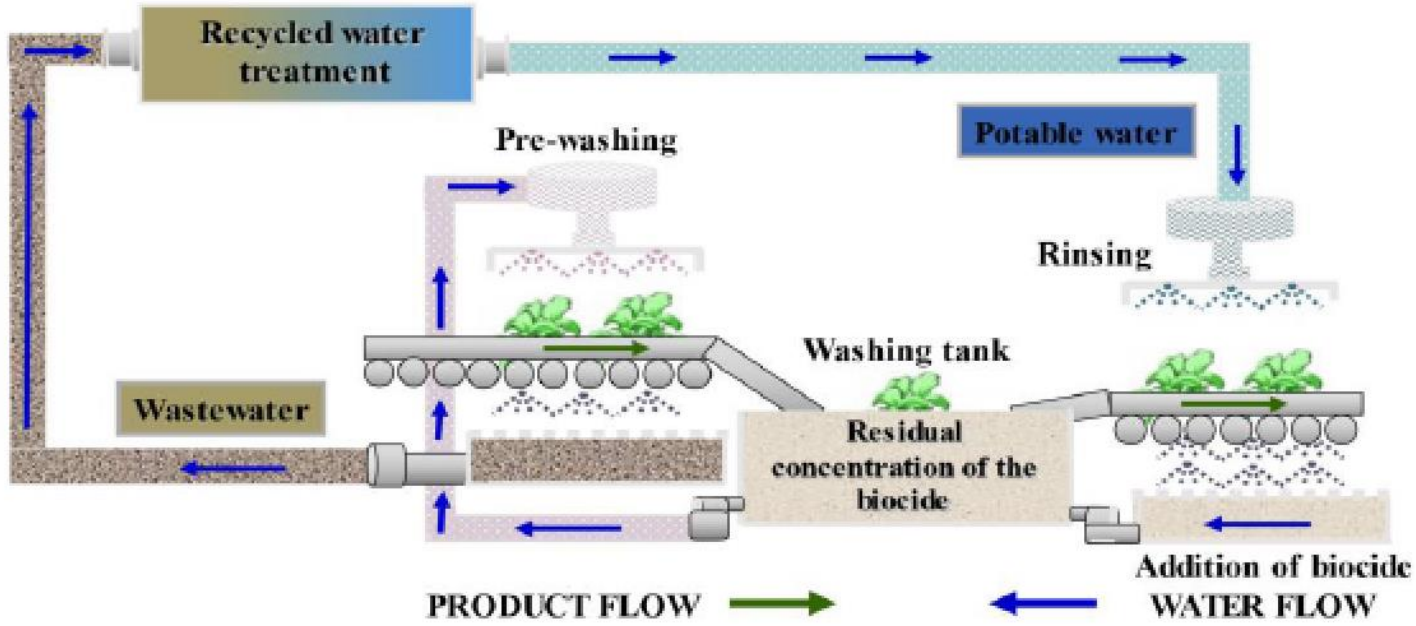

Purpose:
-Not for food contact applications
-No microbiological requirements for consumer food safety
Purpose:
-Food contact applications (food or food contact surfaces)
-Microbiological safety requirement: reuse water should not compromise consumer food safety
Reuse water
Is contact of the reuse water (as reclaimed/recycled) with food materials impossible due to the design and infrastructure of the food business operation?
Yes
Fit-for-purpose for all not-for-food contact applications
No
Are validated control measures in place that consistently exclude contact of reuse water with food materials?
No
Not fit-for-purpose
Do not use this reuse water source or supply without reconditioning
Yes
- Fit-for-purpose for all not-for-food contact applications
- Assure water is separately stored and transported from water for food contact applications
- Monitor and verify control measures.
Are microbiological hazards absent in the reuse water or present at acceptable levels, i.e. levels that do not compromise the consumer food safety of the food materials concerned?
No
Can reuse water be treated to avoid presence of hazards or to control hazards to acceptable levels for use as ingredient or food contact surfaces?
Yes
Fit-for-purpose for intentional and unintentional food contact applications
- Put validated control measures in place as part of the food hygiene system that are monitored and verified during day-to-day operation
No
Can reuse water be limited to applications other than as food ingredient or those not contaminating food materials or contact surfaces?
Yes
- Fit-for-purpose only for food applications other than as ingredient or final cleaning/washing
- Put validated control measures in place as part of the food hygiene system that are monitored and verified during day-to-day operation
No
- Not fit-for-purpose.
- Consider only "not-for-food contact" applications that effectively exclude contact of reuse water with food materials or contact surfaces

Figure 2. Example of a potential option for water re-use in the fresh produce industry.



APPENDIX IV

GUIDELINES FOR THE SAFE USE AND RE-USE OF WATER IN FOOD PRODUCTION AND PROCESSING

Conclusions

- All the participants found the decision tree for the water reuse very useful to identify areas where water can be reuse.
- The Decision Trees are useful for the classification of the water source but Control Measures should be integrated already before the final classification of the water source.
- SLIGHT ADAPTATIONS TO SPECIFIC CONTEXT MIGHT BE NECESSARY
- More initiatives to transmit the new framework would be welcome ☺

Fit-for-purpose water, knowledge gaps and limitations

- Assessment of irrigation water interventions and controls on farms, especially those applicable to low resource settings.
- Data on the survival of various pathogens under real-world water quality conditions to support lab-based observations.
- Increase community empowerment and partnerships that support irrigation water management.
- **Improved education and training** for different stakeholders on irrigation and water quality management.

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