European Union Network for the Implementation and Enforcement of Environmental Law

Bucharest Water & Land Conference
(17-18 October 2023)

WATER AND LAND

Benefits and Challenges of the New Regulation of Water Reuse: Case study of Spain

Ana Allende

CEBAS-CSIC
Centro de Edafología y Biología Aplicada del Segura

NEW EUROPEAN LEGISLATION

What Is The Future For Water Reuse In Europe?

by Luigi Rizzo | September 29, 2018 in Earth 0

Water scarcity is affecting many regions worldwide, and water reuse can help to address this issue. However, its potential remains largely untapped in the European Union. Possible obstacles to water reuse practices in Europe include (i) an inconsistent national legislation across Member States, (ii) water reuse costs (e.g., upgrade of urban wastewater treatment plants (WTPs) to address more stringent limits on water quality), and (iii) last but not least, a general public distrust related to human health risk.

https://sciencetrends.com/

Water reuse milestone in Europe: Regulation (EU) 2020/741 on minimum requirements for water reuse

WRE Team 17th June 2020 news 0

European Parliament

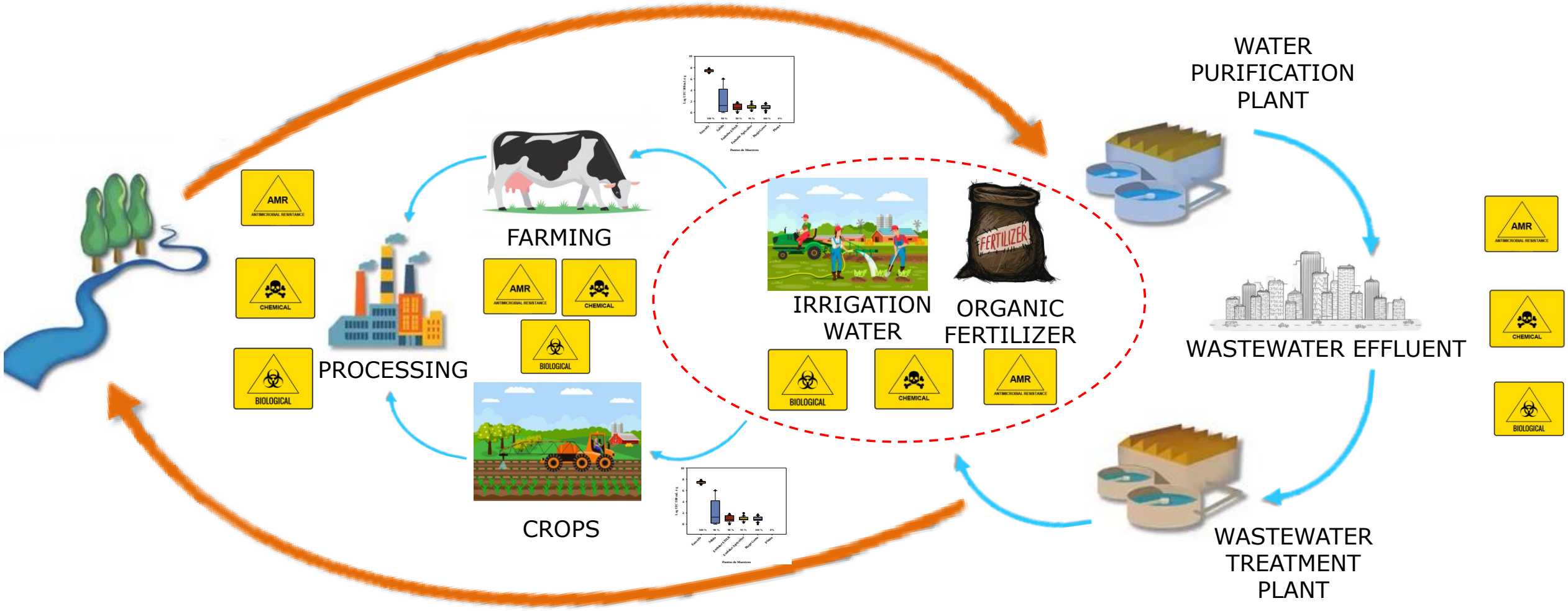
1. **Creating an enabling framework for those Member States** who wish or need to practice water reuse.
2. This regulation **Should be flexible enough** to allow the continuation of the practice of water reuse and at the same time to ensure that it is possible for other Members States to apply those rules when they decide to introduce this practice at a later stage.
3. **Any decision not to practice water reuse Should be duly justified** based on the criteria laid down in this Regulation

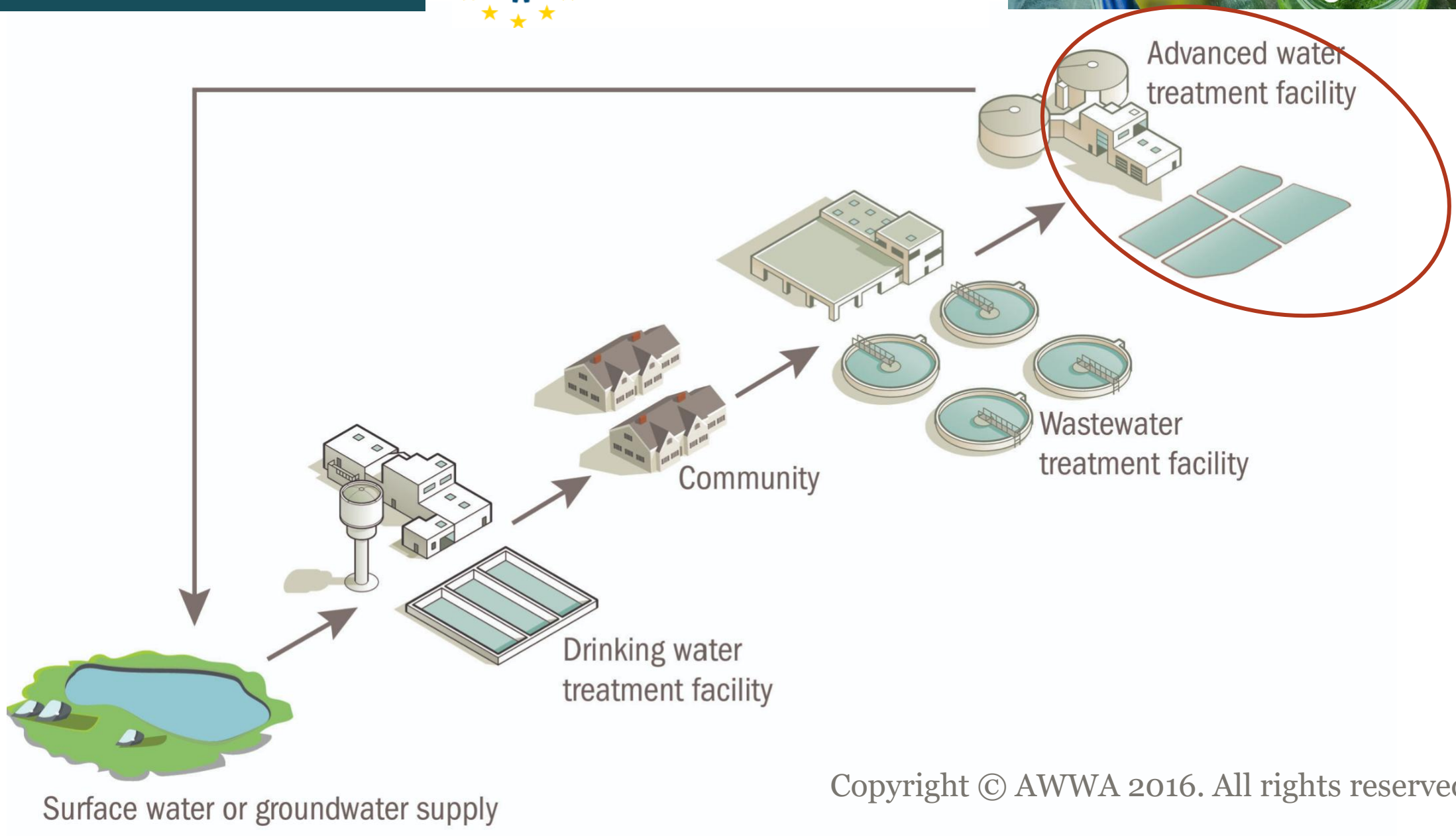
Water reuse milestone in Europe: Regulation (EU) 2020/741 on minimum requirements for water reuse

WRE Team 17th June 2020 news 0

European Parliament

1. **Interpretation of the New Regulation**
2. **Strict microbiological criteria: Update of current technologies** implemented in the WWTP
3. **Growers use "unpplaned water reuse" systems**. *"Water reuse can be planned or unplanned. In unplanned water reuse, the water source consists largely of previously used water. An example of this are communities that draw their water from rivers into which previously treated wastewater from upstream communities has been discharged"*.
4. **Emerging hazards need to be consider**: e.g. Antimicrobial Resistant Agents


WATER PURIFICATION PLANT
AMR
ANTIMICROBIAL RESISTANCE
CHEMICAL
BIOLOGICAL
FARMING
PROCESSING
IRRIGATION WATER
ORGANIC FERTILIZER
FERTILIZER
WASTEWATER EFFLUENT
CROPS
WASTEWATER TREATMENT PLANT



Wastewater treatments

	E. coli (CFU/100 mL)[A]	Enterococci (CFU/100 mL)	Somatic coliphages (PFU/100 mL)	*Cryptosporidium* (oocyst/L)	Helminth (eggs/20 L)	*Salmonella* spp (gene copies/100 mL)
Sabadell SP 1 secondary effluent	3.8×10^{4}–3.3×10^{5} (100%)	6×10^{3}–1.8×10^{4} (100%)	1.3×10^{4}–2.2×10^{4} (100%)	9×10^{-2}–6.5 (100%)	0	0–1.7×10^{2} (66%)[B]
SP 2a river background	2.1×10^{3}–8.9×10^{3} (100%)	4.2×10^{2}–3.4×10^{3} (100%)	1.2×10^{4}–1.4×10^{4} (100%)	10^{-2}–10^{-1} (100%)	0	0–3.9×10^{2} (33%)
SP 2 river water after effluent discharge (injectant)	2.2×10^{3}–8.4×10^{4} (100%)	2×10^{2}–1.3×10^{4} (100%)	7.9×10^{3}–9.7×10^{4} (100%)	0–1.1×10^{-1} (66%)	0	0–2.1×10^{3} (33%)
SP 3 groundwater after river infiltration (recovered water)	1.8–2.6×10 (100%)*	2.6×10^{-1}–7 (100%)*	9×10^{-1}–1.6 (100%)*	0–10^{-2} (33%)	0	0–4.4×10^{2} (33%)
SP 4 irrigation water from the sprinklers	0–7 (66%)*	2.5×10^{-1}–1.8×10 (100%)*	0–5.5×10^{-1} (66%)*	0	0	0–1.2×10^{2} (33%)

Levantesi et al., 2010

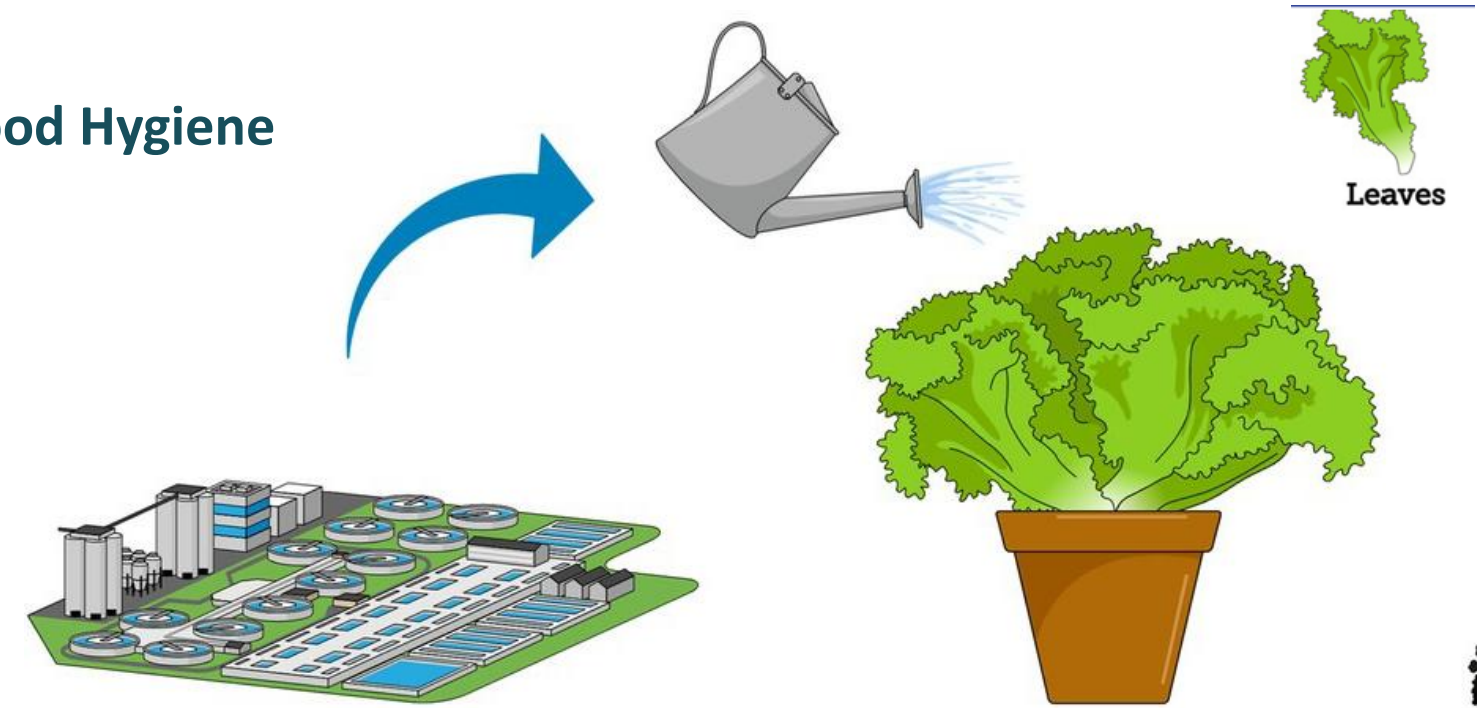
Wastewater treatments

	E. coli (CFU/100 mL)[A]	Enterococci (CFU/100 mL)	Somatic coliphages (PFU/100 mL)	*Giardia* (cysts/L)	*Cryptosporidium* (oocyst/L)	Helminth (eggs/20 L)	*Salmonella* spp (gene copies/100 mL)
Torreele/Wulpen							
SP 1 wastewater	2.4×10^5–3.6×10^6 (100%)	2.4×10^5–1.5×10^6 (100%)	4.8×10^4–2.5×10^6 (100%)	2.9×10^2–7.1×10^2 (100%)	0–1.6 (33%)	0–2 (66%)	0
SP 2 secondary effluent	10^4–8.7×10^4 (100%)	3.2×10^3–8.7×10^4 (100%)	1.2×10^4–5.3×10^4 (100%)	2.6×10^{-1}–2.8×10 (100%)	0–1.7×10^{-1} (66%)	0	0
SP 3 ultrafiltration permeate	0	0	0–2.6×10^2 (66%)	0	0	nd	0
SP 4 infiltration pond (injectant)	0–3.5×10^2 (66%)	0–5.9×10 (33%)	0–4×10 (66%)	0–6×10^{-2} (33%)	0	0–0.4[C] (33%)	0
SP 5 groundwater after SAT (recovered water)	0	0	0–10 (66%)	0	0	0	0
SP 6 UV treated groundwater	0	0	0–1	0	0	nd	0

Ultrafiltration and Reverse Osmosis

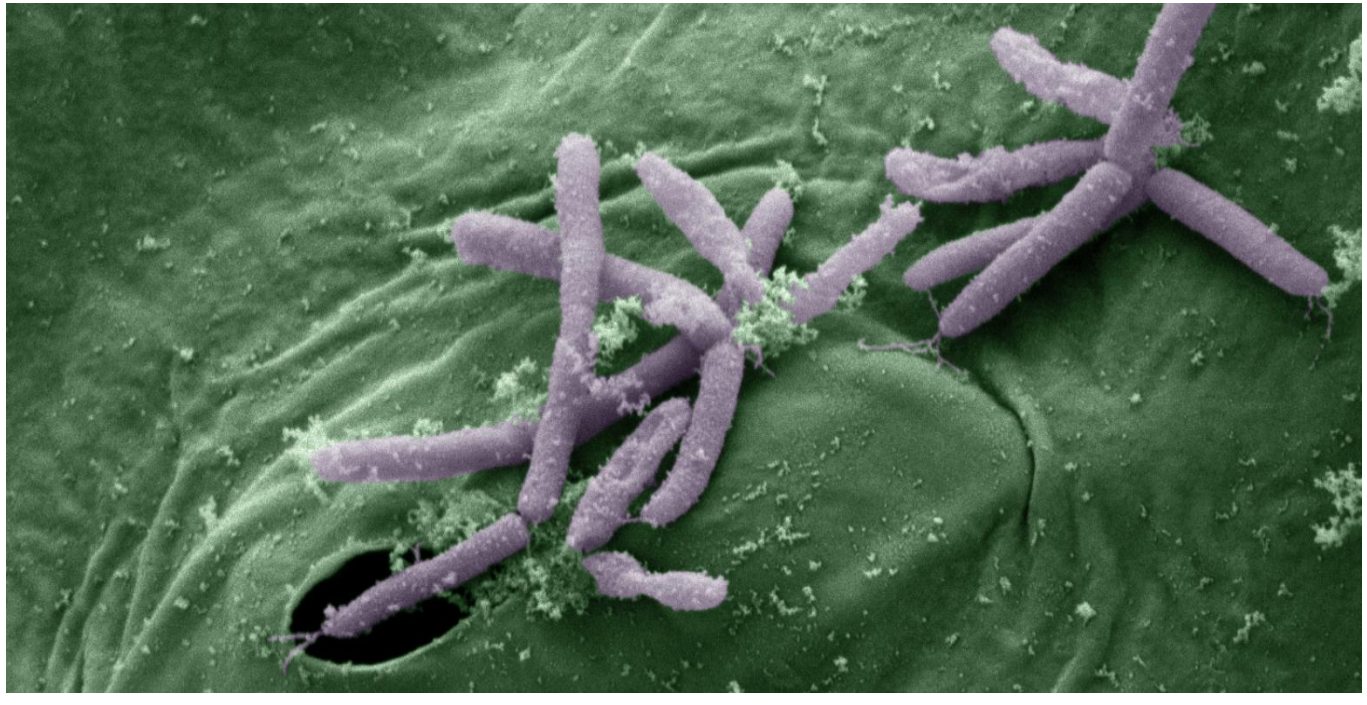
Levantesi et al., 2010

Food Hygiene



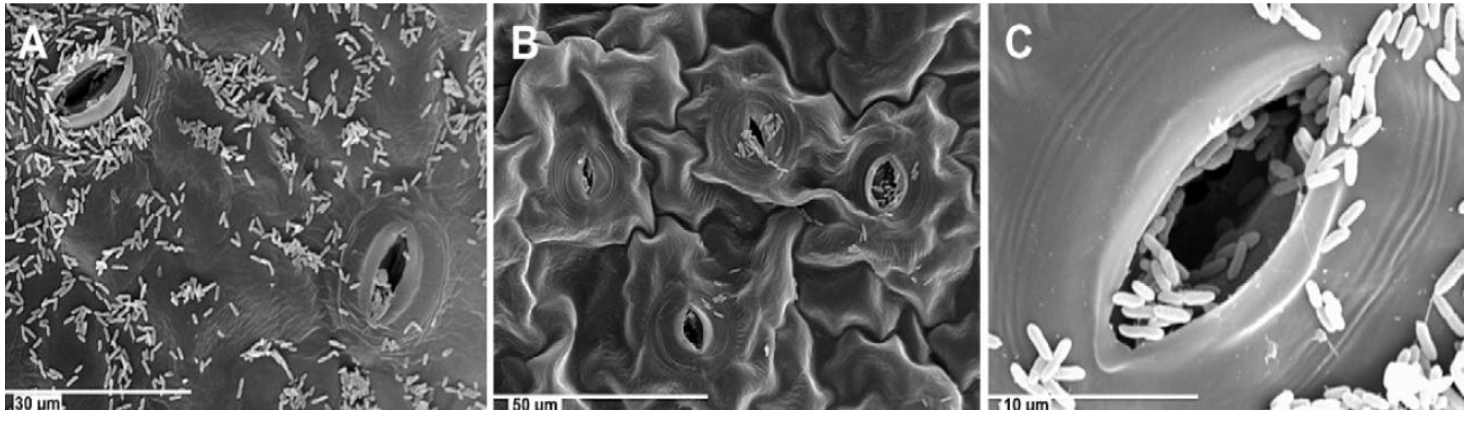
(10) Health standards in relation to food hygiene for agricultural products irrigated with reclaimed water can be achieved only if quality requirements for reclaimed water intended for agricultural irrigation do not differ significantly between the Member States. Harmonisation of requirements would also contribute to the efficient functioning of the internal market in relation to such products. It is therefore appropriate to introduce minimum levels of harmonisation by setting minimum requirements for water quality and monitoring. Those minimum requirements should consist of minimum parameters for reclaimed water that are based on the technical reports of the Commission's Joint Research Centre and reflect international standards on water reuse, and other stricter or additional quality requirements imposed, if necessary, by competent authorities together with any relevant preventive measures.

Front. Microbiol., 20 May 2021 | https://doi.org/10.3389/fmicb.2021.66004



Pseudomonas syringae on a leaf surface. Image by J. Kremer and Sheng Yang He

Food Hygiene is a key aspect of the current legislation



More than 250 ill in UK E. coli outbreak linked to salad

By News Desk on December 7, 2022

NEW EUROPEAN LEGISLATION

L 177/32 EN Official Journal of the European Union 5.6.2020

REGULATION (EU) 2020/741 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 25 May 2020

on minimum requirements for water reuse

Comes into force: 26th June 2023




Which are the key aspects of the New Legislation?

Minimum requirements of water

Table 1 – Classes of reclaimed water quality and permitted agricultural use and irrigation method

Minimum reclaimed water quality class	Crop category (*)	Irrigation method
A	All food crops consumed raw where the edible part is in direct contact with reclaimed water and root crops consumed raw	All irrigation methods
B	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water, processed food crops and non-food crops including crops used to feed milk- or meat-producing animals	All irrigation methods
C	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water, processed food crops and non-food crops including crops used to feed milk- or meat-producing animals	Drip irrigation (**) or other irrigation method that avoids direct contact with the edible part of the crop

Which are the key aspects of the New Legislation?

Minimum requirements of water

Table 2 – Reclaimed water quality requirements for agricultural irrigation

Reclaimed water quality class	Indicative technology target	Quality requirements				
		E. coli (number/100 ml)	BOD_5 (mg/l)	TSS (mg/l)	Turbidity (NTU)	Other
A	Secondary treatment, filtration, and disinfection	≤ 10	≤ 10	≤ 10	≤ 5	*Legionella* spp.: < 1 000 cfu/l where there is a risk of aerosolisation Intestinal nematodes (helminth eggs): ≤ 1 egg/l for irrigation of pastures or forage
B	Secondary treatment, and disinfection	≤ 100	In accordance with Directive 91/271/EEC (Annex I, Table 1)	In accordance with Directive 91/271/EEC (Annex I, Table 1)	-	
C	Secondary treatment, and disinfection	≤ 1 000			-	
D	Secondary treatment, and disinfection	≤ 10 000			-	

Which are the key aspects of the New Legislation?

Minimum requirements of water

Table 3 – Minimum frequencies for routine monitoring of reclaimed water for agricultural irrigation

	Minimum monitoring frequencies					
Reclaimed water quality class	*E. coli*	BOD_5	TSS	Turbidity	*Legionella* spp. (when applicable)	Intestinal nematodes (when applicable)
A	Once a week	Once a week	Once a week	Continuous	Twice a month	Twice a month or as determined by the reclamation facility operator according to the number of eggs in waste water entering the reclamation facility
B	Once a week	In accordance with Directive 91/271/EEC (Annex I, Section D)	In accordance with Directive 91/271/EEC (Annex I, Section D)	-		
C	Twice a month			-		
D	Twice a month			-		

Which are the key aspects of the New Legislation?

Minimum requirements of water

Table 4 – Validation monitoring of reclaimed water for agricultural irrigation

Reclaimed water quality class	Indicator microorganisms (*)	Performance targets for the treatment chain (log_{10} reduction)
A	*E. coli*	≥ 5,0
	Total coliphages/F-specific coliphages/somatic coliphages/coliphages (**)	≥ 6,0
	Clostridium perfringens spores/spore-forming sulfate-reducing bacteria (***)	≥ 4,0 (in case of *Clostridium perfringens* spores) ≥ 5,0 (in case of spore-forming sulfate-reducing bacteria)

(*) The reference pathogens *Campylobacter*, Rotavirus and *Cryptosporidium* may also be used for validation monitoring purposes instead of the proposed indicator microorganisms. The following log_{10} reduction performance targets shall then apply: *Campylobacter* (≥ 5,0), Rotavirus (≥ 6,0) and *Cryptosporidium* (≥ 5,0).

(**) Total coliphages is selected as the most appropriate viral indicator. However, if analysis of total coliphages is not feasible, at least one of them (F-specific or somatic coliphages) shall be analysed.

(***) *Clostridium perfringens* spores is selected as the most appropriate protozoa indicator. However, spore-forming sulfate-reducing bacteria are an alternative if the concentration of *Clostridium perfringens* spores does not make it possible to validate the requested log_{10} removal.

How is this translated in each country?

Interpretation

MINISTERIO
PARA LA TRANSICIÓN ECOLÓGICA
Y EL RETO DEMOGRÁFICO

SECRETARIA DE ESTADO
DE MEDIO AMBIENTE

INSTRUCCIÓN DEL SECRETARIO DE ESTADO DE MEDIO AMBIENTE PARA LA APLICACIÓN DEL RÉGIMEN TRANSITORIO EN RELACION CON LA NORMATIVA SOBRE REUTILIZACIÓN DE AGUAS RESIDUALES TRATADAS PARA EL USO AGRÍCOLA.

El Real Decreto 1620/2007, de 7 de diciembre, por el que se establece el régimen jurídico de la reutilización de las aguas depuradas supuso un hito en el fomento de la reutilización de las aguas residuales en España. El decreto estableció la normativa básica en la materia fijando los requisitos administrativos para obtener el título habilitante, así como los usos permitidos y criterios de calidad exigidos.

Por primera vez, una norma regulaba el uso del agua regenerada en 5 ámbitos distintos: usos urbanos, agrícolas, industriales, recreativos y ambientales. Posteriormente, en el año 2010, se aprueba la Guía para la Aplicación del Real Decreto 1620/2007, al objeto de orientar el cumplimiento del mismo y garantizar los niveles de calidad y el buen uso de las aguas regeneradas.

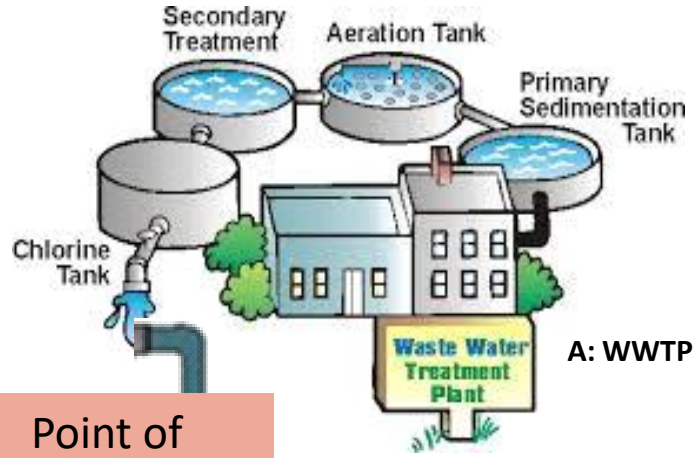
Esta normativa española ha tenido su reflejo en la normativa europea, de forma que, parte de sus objetivos e incluso de su articulado ha sido recogido en el Reglamento (UE) 2020/741 del Parlamento Europeo y del Consejo del 25 de mayo de 2020, relativo a los requisitos mínimos para la reutilización del agua urbana depurada en usos agrícolas, siendo los hitos más destacados del Reglamento:

- Que los requisitos de calidad de las aguas regeneradas destinadas al riego agrícola se armonicen entre los Estados miembros, contribuyendo así a su fomento (art.1).
- La elaboración del Plan de gestión del riesgo del agua regenerada para garantizar que las aguas regeneradas se usen y gestionen de forma segura y que no existe riesgo para el medio ambiente, ni para la salud humana o la sanidad animal (art. 5 y Anexo II), aumentando así la confianza de la población en esta práctica.
- La producción y el suministro de aguas regeneradas destinadas al riego agrícola

POINT OF COMPLIANCE

(15) In some cases, reclamation facility operators still transport and store reclaimed water beyond the outlet of the reclamation facility, prior to delivering it to the next actors in the chain, such as the reclaimed water distribution operator, the reclaimed water storage operator or the end-user. It is necessary to define the point of compliance, to clarify where the responsibility of the reclamation facility operator ends and where the responsibility of the next actor in the chain starts.

WWTP Operators



A: WWTP Inlet

Point of compliance?

B: WWTP Outlet

DISTRIBUTION

C1: Reservoir WWTP

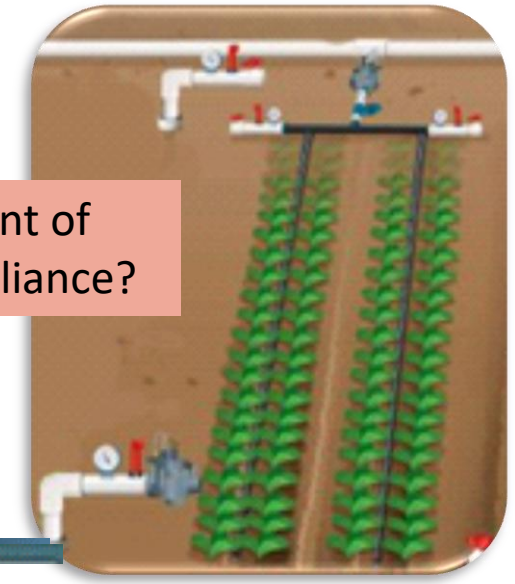
Point of compliance?

C2: Reservoir Grower

FINAL USER

Point of compliance?

D: Irrigation



E: Crop

POINT OF COMPLIANCE

(18) Cooperation and interaction between the various parties involved in the water reclamation process should be a precondition for setting up reclamation treatment procedures in accordance with the requirements for specific uses, and in order to be able to plan the supply of reclaimed water in line with demand from end-users.

(19) In order to effectively protect the environment and human and animal health, reclamation facility operators should be primarily responsible for the quality of reclaimed water at the point of compliance. For the purposes of compliance with the minimum requirements laid down under this Regulation and with any additional conditions set by the competent authority, reclamation facility operators should monitor the quality of reclaimed water. It is therefore appropriate to establish the minimum requirements for monitoring, consisting of the frequencies of the routine monitoring and the timing and performance targets for validation monitoring. Certain requirements for routine monitoring are provided for in Directive 91/271/EEC.

Operators

Point of Compliance

Growers

A: WWTP Inlet

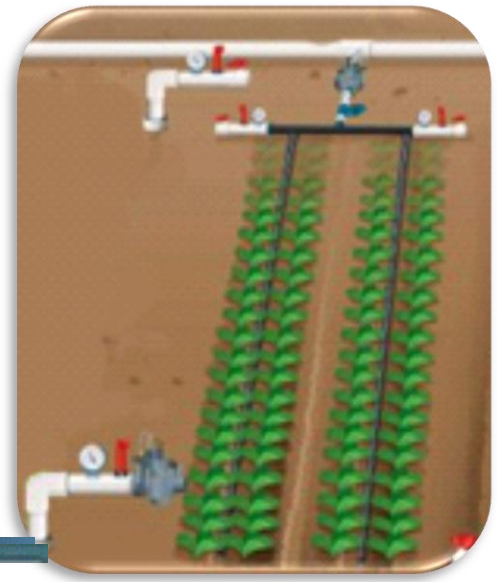
B: WWTP Outlet

Distribution

C1: Reservoir WWTP

C2: Reservoir Grower

D: Irrigation



E: Crop

Point of Compliance

Operators

Point of Compliance

Which guidance we have in Europe?

A: WWTP Inlet

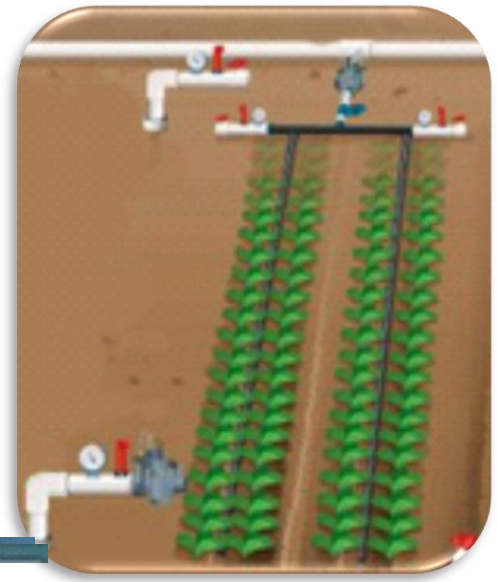
B: WWTP Outlet

Distribution system

Reservoir WWTP

C2: Reservoir Grower

D: Irrigation



E: Crop

Growers

Reclaimed water quality class	Indicative technology target	*E. coli* (number/100 ml)
A	Secondary treatment, filtration, and disinfection	≤ 10
B	Secondary treatment, and disinfection	≤ 100
C	Secondary treatment, and disinfection	≤ 1 000
D	Secondary treatment, and disinfection	≤ 10 000

Which guidance we have in Europe?

FOOD HYGIENE

(28) Regulation (EC) No 852/2004 lays down general rules for food business operators and covers the production, processing, distribution and placing on the market of food intended for human consumption. That Regulation addresses the health quality of food and one of its main principles is that the primary responsibility for food safety is borne by the food business operator. That Regulation is also supported by detailed guidance. In this regard, the Commission notice on guidance document on addressing microbiological risks in fresh fruits and vegetables at primary production through good hygiene is of particular relevance. The minimum requirements for reclaimed water laid down in this Regulation do not preclude food business operators from obtaining the water quality required to comply with Regulation (EC) No 852/2004 using, at a subsequent stage, several water treatment options alone or in combination with non-treatment options.

Which guidance we have in Europe?

PRIMARY PRODUCTION

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C 163

Edición en lengua española

Comunicaciones e informaciones

60.º año
23 de mayo de 2017

NOTICES FROM EUROPEAN UNION INSTITUTIONS, BODIES, OFFICES AND AGENCIES

Commission notice on guidance document on addressing microbiological risks in fresh fruits and vegetables at primary production through good hygiene

(2017/C 163/01)

CEBAS-CSIC
Centro de Edafología y Biología Aplicada del Segura

IMPEL
European Union Network for the Implementation and Enforcement of Environmental Law

Microbiology and quality of fruit and vegetables

efsa
European Food Safety Authority

Risk Ranking

efsa European Food Safety Authority EFSA Journal 2014;12(12):3937

SCIENTIFIC OPINION

Scientific Opinion on the risk posed by pathogens in food of non-animal origin. Part 2 (*Salmonella, Yersinia, Shigella* and Norovirus in bulb and stem vegetables, and carrots)[1]

efsa European Food Safety Authority EFSA Journal 2014;12(10):3831

SCIENTIFIC OPINION

Scientific Opinion on the risk posed by pathogens in food of non-animal origin. Part 2 (*Salmonella* in melons)[1]

efsa European Food Safety Authority EFSA Journal 2014;12(10):3832

SCIENTIFIC OPINION

Scientific Opinion on the risk posed by pathogens in food of non-animal origin. Part 2 (*Salmonella* and Norovirus in tomatoes)[1]

efsa uropean Food Safety Authority EFSA Journal 2011;9(11):2424

SCIENTIFIC OPINION

Scientific Opinion on the risk posed by Shiga toxin-producing *Escherichia coli* (STEC) and other pathogenic bacteria in seeds and sprouted seeds [1]

EFSA Panel on Biological Hazards (BIOHAZ)[2, 3]

efsa European Food Safety Authority EFSA Journal 2014;12(6):3706

SCIENTIFIC OPINION

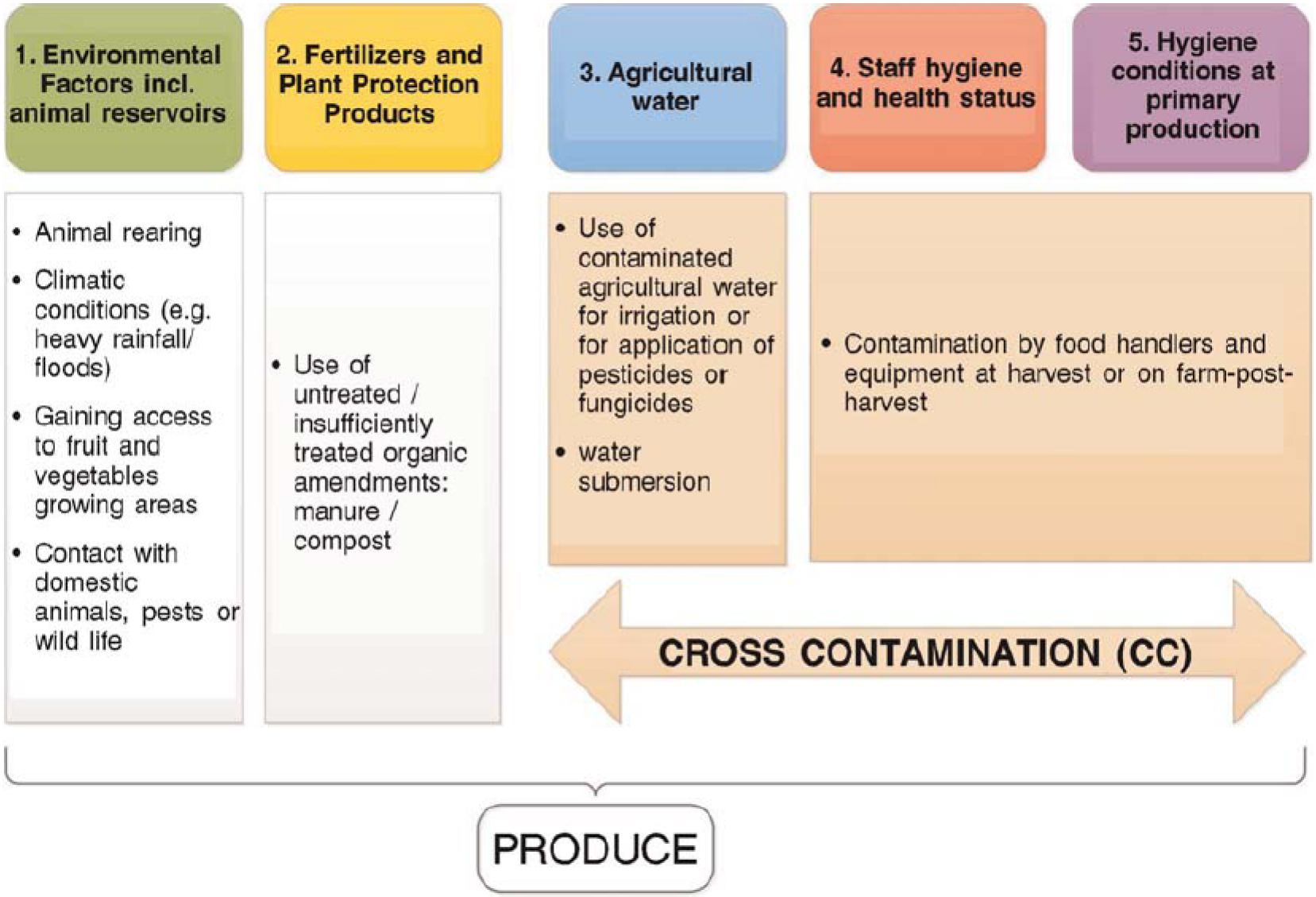
Scientific Opinion on the risk posed by pathogens in food of non-animal origin. Part 2 (*Salmonella* and Norovirus in berries)[1]

EFSA Panel on Biological Hazards (BIOHAZ)[2, 3]

efsa European Food Safety Authority EFSA Journal 2014;12(3):3600

SCIENTIFIC OPINION

Scientific Opinion on the risk posed by pathogens in food of non-animal origin. Part 2 (*Salmonella* and Norovirus in leafy greens eaten raw as salads)[1]


1. Environmental Factors incl. animal reservoirs
2. Fertilizers and Plant Protection Products
3. Agricultural water
4. Staff hygiene and health status
5. Hygiene conditions at primary production
• Animal rearing
• Climatic conditions (e.g. heavy rainfall/ floods)
• Gaining access to fruit and vegetables growing areas
• Contact with domestic animals, pests or wild life
• Use of untreated / insufficiently treated organic amendments: manure / compost
• Use of contaminated agricultural water for irrigation or for application of pesticides or fungicides
• water submersion
• Contamination by food handlers and equipment at harvest or on farm-post-harvest
CROSS CONTAMINATION (CC)
PRODUCE

Intended use of the water	Source of water (1)						Indicator of faecal contamination: *E. coli* (2)
	Untreated surface water/open water channels (3)	Untreated ground water collected from wells (4)	Untreated Rain water	Treated (5) sewage/surface/waste water/water reuse	Disinfected water (6)	Municipal water	
PRE-HARVEST and HARVEST							
Irrigation of FFVs likely to be eaten uncooked (i.e. ready-to-eat FFV) (irrigation water comes into direct contact with the edible portion of the FFV) Dilution or application of pesticide, fertiliser or agrochemicals and cleaning equipment for ready-to-eat FFV and direct contact.	x	x	▲	•	•	√	100 CFU/100 ml
Irrigation of FFVs likely to be eaten uncooked (i.e. ready-to-eat FFV) (irrigation water does not come into direct contact with the edible portion of the FFV) Dilution or application of pesticide, fertiliser or agrochemicals and cleaning equipment for ready-to-eat FFV and no direct contact	x	x	▲	•	•	√	1 000 CFU/100 ml (7)
Irrigation of FFVs likely to be eaten cooked (irrigation water comes into direct contact with the edible portion of the FFV). Dilution or application of pesticide, fertiliser or agrochemicals and cleaning equipment used in this FFV direct contact).	▲	▲	•	•	•	√	1 000 CFU/100 ml
Irrigation of FFVs likely to be eaten cooked (irrigation water does not come into direct contact with the edible portion of the FFV). Dilution or application of pesticide, fertiliser or agrochemicals and cleaning equipment used in this FFV (no direct contact)	•	•	√	√	√	√	10 000 CFU/100 ml
POST-HARVEST							
Post-harvest cooling and post-harvest transport for non-ready-to-eat FFVs. Water used for first washing of products in case of ready-to-eat products. Cleaning equipment and surfaces where the products are handled.	x	x	▲	•	•	√	100 CFU/100 ml

Uso previsto del agua	Indicador de contaminación fecal: *E. coli* (2)
Riego de FHF con probabilidad de consumo sin cocinar (es decir, FHF listas para el consumo) (el agua de riego entra en contacto directo con la parte comestible de las FHF) Dilución o aplicación de plaguicidas, fertilizantes o productos agroquímicos y equipo de limpieza para FHF listas para el consumo y contacto directo.	100 ufc/100 ml

Clase de calidad de las aguas regeneradas	Tratamiento indicativo	*E. coli* (número/100 ml)
A	Tratamiento secundario, filtración y desinfección	≤ 10
B	Tratamiento secundario y desinfección	≤ 100
C	Tratamiento secundario y desinfección	≤ 1 000
D	Tratamiento secundario y desinfección	≤ 10 000

23.5.2017 EN Official Journal of the European Union C 163/1

IV

(Notices)

NOTICES FROM EUROPEAN UNION INSTITUTIONS, BODIES, OFFICES AND AGENCIES

Commission notice on guidance document on addressing microbiological risks in fresh fruits and vegetables at primary production through good hygiene

(2017/C 163/01)

EUROPEAN COMMISSION

Official Journal of the European Union L 177

English edition Legislation Volume 63 5 June 2020

¿?

WHO 2016

¿Which is the intensity of the treatment needed in wastewater to comply with the health target of 10^{-6} DALY pppy?

A5 Case-study 5: Guidelines for water recycling – Setting health-based performance targets and safe use of wastewater in Australia (NWQMS, 2006)

REGLAMENTO (UE) 2020/741 DEL PARLAMENTO EUROPEO Y DEL CONSEJO

de 25 de mayo de 2020

relativo a los requisitos mínimos para la reutilización del agua

Table 4 – Validation monitoring of reclaimed water for agricultural irrigation

Reclaimed water quality class	Indicator microorganisms (*)	Performance targets for the treatment chain (log_{10} reduction)
A	*E. coli*	≥ 5,0
	Total coliphages/F-specific coliphages/somatic coliphages/coliphages (**)	≥ 6,0
	Clostridium perfringens spores/spore-forming sulfate-reducing bacteria (***)	≥ 4,0 (in case of *Clostridium perfringens* spores) ≥ 5,0 (in case of spore-forming sulfate-reducing bacteria)

(*) The reference pathogens *Campylobacter*, Rotavirus and *Cryptosporidium* may also be used for validation monitoring purposes instead of the proposed indicator microorganisms. The following log_{10} reduction performance targets shall then apply: *Campylobacter* (≥ 5,0), Rotavirus (≥ 6,0) and *Cryptosporidium* (≥ 5,0).

(**) Total coliphages is selected as the most appropriate viral indicator. However, if analysis of total coliphages is not feasible, at least one of them (F-specific or somatic coliphages) shall be analysed.

(***) *Clostridium perfringens* spores is selected as the most appropriate protozoa indicator. However, spore-forming sulfate-reducing bacteria are an alternative if the concentration of *Clostridium perfringens* spores does not make it possible to validate the requested log_{10} removal.

After application of prventive measures the residual risk (treatment) should comply with the tolerance level of ***10^{-6} DALY*** pppy

$$log_{10}reducción = log_{10}\left(\frac{C_0 \times L \times N}{DALYd}\right)$$

Donde: C_0 residual concentration in the water
L ingested amount (liters)
N anual exposure frequency
DALYd equivalente dose DALY 10^{-6}
1.6×10^{-2} *Cryptosporidium*,
2.5×10^{-3} rotavirus,
3.8×10^{-2} *Campylobacter*
Incluye dosis-respuesta y ratio de infección a enfermedad

10^{-6} DALY pppy
The sum of the years of life lost to due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population
1/1.000.000 years lost

esamur
Entidad de Saneamiento y Depuración de la Región de Murcia

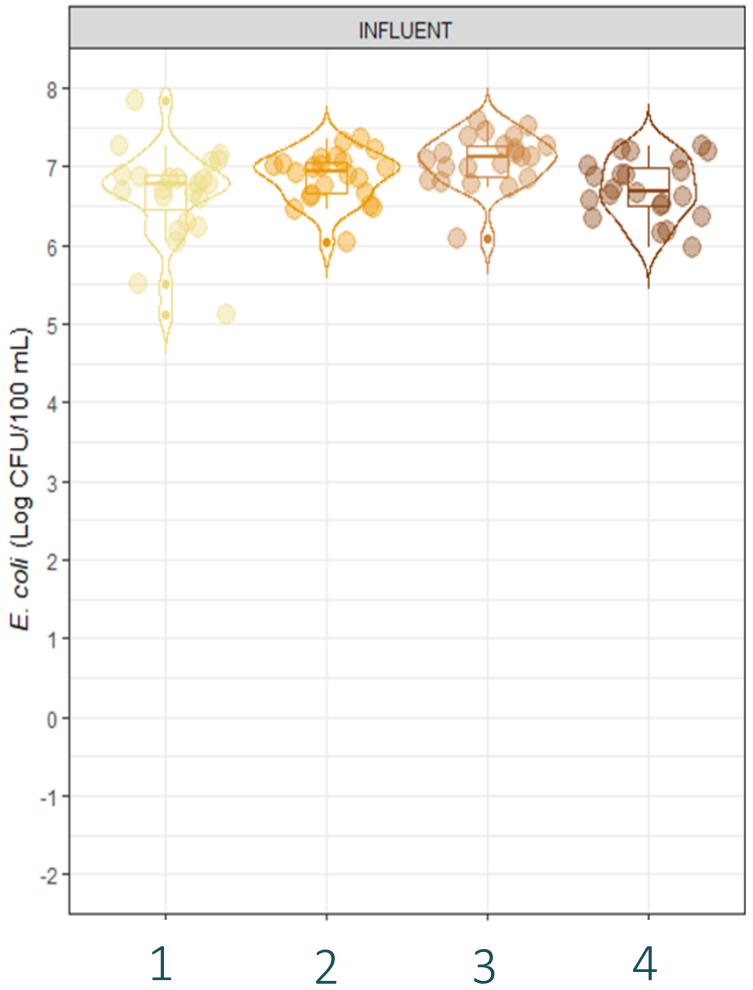


Table 4 – Validation monitoring of reclaimed water for agricultural irrigation

Reclaimed water quality class	Indicator microorganisms (*)	Performance targets for the treatment chain (log_{10} reduction)
A	*E. coli*	≥ 5,0
	Total coliphages/F-specific coliphages/somatic coliphages/coliphages (**)	≥ 6,0
	Clostridium perfringens spores/spore-forming sulfate-reducing bacteria (***)	≥ 4,0 (in case of *Clostridium perfringens* spores) ≥ 5,0 (in case of spore-forming sulfate-reducing bacteria)

(*) The reference pathogens *Campylobacter*, Rotavirus and *Cryptosporidium* may also be used for validation monitoring purposes instead of the proposed indicator microorganisms. The following log_{10} reduction performance targets shall then apply: *Campylobacter* (≥ 5,0), Rotavirus (≥ 6,0) and *Cryptosporidium* (≥ 5,0).

(**) Total coliphages is selected as the most appropriate viral indicator. However, if analysis of total coliphages is not feasible, at least one of them (F-specific or somatic coliphages) shall be analysed.

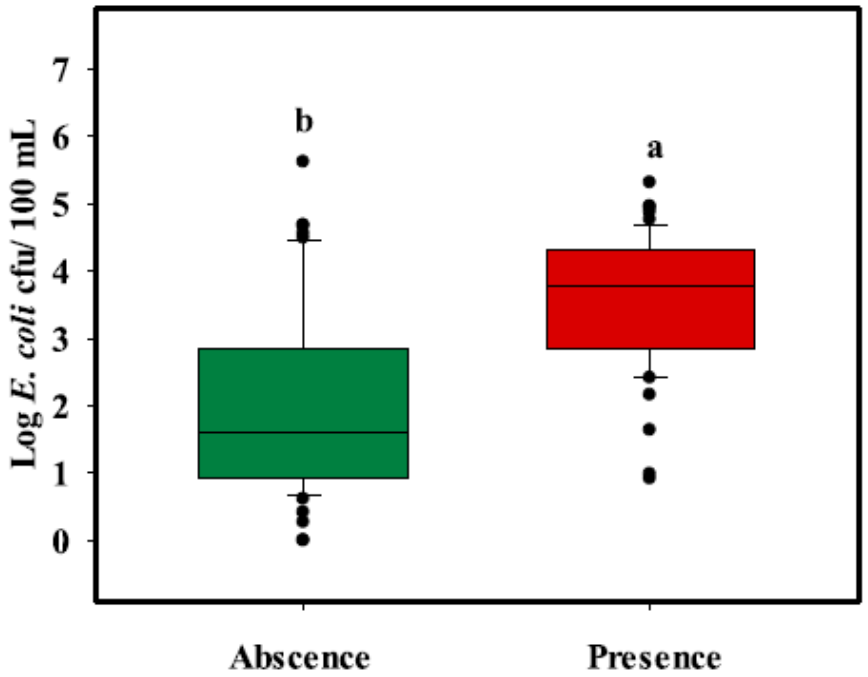
(***) *Clostridium perfringens* spores is selected as the most appropriate protozoa indicator. However, spore-forming sulfate-reducing bacteria are an alternative if the concentration of *Clostridium perfringens* spores does not make it possible to validate the requested log_{10} removal.

Reclaimed water quality class	Indicative technology target	*E. coli* (number/100 ml)
A	Secondary treatment, filtration, and disinfection	≤ 10
B	Secondary treatment, and disinfection	≤ 100
C	Secondary treatment, and disinfection	≤ 1 000
D	Secondary treatment, and disinfection	≤ 10 000

Contents lists available at ScienceDirect
Water Research
journal homepage: www.elsevier.com/locate/watres

Correlation between *E. coli* levels and the presence of foodborne pathogens in surface irrigation water: Establishment of a sampling program

Pilar Truchado [a], Natalia Hernandez [a], Maria I. Gil [a], Renata Ivanek [b], Ana Allende [a, *]



23.5.2017 EN Official Journal of the European Union C 163/1

IV

(Notices)

NOTICES FROM EUROPEAN UNION INSTITUTIONS, BODIES, OFFICES AND AGENCIES

Commission notice on guidance document on addressing microbiological risks in fresh fruits and vegetables at primary production through good hygiene

(2017/C 163/01)

Uso previsto del agua	Indicador de contaminación fecal: *E. coli* (2)
Riego de FHF con probabilidad de consumo sin cocinar (es decir, FHF listas para el consumo) (el agua de riego entra en contacto directo con la parte comestible de las FHF)	100 ufc/100 ml
Dilución o aplicación de plaguicidas, fertilizantes o productos agroquímicos y equipo de limpieza para FHF listas para el consumo y contacto directo.	

(22) In order to ensure optimal reuse of urban waste water resources, end-users should receive training to ensure that they use water of the appropriate reclaimed water quality class. Where the destination of a specific type of crop is unknown or where it has multiple destinations, reclaimed water of the highest quality class should be used, unless appropriate barriers are applied which enable the required quality to be achieved.

Environment

(B) Conditions relating to the additional requirements

6. Consideration of requirements for water quality and monitoring that are additional to or stricter than those specified in Section 2 of Annex I, or both, when necessary and appropriate to ensure adequate protection of the environment and of human and animal health, in particular when there is clear scientific evidence that the risk originates from reclaimed water and not from other sources.

Depending on the outcome of the risk assessment referred to in point 5, such additional requirements may in particular concern:

(a) heavy metals;

(b) pesticides;

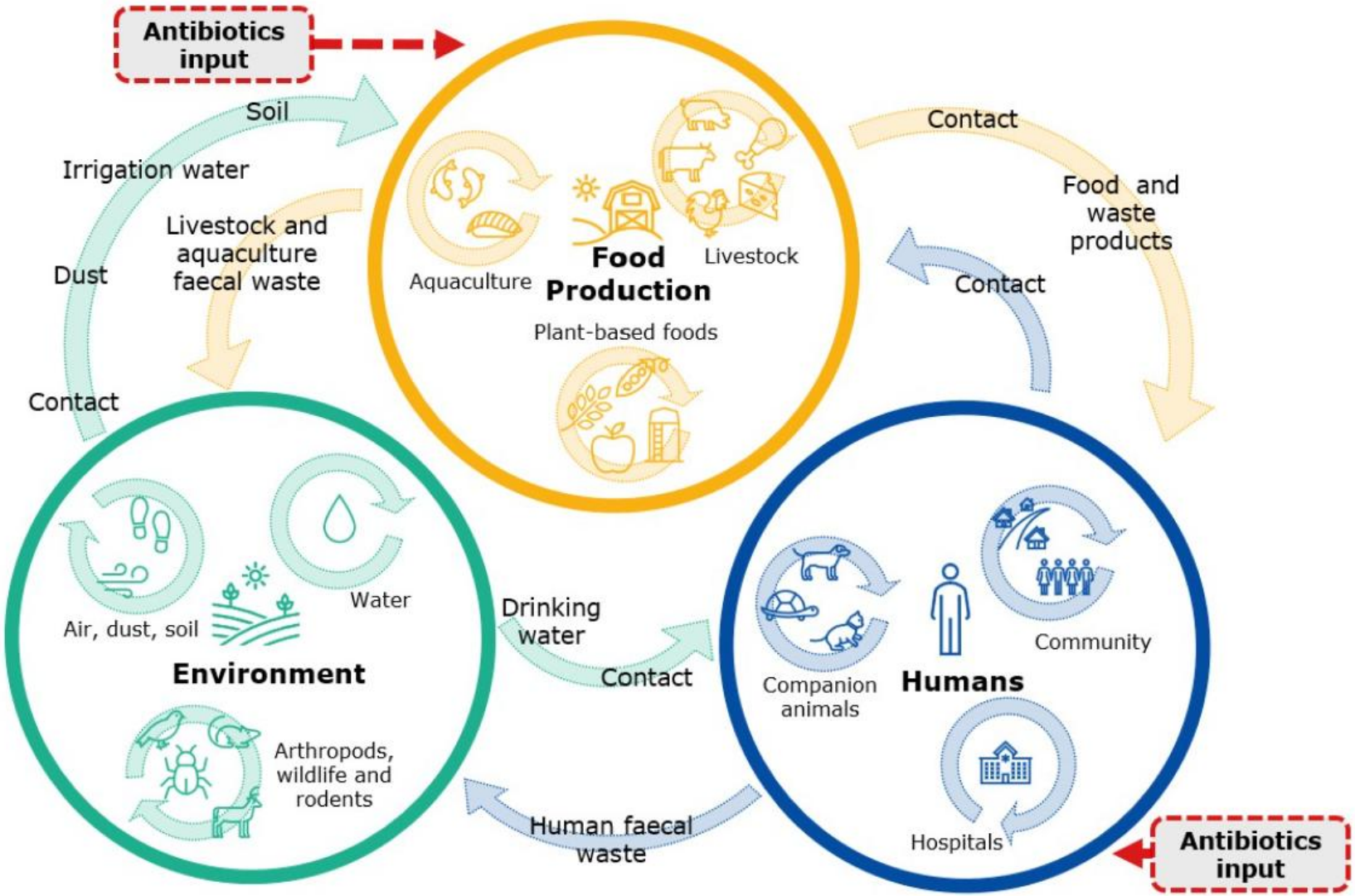
(c) disinfection by-products;

(d) pharmaceuticals;

(e) other substances of emerging concern, including micro pollutants and micro plastics;

(f) anti-microbial resistance.

efsa
EUROPEAN FOOD SAFETY AUTHORITY



CEBAS-CSIC
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IMPEL
European Union Network for the Implementation and Enforcement of Environmental Law

Mabel Gil
Scientific staff

Pilar Truchado
Scientific staff

- **CEBAS-CSIC Team**
- **Industry collaborators**
- **ESAMUR**
- **Spanish Government**

esamur
Entidad de Saneamiento y Depuración de la Región de Murcia

Plan de Recuperación, Transformación y Resiliencia

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

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European Union Network for the Implementation and Enforcement of Environmental Law

Bucharest Water & Land Conference
(17-18 October 2023)

WATER AND LAND

Benefits and Challenges of the New Regulation of Water Reuse: Case study of Spain

Ana Allende

CEBAS-CSIC
Centro de Edafología y Biología Aplicada del Segura