

Webinar guide for attendees

- This webinar is being recorded!
- The webinar is in English and questions should be submitted in English through the platform
- To communicate with us use the chat boxes

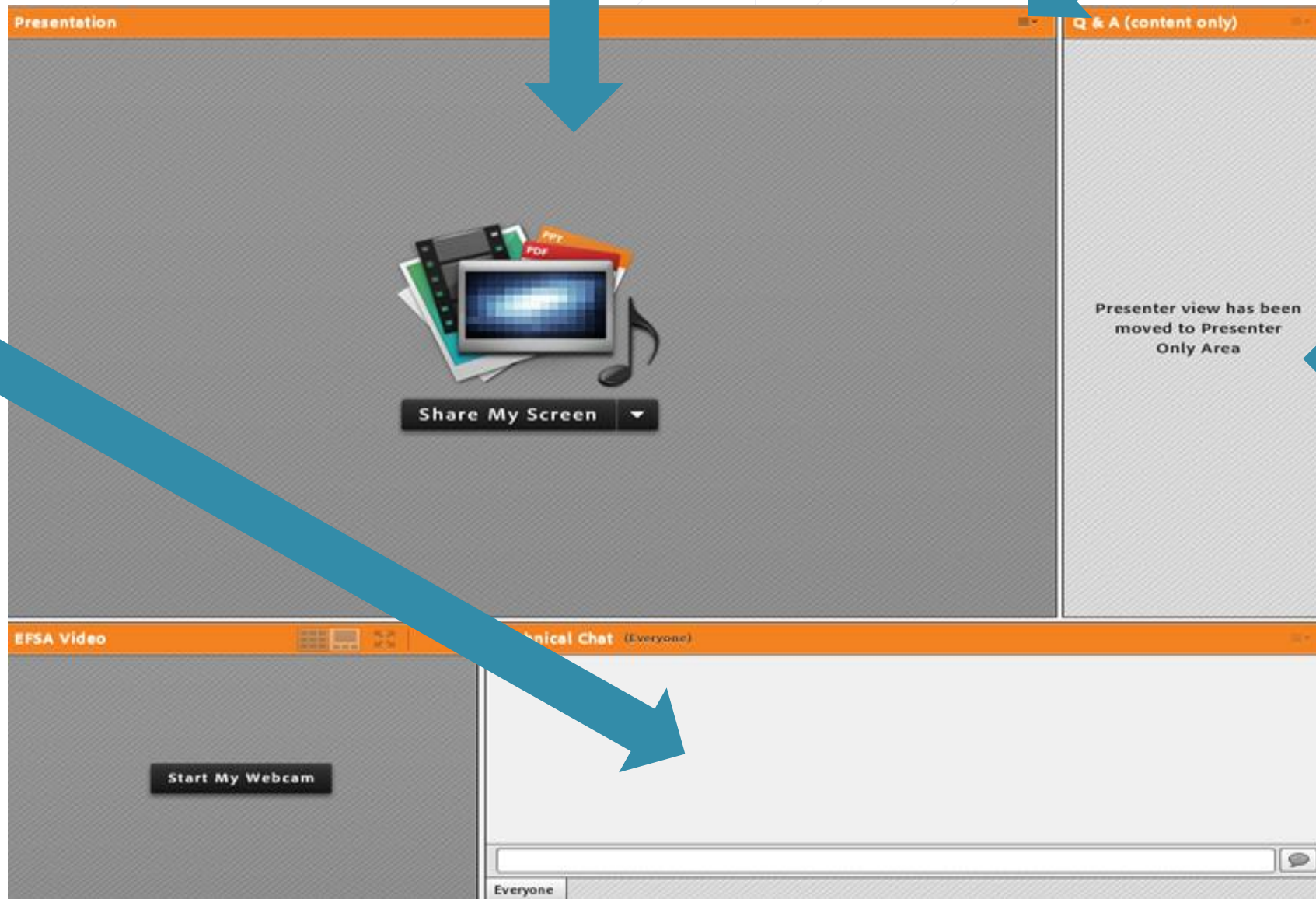


Presentation window

Full screen

Chat box:
For
technical
issues
related
questions

Q&A box:
For any
question
related
to the
topic



21 October 2020



Detect your pests: practical statistical framework for risk-based surveillance

Sybren Vos - Scientific Officer in Plant Health Team - ALPHA Unit

Elena Lázaro - ALPHA Working Group on Pest Surveys

Trusted science for safe food

➤ ***Request from the European Commission***

to facilitate and support the MSs in the planning and execution of their survey activities

➤ ***Context:***

EU regulation towards more prevention, risk-targeting and statistics (EU/2016/2031-EU/2019/2072- EU/2019/1702 – EU/652/2014)

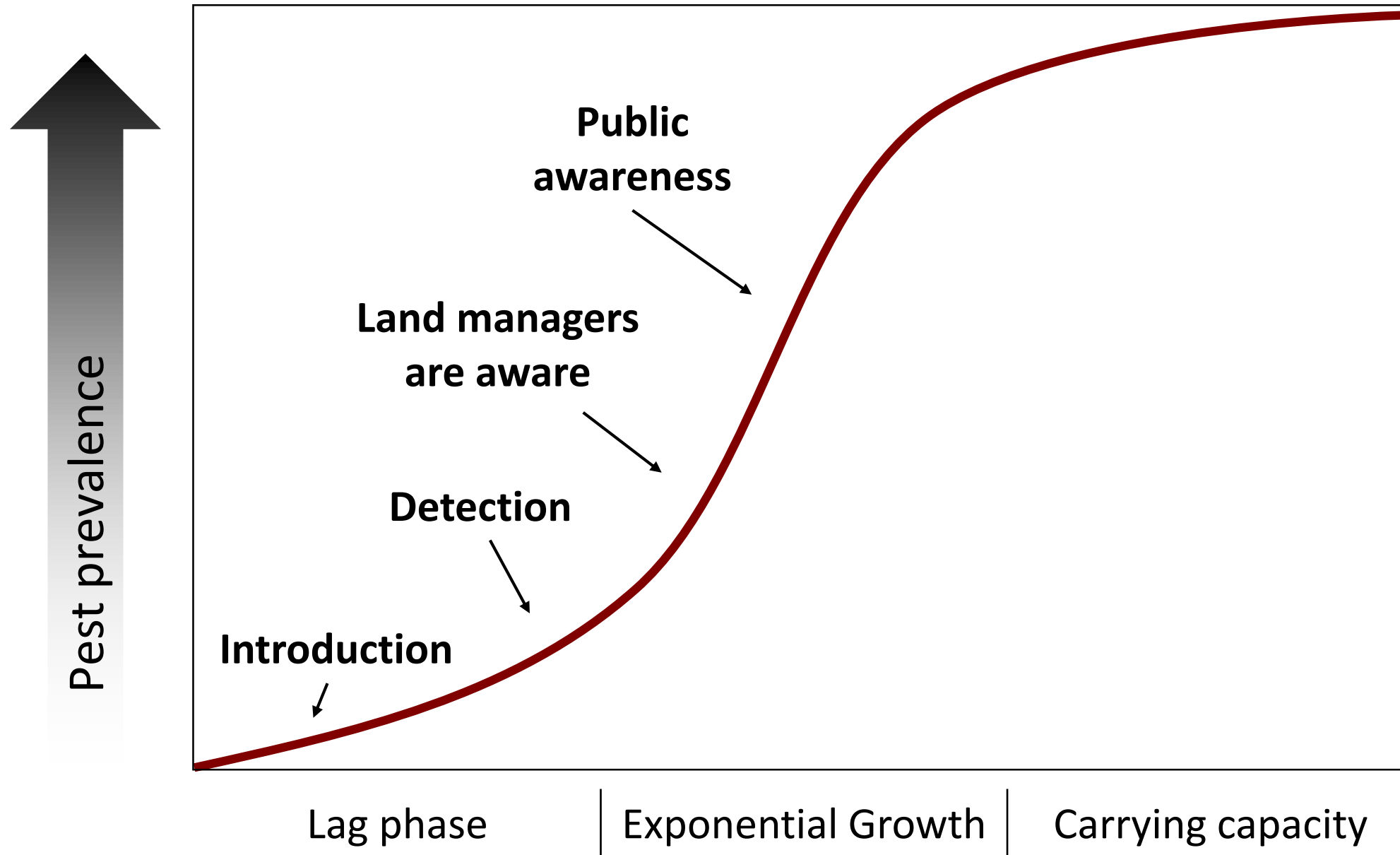
International context IPPC-ISPMs

Instructions: ISPM 6 & ISPM 31

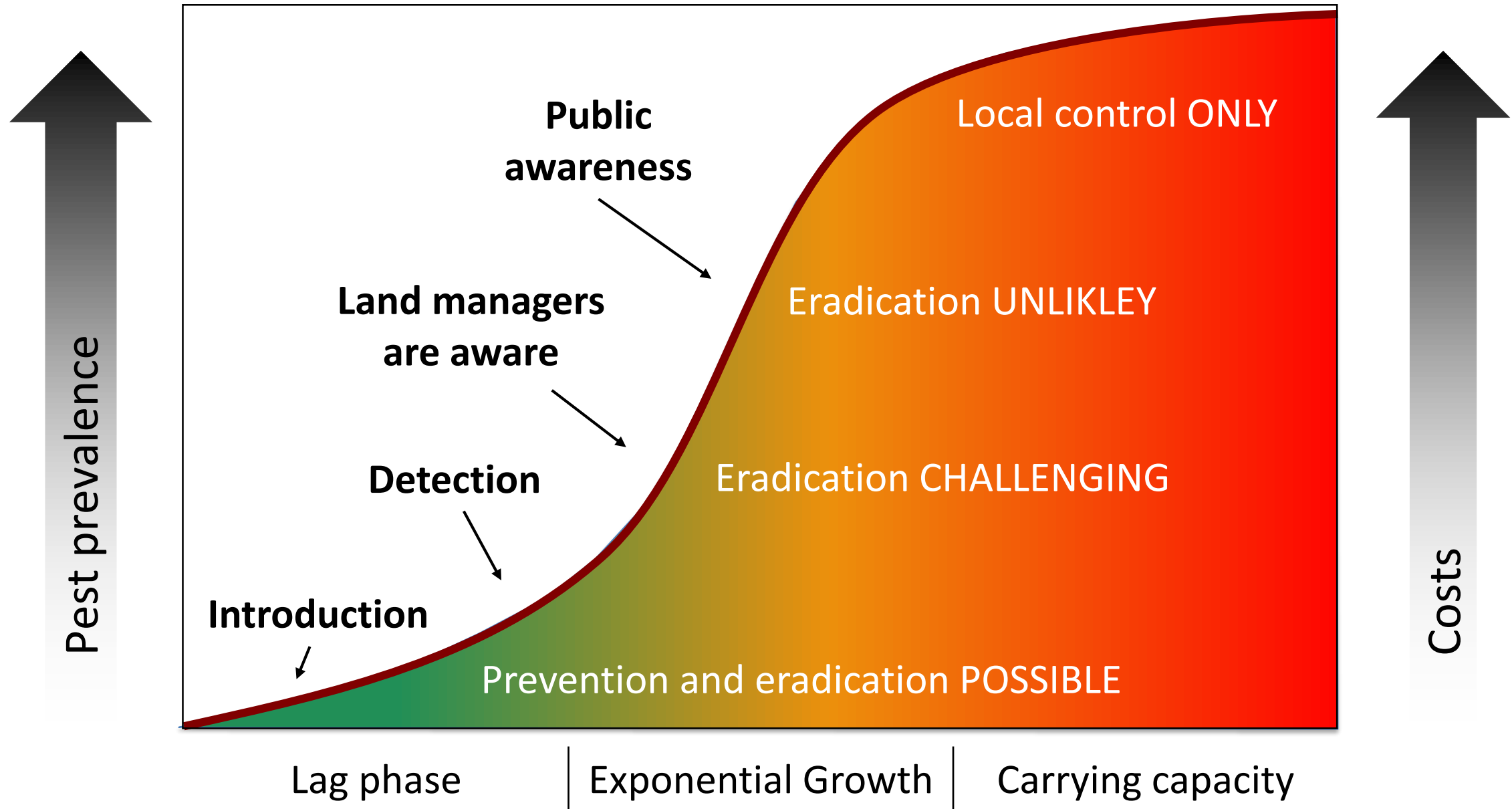
Procedures and protocols: ISPMs 1/4/8/9/10/17/22/26/27/32

➤ ***Detection, delimiting and monitoring surveys***

Quarantine pests



Invasion curve





**From survey preparation
to survey design**



WHAT?

WHERE?

WHEN?

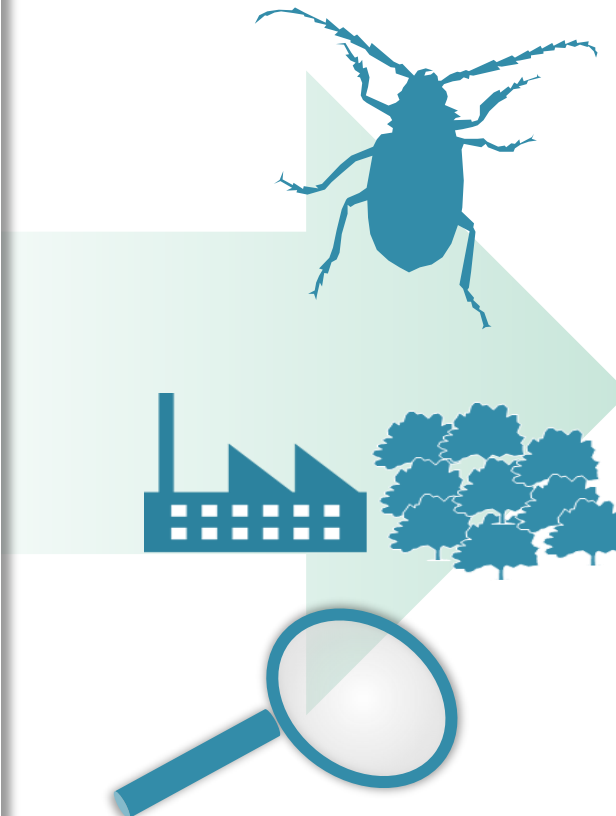
HOW?

HOW MUCH?

Structure of the outputs

Objective of Pest survey cards and Story maps:
guide the surveyor through the gathering of the
relevant information for the survey design

PEST SURVEY CARD	
Abstract.....	1
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1. The pest and its biology	5
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WHAT

WHEN

WHERE

HOW

Survey cards available

43
cards

...63
pests

EFSA journal virtual issue

[https://efsa.onlinelibrary.wiley.com/doi/toc/10.1002/\(ISSN\)1831-4732.toolkit-plant-pest-surveillance](https://efsa.onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)1831-4732.toolkit-plant-pest-surveillance)

- Pilot organisms *Xylella fastidiosa*
Phyllosticta citricarpa
Agilus planipennis
- Citrus pests
- Forest pests
- Potato pests
- Miscellaneous pests



...“Story maps” are available!

29
maps

Story Maps Gallery

<https://efsa.maps.arcgis.com/apps/MinimalGallery/index.html?appid=f91d6e95376f4a5da206eb1815ad1489>

What
is it?

video

Latest update of survey
cards

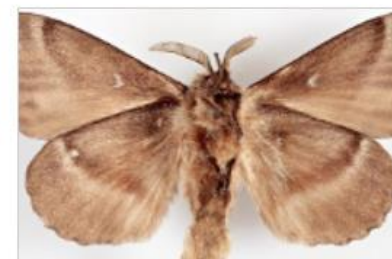
ESRI platform

Online visual format

It's a “pocket” survey card



Story map for survey of
'Candidatus Liberibacter
solanacearum' and its
vectors



Story map for survey of
Dendrolimus sibiricus



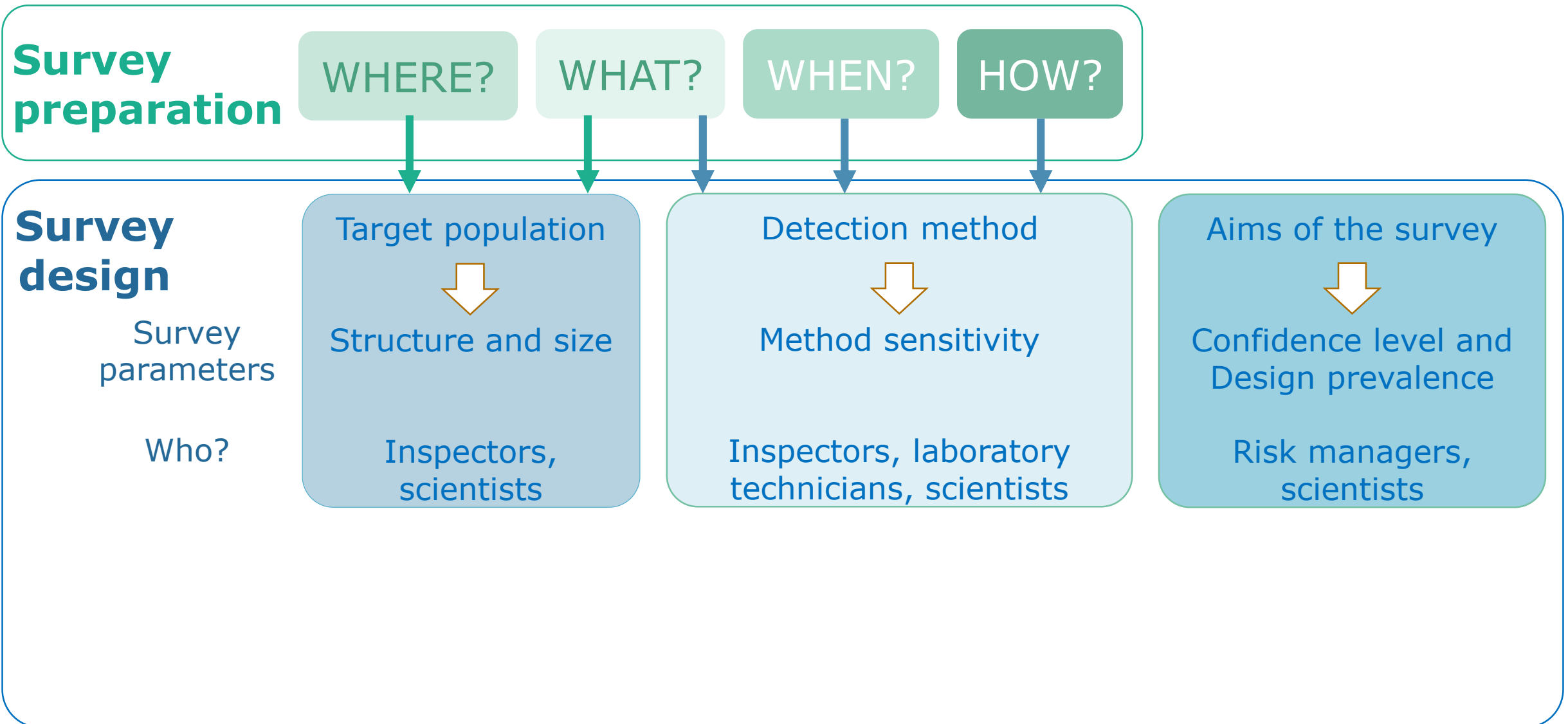
Story map for survey of
Popillia japonica



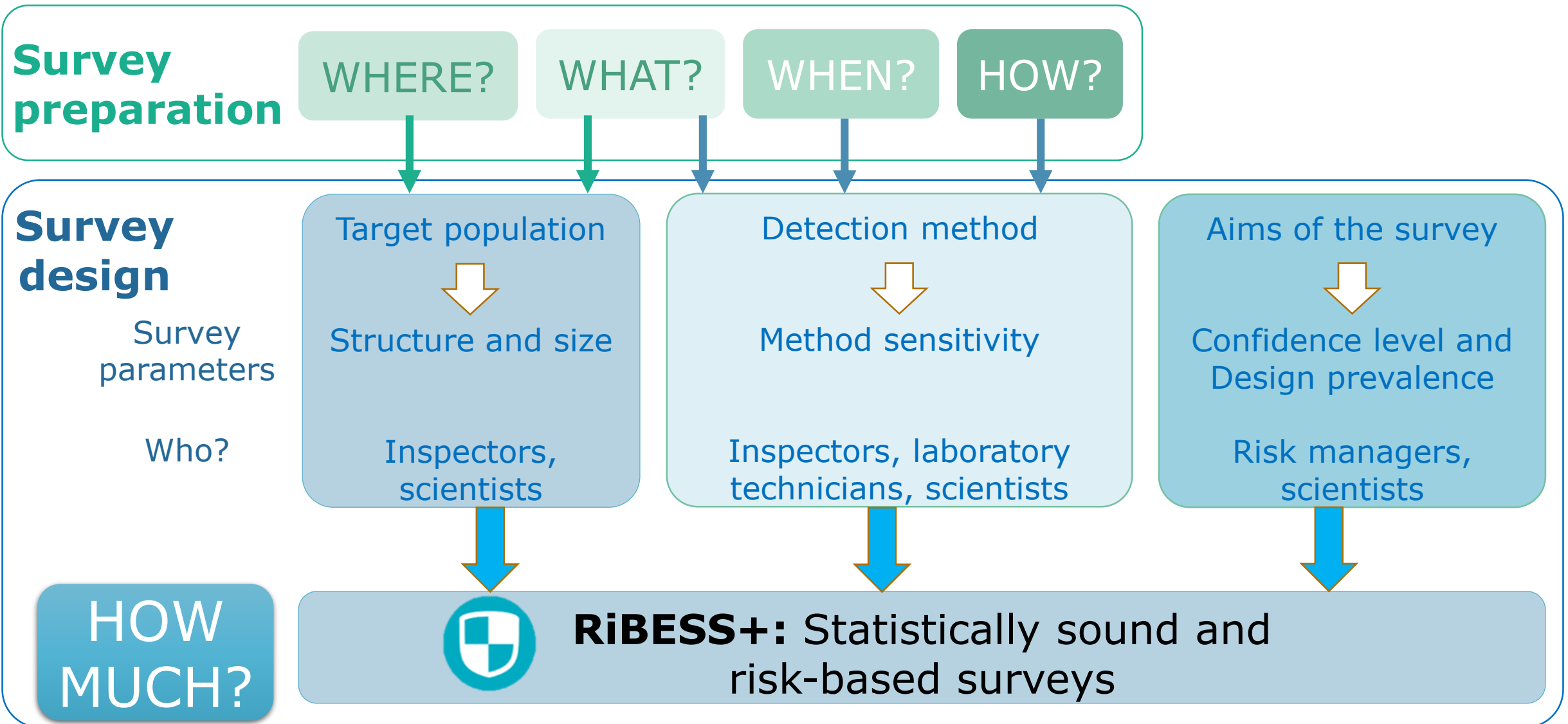
Story map for survey of
Scirtothrips aurantii, S. citri
and S. dorsalis



Survey design



Survey design



Guidelines: 4 documents

TECHNICAL REPORT



APPROVED: 31 July 2020

doi:10.2903/sp.efsa.2020.EN-1919

General guidelines for statistically sound and risk-based surveys of plant pests

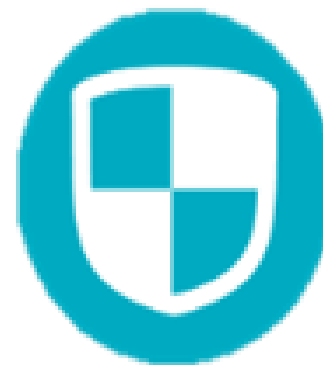
Guidelines for statistically sound and risk-based surveys of *Xylella fastidiosa*

Guidelines for statistically sound and risk-based surveys of *Phyllosticta citricarpa*

Guidelines for statistically sound and risk-based surveys of *Agrilus planipennis*

[https://efsa.onlinelibrary.wiley.com/doi/toc/10.1002/\(ISSN\)1831-4732.toolkit-plant-pest-surveillance](https://efsa.onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)1831-4732.toolkit-plant-pest-surveillance)

Statistical tool



RIBESS+

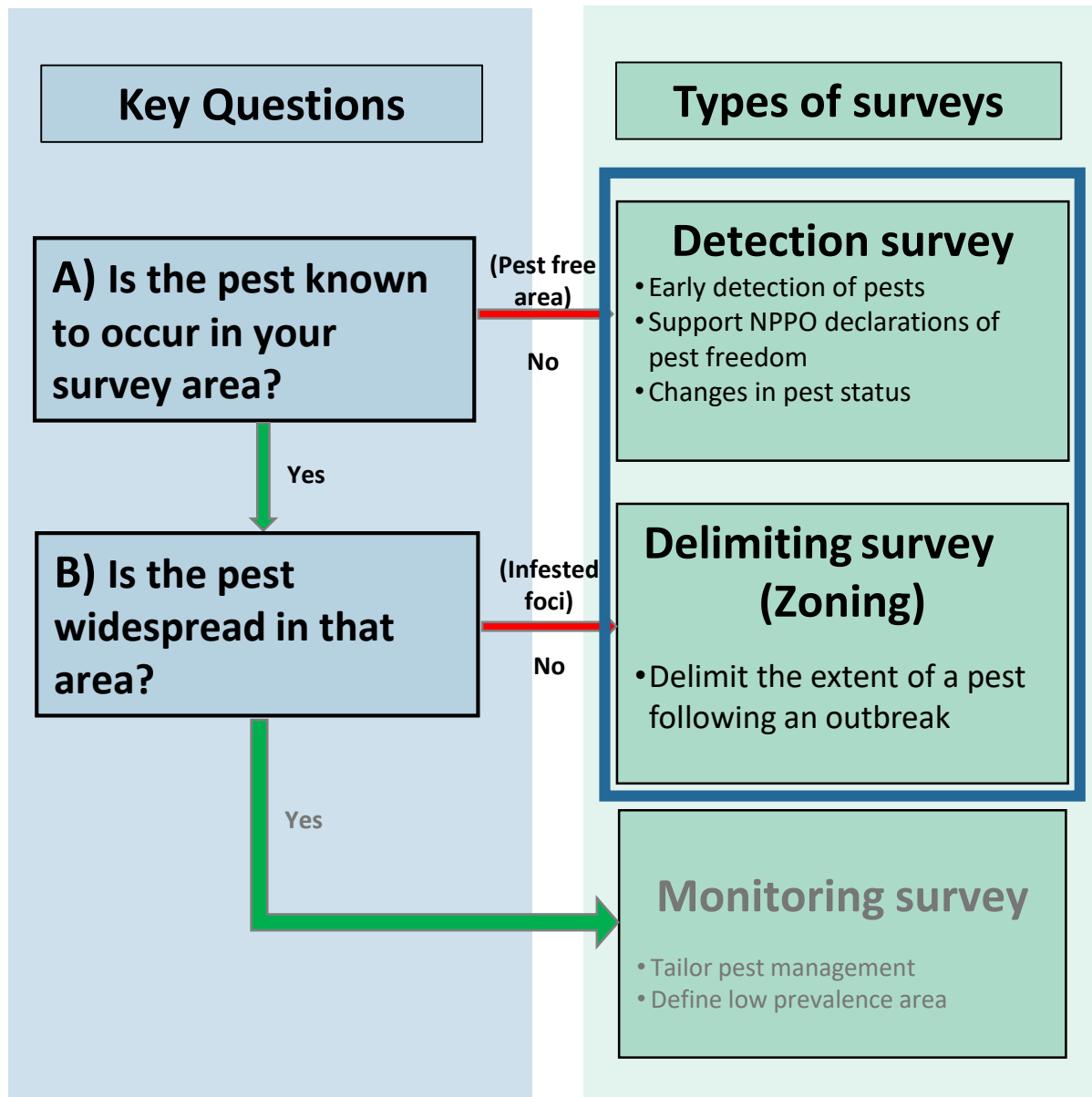




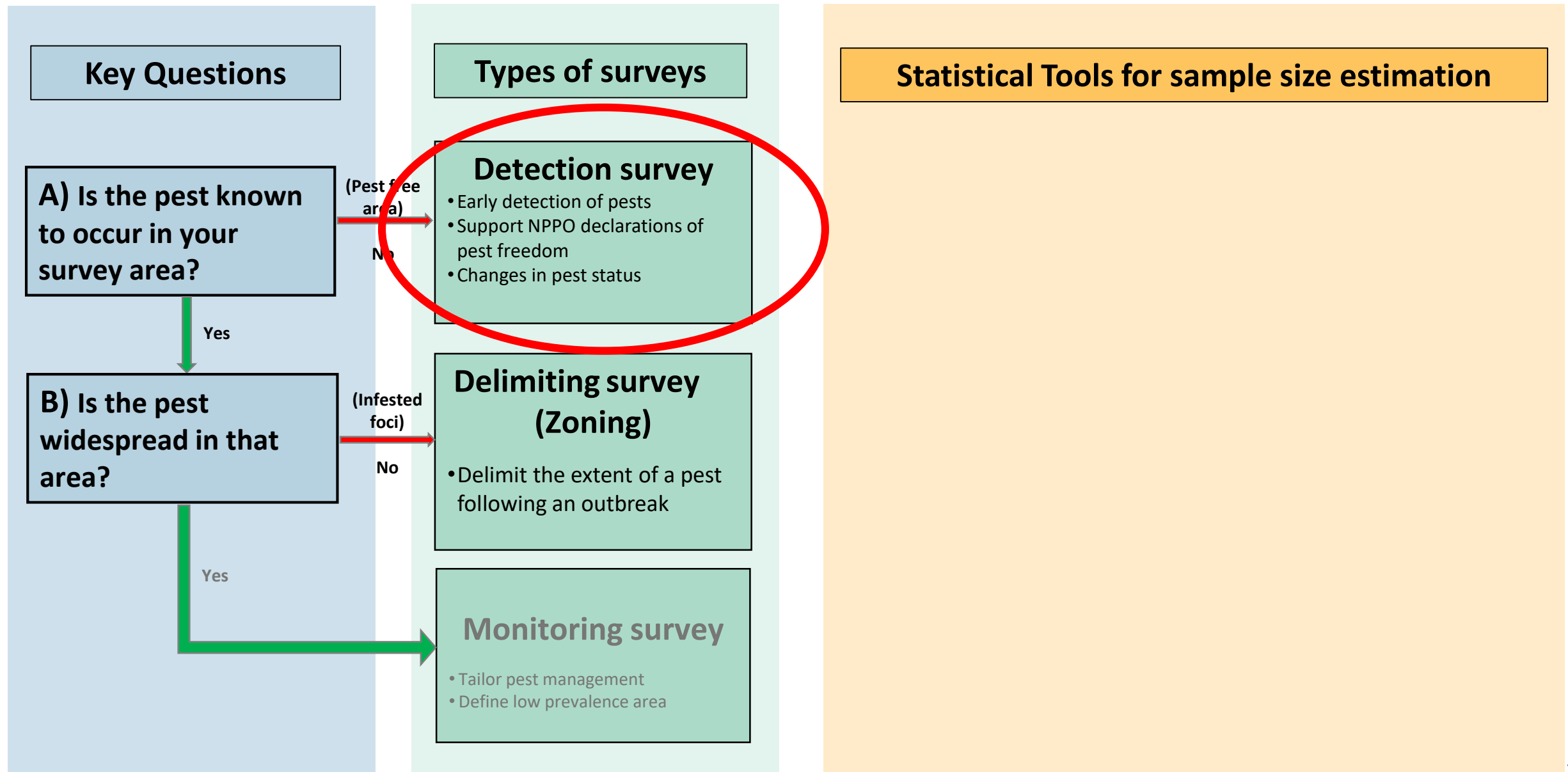
Q & A

Trusted science for safe food

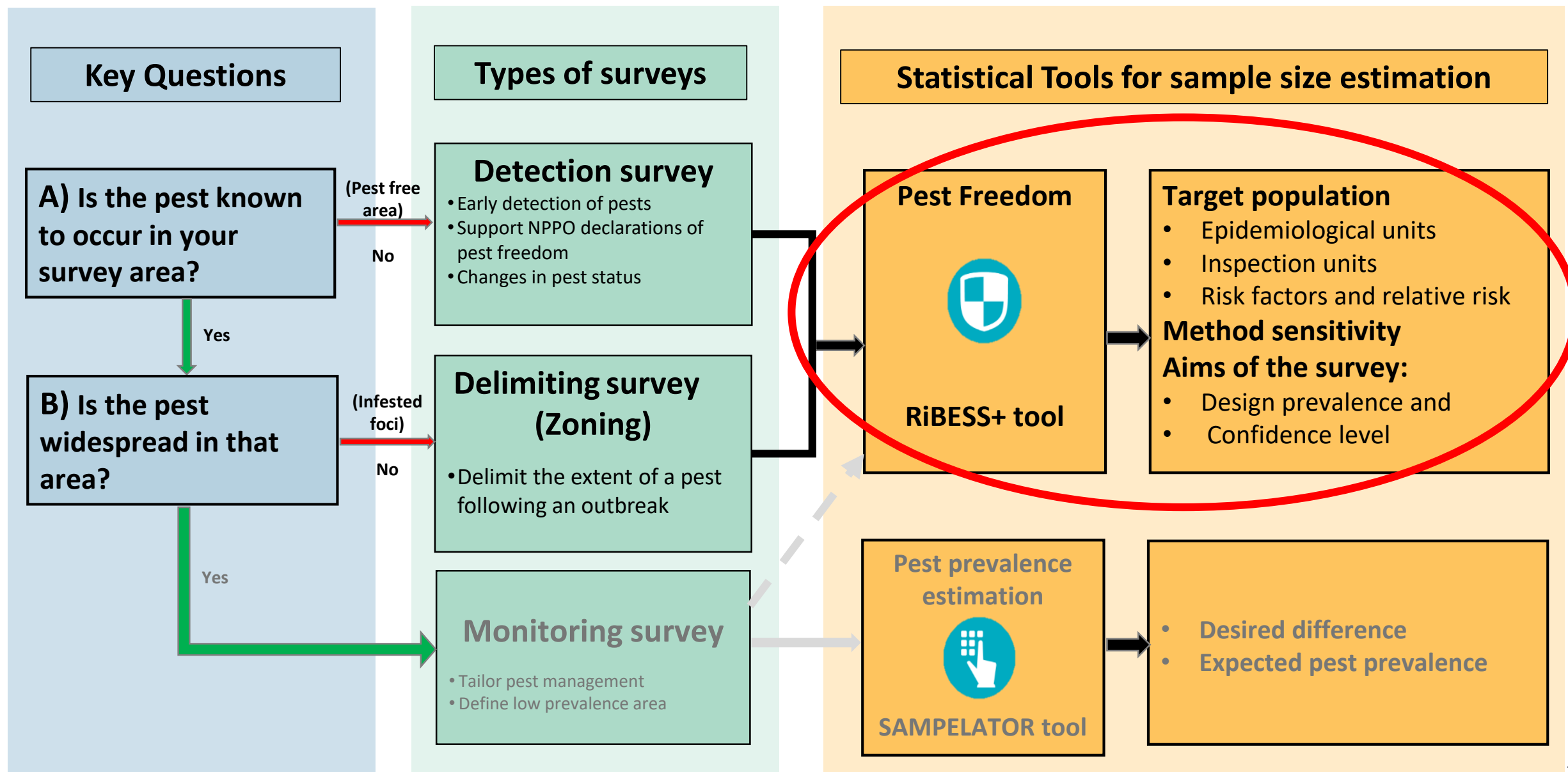
Survey design: type of surveys



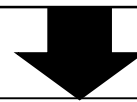
Survey design: type of surveys



Survey design: type of surveys



**Detection and
identification methods**

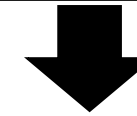


Method sensitivity: from the field to the lab

- The probability to detect the pest in an individual inspection unit if it is present



**Inspection/Sampling/
Trapping effectiveness**



Diagnostic sensitivity

Survey design: method sensitivity for *P. citricarpa*

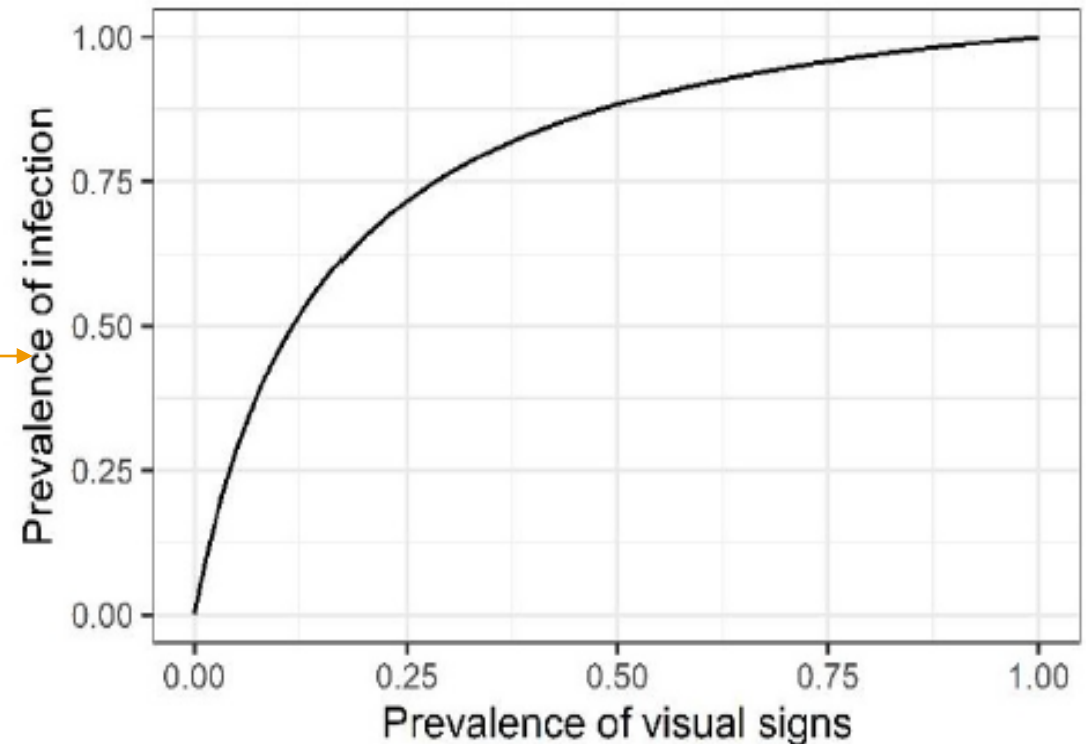
Method sensitivity (*P. citricarpa*) = sampling effectiveness × diagnostic sensitivity = $0.80 \times 1 = 0.80$

Sampling effectiveness (0.8):

- inspection and sampling on host plants with mature fruits
- sampling of symptomatic and asymptomatic fruits (symptoms induction)

Diagnostic sensitivity (1):

- PCR methods



Survey design: target population for *Phyllosticta citricarpa*

Structure Size Assumptions

SURVEY AREA



LAND USE CATEGORIES



Epidemiological unit



FROM the
whole
survey area
TO a single
hectare

Risk factors



Inspection Unit



LEVEL 1

LEVEL 2

LEVEL 3

LEVEL 4

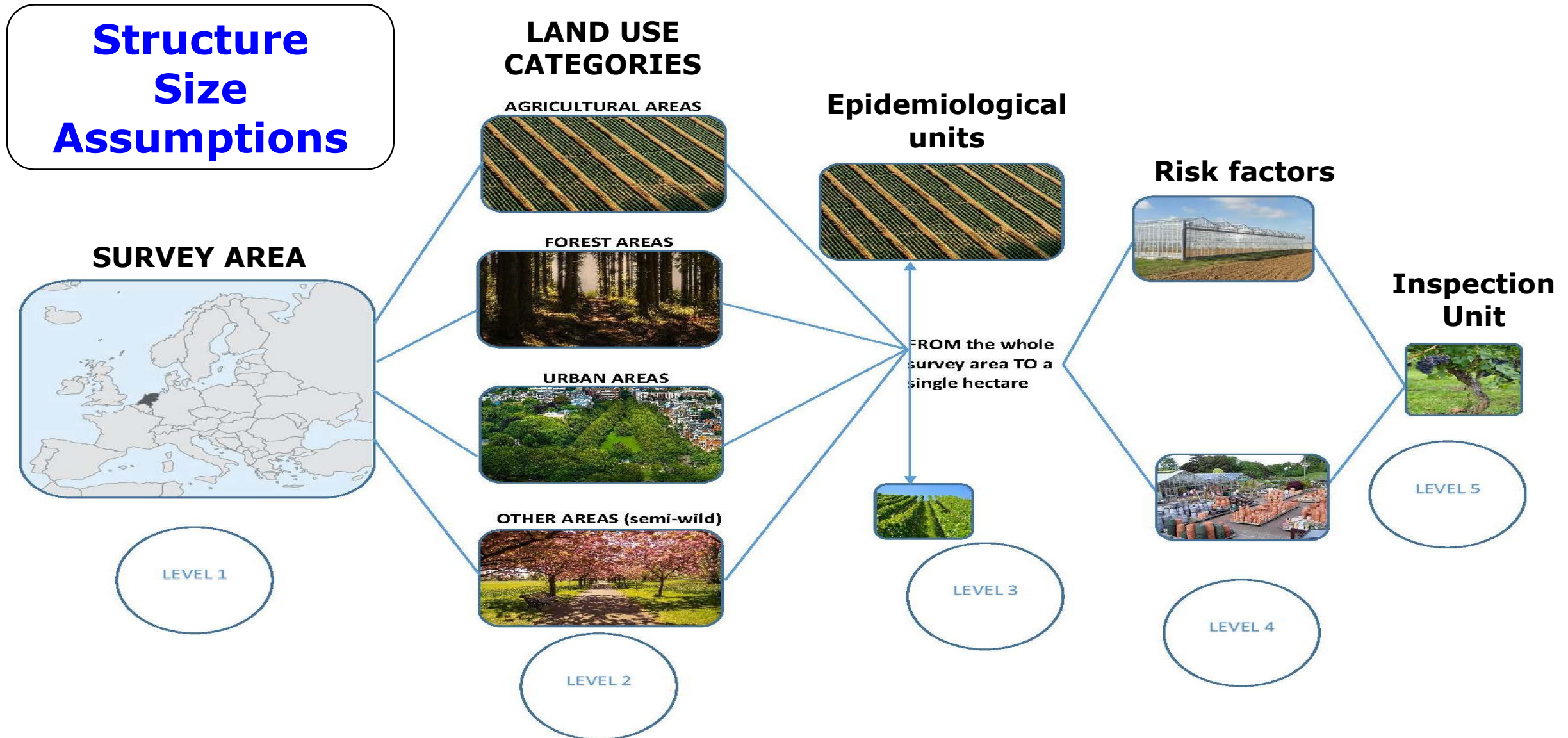
LEVEL 5

Survey design: risk factor for *P. citricarpa*

- **Risk factor** based on citrus species susceptibility
- **Lemon: several flowerings**, thus the likelihood that young lemon fruit coincides with favourable weather conditions for the fungal infection is high
- **Sweet-orange (late-maturing):** have **more time for symptom expression**

Botanical name	Common name	Relative Risk
<i>Citrus limon</i>	Lemon	1.5
<i>Citrus sinensis</i>	Sweet orange (late-maturing cultivars)	1.4
<i>Citrus sinensis</i> , <i>Citrus reticulata</i> , <i>Citrus unshiu</i> , <i>Citrus paradisi</i>	Sweet orange (other cultivars), mandarin satsuma, mandarin, grapefruit	1

Survey design: target population for *Xylella fastidiosa*

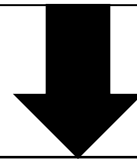


→ Proxy of absence defined by Risk managers

- Confidence level is the confidence we want to have on the survey
- The Design prevalence: What is the prevalence I can live with?

Using statistical tools, we can say that:

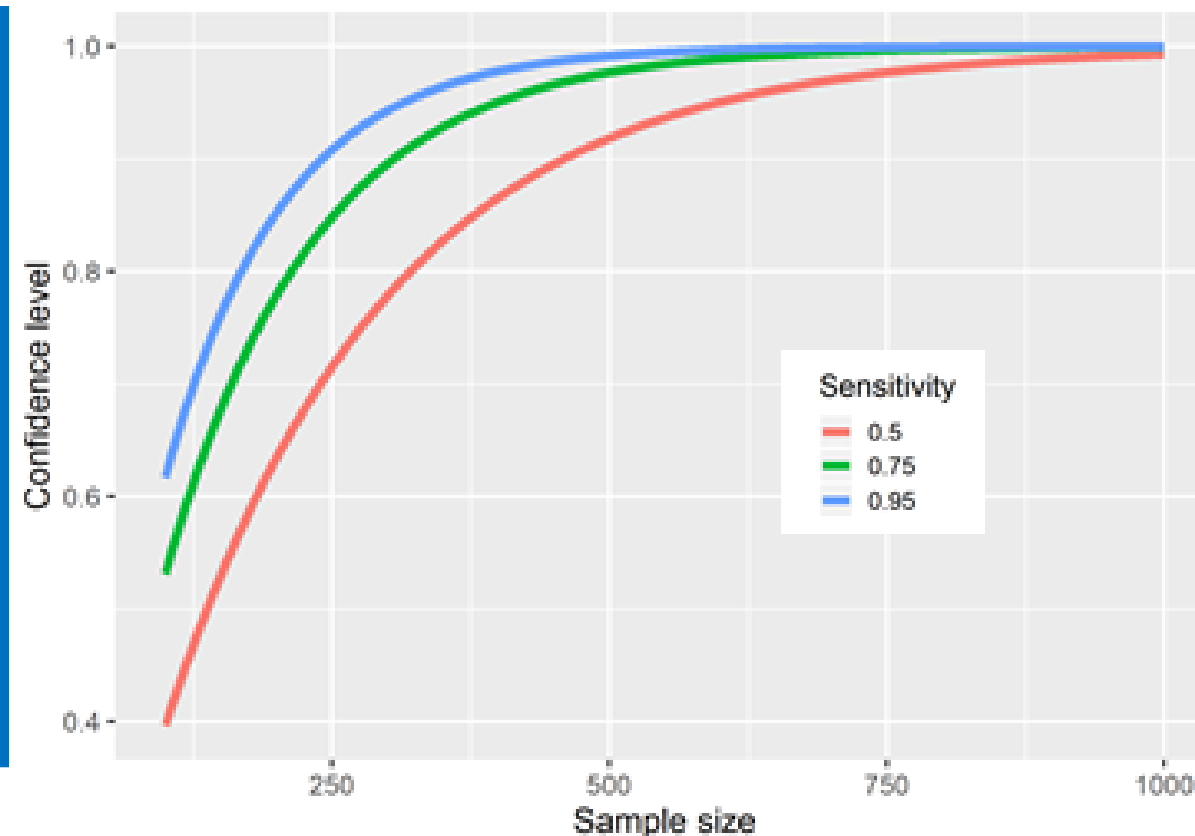
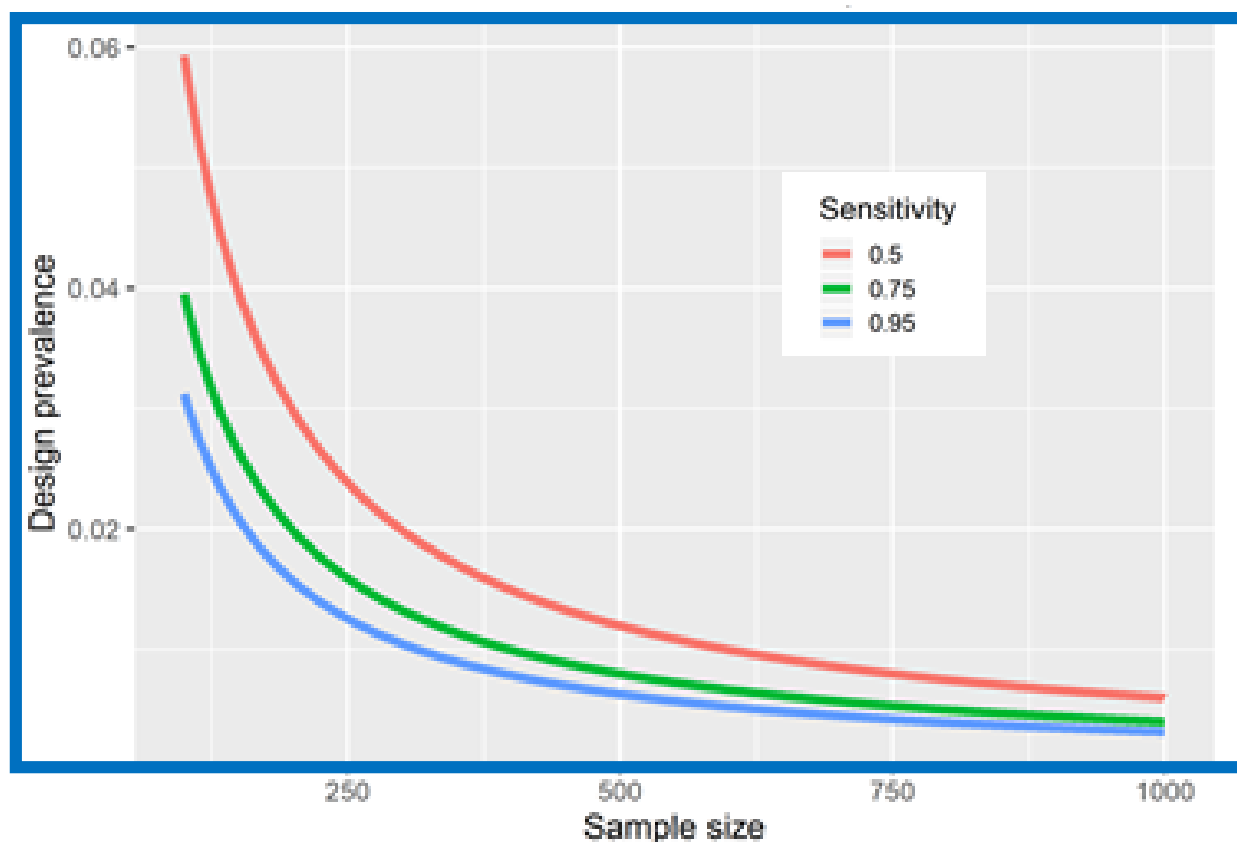
"With a given amount of confidence, the prevalence is below a maximum prevalence level"



Risk managers compromise between:
available resources
acceptable level of risk

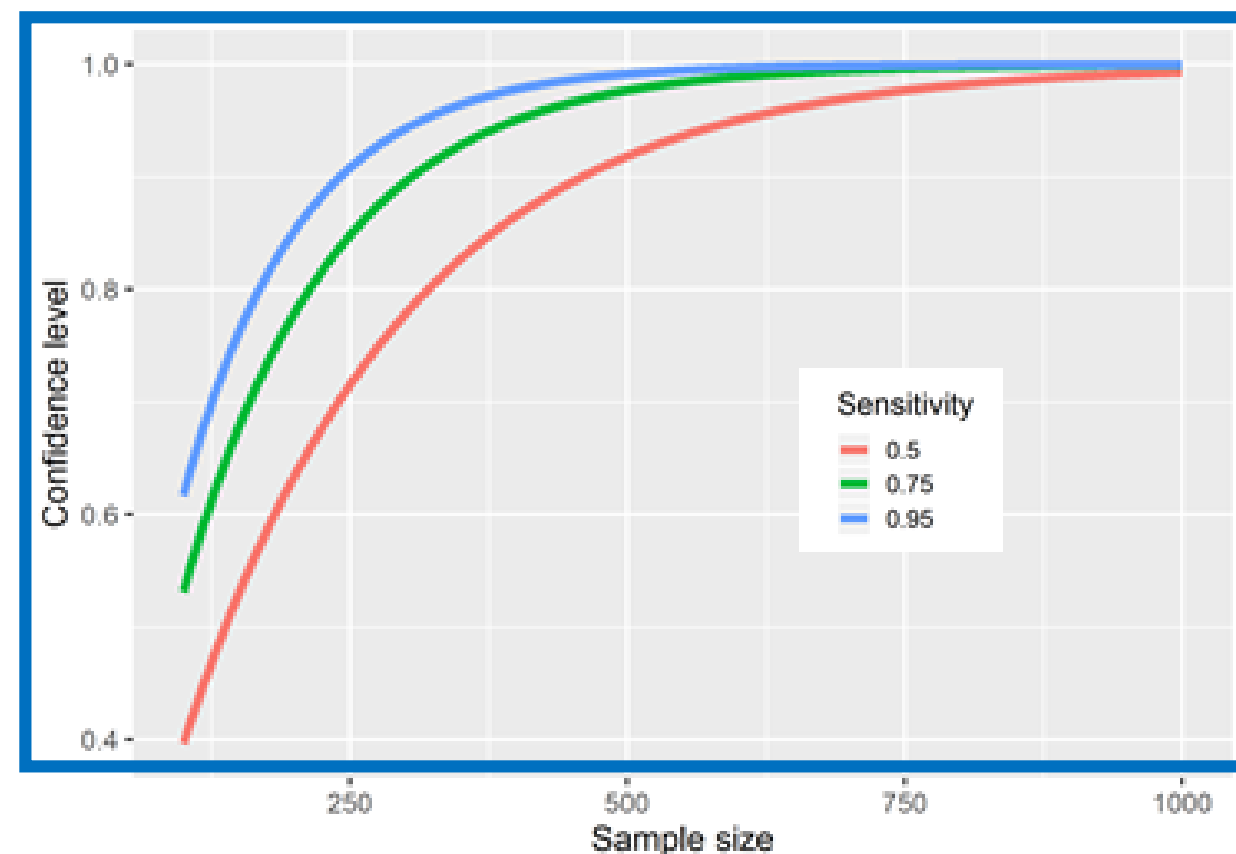
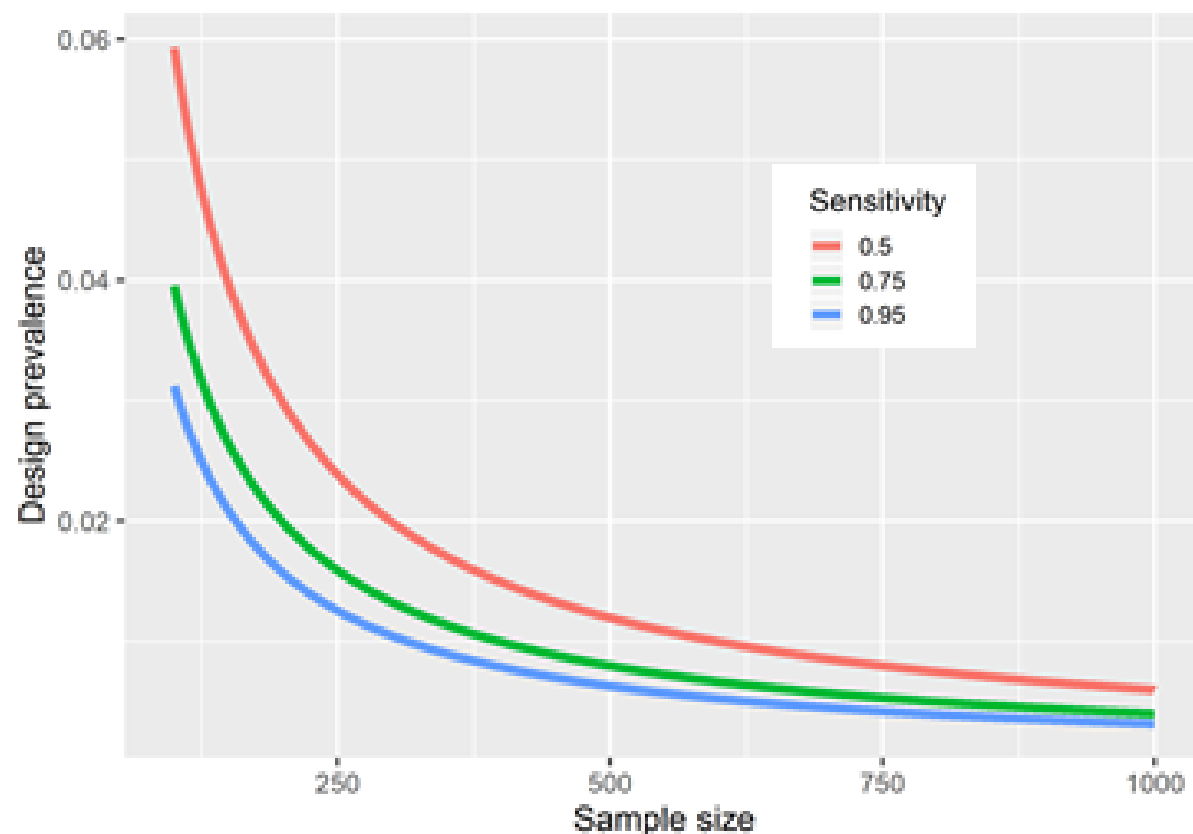
➤ Interrelation of survey parameters

The lower the design prevalence and the higher the confidence level, the stronger the evidence for pest freedom.



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CBS survey design: target population

SURVEY AREA

Valencia province
within the
Valencian
Autonomous
Community



**92,057 ha of
citrus**

LEVEL 1

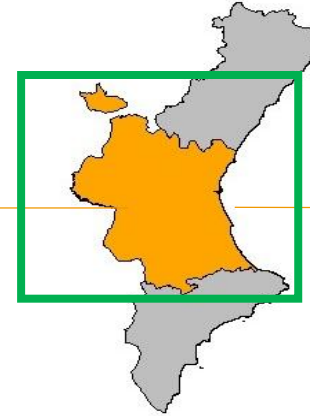
LAND USE CATEGORIES

Agricultural areas



LEVEL 2

EPIDEMIOLOGICAL UNIT



**The whole
province**

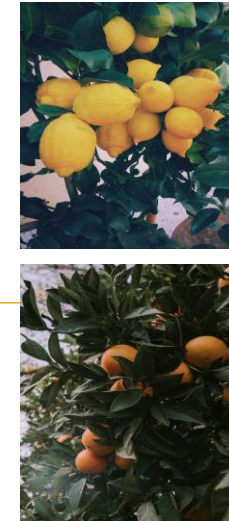
LEVEL 3



Where statistics apply

RISK FACTORS

**Most susceptible
species**



LEVEL 4

INSPECTION UNIT

**Trees with
mature fruits**



LEVEL 5

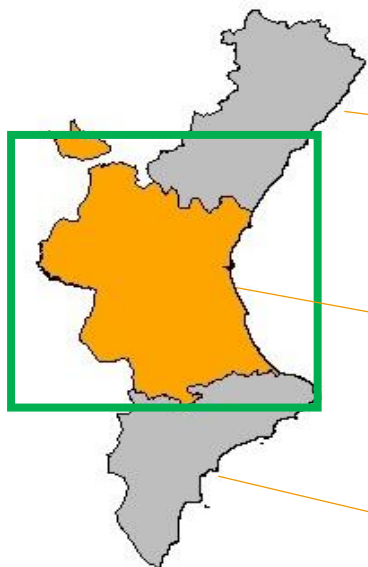


Where we seek the pest

AGRICULTURAL AREAS:

Host plants of <i>Phyllosticta citricarpa</i>		Crop hectares (ha.)
<i>Citrus limon</i> (L.) Burm. f.	Lemon	124
<i>Citrus sinensis</i> (L.) Osbeck (Late-maturing cultivars)	Sweet orange	7,960
<i>Citrus sinensis</i> (L.) Osbeck (Other cultivars)	Sweet orange	44,814
<i>Citrus reticulata</i> Blanco	Mandarin	32,479
<i>Citrus unshiu</i> (Swingle) Marcow	Satsuma mandarin	6,214
<i>Citrus paradisi</i> Macfad.	Grapefruit	466
		92,057
Total number of trees (450 trees/ha.)		41,425,650

EPIDEMIOLOGICAL UNIT



**The whole
province**

LEVEL 3



Where statistics apply

Overall for **Valencia autonomous community**:
95% Confidence to detect **>1%** prevalence

Castellon province:
63% Confidence to detect >1% prevalence

Valencia province:
63% Confidence to detect >1% prevalence

Alicante province:
63% Confidence to detect >1% prevalence

CBS survey design: survey parameters

Survey parameter	Item	CBS survey design			
Target population	Size	41,425,650 host plants			
	Epidemiological unit	Valencian province citrus area (92,057 ha)			
	Risk factor	Species	Relative Risk	Population proportion	Convenience sampling
		Lemon	1.5	0.001	2
		Sweet orange (late-maturing cultivars)	1.4	0.087	2
		Other	1	0.912	1
Detection method	Method sensitivity	Sampling effectiveness	0.8	0.8	
		Diagnostic sensitivity	1		
	Detection and identification	50 mature fruits (symptomatic and asymptomatic)/host plant			
Aim of the survey	Confidence level (%)	63			
	Design prevalence (%)	1			

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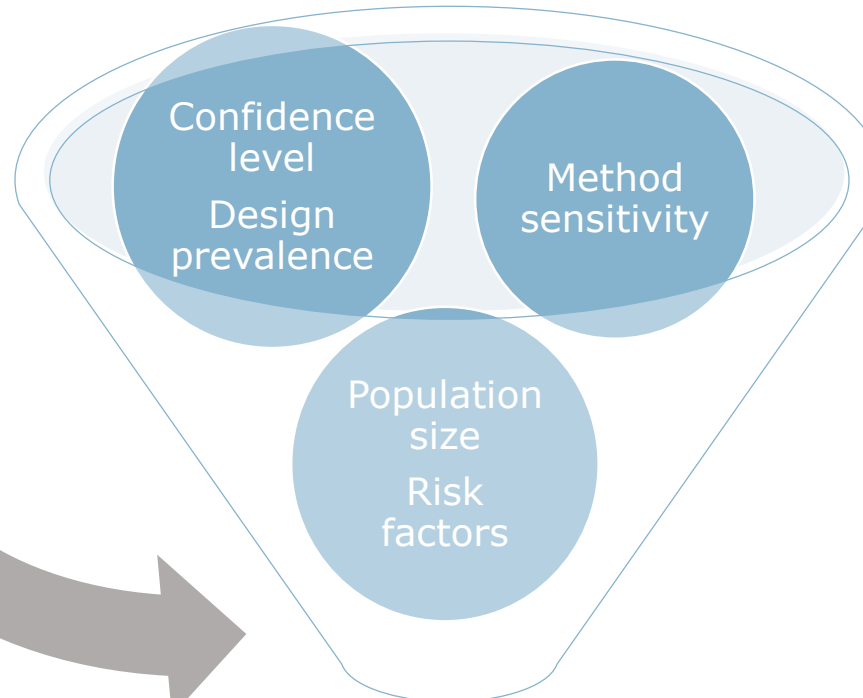
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CBS survey design: estimating sampling efforts



**RIBESS+
stats tool**



50 mature fruits/tree

Lemon: 1900 fruits
Sweet orange (late-maturing): 1900 fruits
Other citrus species: 950 fruits

Finite population

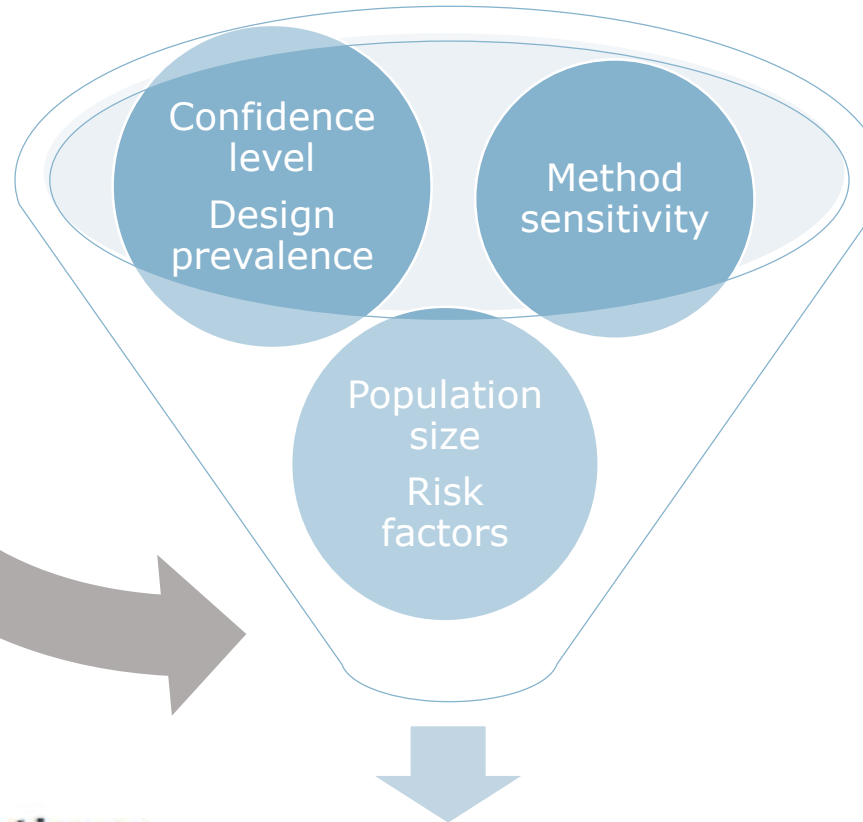
	risk factor 1	Population size	Sample size	Group sensitivity
1	Lemon	41425.000	38.000	0.358
2	Sweet orange (late)	3604031.000	38.000	0.339
3	Other	37780192.000	19.000	0.137

Total sample size: 95
Global sensitivity: 0.63

CBS survey design: estimating sampling efforts



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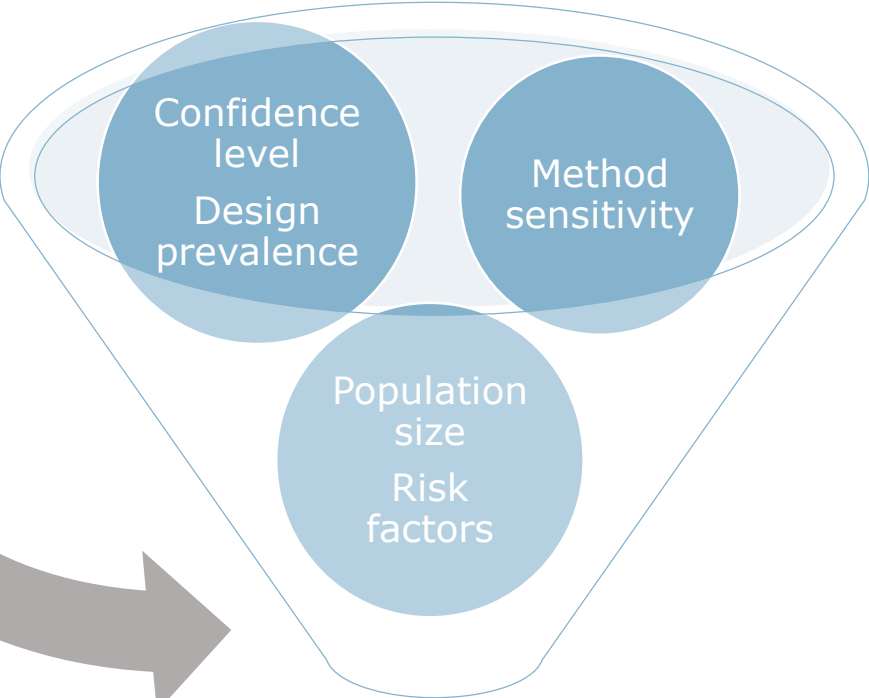
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Finite population

risk factor 1	
1	Lemon
2	Sweet orange (late)
3	Other

Population size
41425.000
3604031.000
37780192.000

Sample size
38.000
38.000
19.000

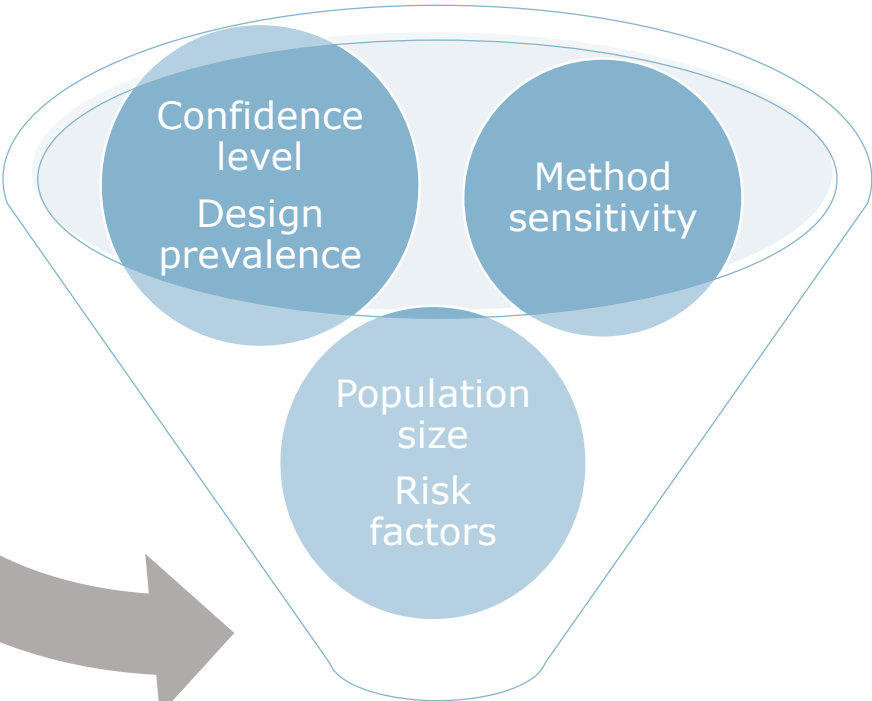
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Total sample size: 95
Global sensitivity: 0.63

LEMON: 38 trees

SWEET ORANGE
(late): 38 trees

OTHER CITRUS:
19 trees



Assuming that:

- in the Valencian province the **epidemiology of *P. citricarpa* is similar.**

After implementing the detection survey, should all the **samples test negative (4750 mature fruits)**, it could be concluded that:

- with an overall confidence of **63%**, if is present *P. citricarpa*, the number of infected citrus trees is below 1% (**from 0 to 414,256 host trees**).

Tutorial for use of RiBESS+



The videos are available on the [EFSA YouTube channel](#)



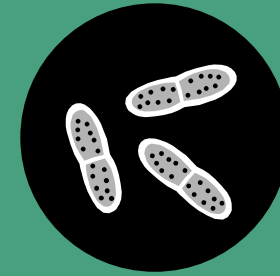
Q & A

Trusted science for safe food

What is next...

New mandate: >200 pests in 6 yr

- Quarantine, protected zone, and emerging pests
- From pest-based to crop-based survey
- Plant health specific stats tool



**Next webinar on
pest surveys:**

- 1 December
“Delimiting surveys”

Thanks for attending!

EFSA Working Group on Pest Surveys

- **Staff:** Sybren Vos, Ignazio Graziosi, Giulia Mattion, Jose Cortiñas Abrahantes, Gabriele Zancanaro, Alice Delbianco
- **Experts:** Stephen Parnell, Elena Lazaro, Antonio Vicent et al.
- **Tasking grants:** NWVA - Martijn Schenk, Jan Schans et al.; JKI - Gritta Schrader et al.
- **Contractor HORTA:** Maria Chiara Rosace

We also thank

Laura Carotti, Oresteia Sfyra and Sara Tramontini of the ALPHA Unit and all the EFSA colleagues who provided the communication and technical support

Thanks for attending!

In case we did not manage
to answer all your
questions, please feel free
to reach out at:

alpha@efsa.europa.eu

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