Julius Kühn-Institut
Bundesforschungsinstitut für Kulturpflanzen
Federal Research Centre for Cultivated Plants

efsa
European Food Safety Authority

Netherlands Food and Consumer Product Safety Authority
Ministry of Economic Affairs

EFSA develops scientifically based survey guidelines for EU Member States

Gritta Schrader, JKI Braunschweig, Germany
for EFSA Tasking Grant

Trusted science for safe food

EU-Mandate on Surveillance of Plant Pests

- **EFSA was requested by the Commission of the European Union (EU) to facilitate EU Member States** in **their planning and execution of their survey activities by**
  - providing practical and concise outputs
  - addressing all pests of the survey work program 2018-2020
  - providing detailed guidelines for surveillance for 3 pilot organisms

Regulatory background:

PLH regulation EU 2016/2031:

- extra focus on prevention and risk targeting
- need for harmonized pest surveillance to inform both the EU risk management and risk assessment

PLH regulation EU 652/2014:

Commission co-financing programme of the annual MS survey enhances the survey capacity in EU MSs

EU-Mandate on Surveillance of Plant Pests

➢ Outputs

1. **Workplan and methods**, published in March 2018 in the EFSA Journal:

TECHNICAL REPORT

APPROVED: 19 March 2018

doi:10.2903/sp.efsa.2018.EN-1399

Work-plan and methodology for EFSA to develop plant pest survey guidelines for EU Member States

European Food Safety Authority (EFSA),

Ramona Mihaela Ciubotaru, José Cortiñas Abrahantes, Joshua Oyedele, Stephen Parnell, Gritta Schrader, Gabriele Zancanaro, Sybren Vos

Available up to now:
https://bit.ly/2Yg5cmh

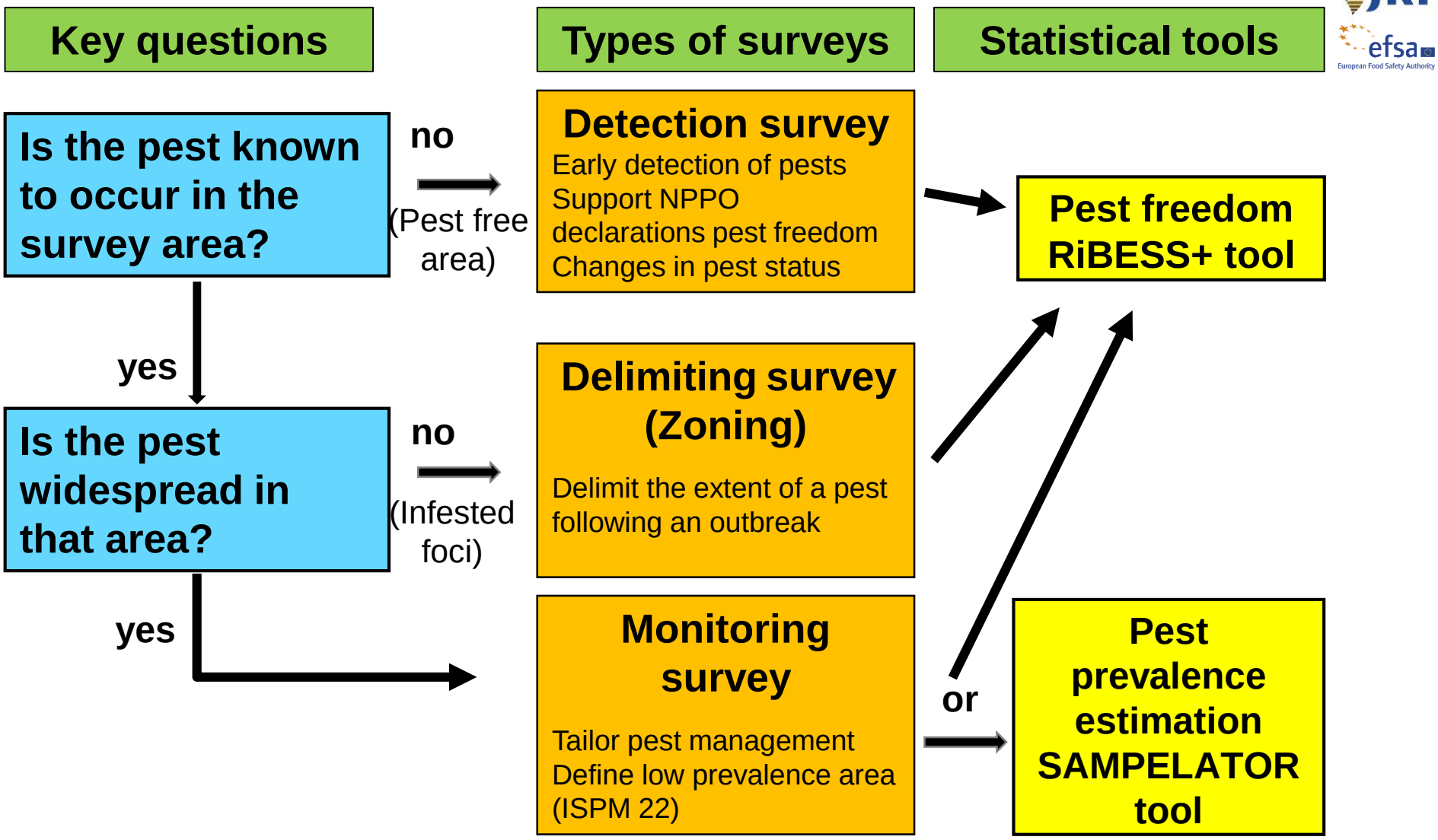
Deadline: end of March 2020

2. "**Pest survey cards**" with all necessary information for scientifically and technically based surveys (RiBESS+ and SAMPELATOR)

3. **Specific guidelines for three pilot pests** (*Agrilus planipennis, Phyllosticta citricarpa* and *Xylella fastidiosa*)

4. **General guidelines** for survey design

Survey Objectives



Surveys should be designed and executed to provide the level of statistical confidence necessary for the results to be meaningful for regulatory purposes.

Pest survey cards

Pest survey cards

More than 50 pests in the work program of the EU MS

Objective:

Guide the surveyor through the gathering of the relevant information for the survey design

1.The pest and its biology

- Taxonomy, regulatory status, distribution
- life cycle, host plants, environmental suitability
- Spread capacity
- Risk factors

2. Detection and identification methods

- Visual examination (Pest, Symptoms, Traps)
- Laboratory testing (Identification of methods, Diagnostic protocols)

3. Key elements for survey design

- Target population
- Epidemiological unit
- Inspection units

Specific guidelines for the pilot organisms

→ In line with ISPM 6 (Guidelines for Surveillance)

→ Concise

→ Practical documents fit for purpose for the end user

- Survey design
- Strategy for detection survey
- Strategy for delimiting survey
- Sample size calculations

→ Insect: Emerald ash borer *Agrilus planipennis*

→ Fungus: *Phyllosticta citricarpa* (*Citrus black spot*)

→ Bacterium: *Xylella fastidiosa*
(Revision of existing EU guidelines)

Pest survey cards

2018: 25 plant pests

Pilot organisms

Agrilus planipennis (test phase) 03/20

Phyllosticta citricarpa (test phase) 03/20

Xylella fastidiosa (Guidelines: test phase) 03/20

Popillia japonica

Citrus pests

Xanthomonas citri pv. *aurantifolii*
Xanthomonas citri pv. *citri*
} 1 Survey card

Candidatus Liberibacter spp.(HLB) +Vektoren

Citrus tristeza virus (non-European)

Aleurocanthus spp.

Pterandrus rosa

Toxoptera citricida

Scirtothrips sp.

Potato pests

Scrobipalpopsis (Tecia) solanivora

Epitrix cucumeris
Epitrix papa
Epitrix subcrinita
Epitrix tuberis
} 1 Survey card

Meloidogyne fallax
Meloidogyne chitwoodi
} 1 Survey card

Globodera pallida
Globodera rostochiensis
} 1 Survey card

Synchytrium endobioticum

Ralstonia solanacearum

Clavibacter michiganensis ssp. sepedonicus

Candidatus Liberibacter solanacearum

In green: pest survey cards already published

Pest survey cards

2019: 30 plant pests

Forest pests	Miscellaneous pests
Agrilus anxius	*Dacus (Bactrocera) dorsalis*
Agrilus auroguttatus	*Grapevine flavescence dorée phytoplasma*
Anoplophora chinensis	*Scaphoideus titanus*
Anoplophora glabripennis	*Thekopsora minima*
Bursaphelenchus xylophilus	~~*Diaporthe vaccinii*~~
Dendrolimus sibiricus	*Aromia bungii*
Giberella circinata	*Thaumatotibia leucotreta*
Monochamus spp. (nicht europäisch)	*Rhagoletis fausta*
Pissodes spp. (nicht europäisch)	*Rhagoletis pomonella*
Polygraphus proximus	*Rose rosette virus*
Xylosandrus crassiusculus	*Phyllocoptes fructiphilus (Vektor Rose rosette virus)*
Geosmithia morbida	*Pseudomonas syringae pv. actinidiae*
Pityophthorus juglandis (Vektor von *G. morbida*)	*Spodoptera frugiperda*
	Pomacea
	Tomato leaf curl New Delhi virus (ToLCNDV)
	Erwinia stewartii
	Anthonomus eugenii

Statistically based surveys

Target population:
Host plants – size

Epidemiological unit:
Homogeneous spatial units

Data requirements for pest freedom surveys (RIBESS+)
(needed for survey cards and guidelines)

Risk based approach:
Relative risk and optimal targeting

Detection and diagnostic method:
Visual examination and laboratory tests – methods sensitivity

Design prevalence and confidence:
Acceptability of the risk (risk managers)
Confidence around the estimation of the real prevalence OR of the freedom statement

Generic survey design: Definition of areas and units needed for statistically sound surveys

Survey area

e.g. a country, a province, a place of production, a buffer zone

Target population

The set of individual plants or commodities or vectors in which the target pest can be detected in the survey area. E.g. **all ha in a country that contain at least one host plant**

Epidemiological unit

A group of individuals with a defined epidemiological relationship that share approximately the same likelihood of exposure to the pest; e.g. fields, greenhouses or forest stands with host crops; e.g. **1 ha with 1 or more host plants**

Inspection unit

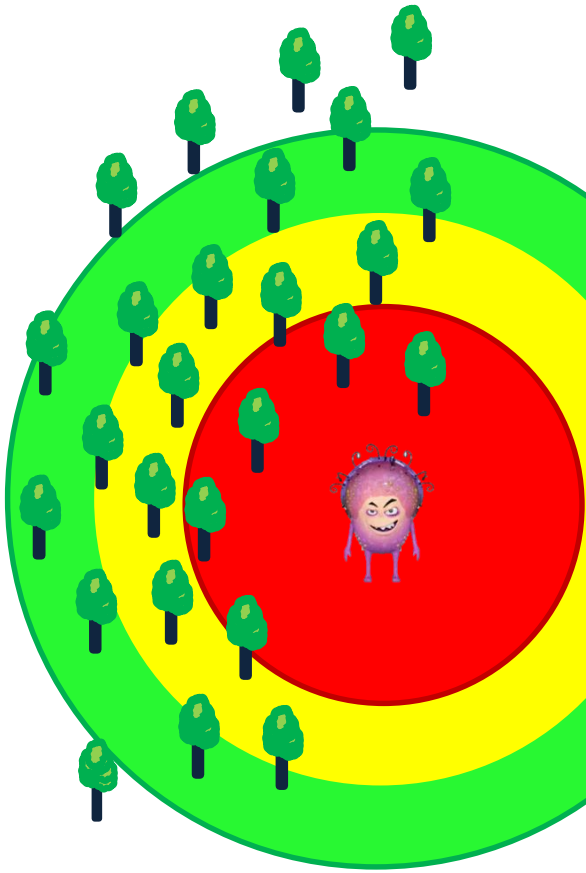
The plant, plant product or plant part that is actually inspected to determine the presence of the target pest, could also be a trap

→ To be adjusted to situation in individual Member State

Risk based surveys

A **risk factor** is a biotic or abiotic factor that increases the probability of infection by the pest in the area of interest.

- a risk factor should have more than one level of risk for the target population.
- characterised by the relative risk and the proportion of the overall plant population on which it applies
- the relative risk of each level needs to be estimated as the relative probability of infection compared to a baseline with a level 1



Examples provided in the pest survey cards for:

- risk activities
- risk locations
- risk areas

Design prevalence and confidence

- Harmonising the entire survey process among 28 (27) EU Member States is difficult

- For comparing the pest status between different areas/Member States, harmonising the conclusions is essential. Recommendation: sample size with RIBESS+, confidence level at 95% and design prevalence at 1%, calculation of samples taken accordingly

Example (with design prevalence set to 1% and confidence level at 95%)**:**

If all examinations and/or tests are negative, the Member State is 95% confident that, if the pest is present, its prevalence is below 1% in the target population.

Statistically based surveys: Action for EU Member States

- Collection of data on host plants and their distribution
- Design survey, taylored to the Member State‘s situation (supported by workshops)
- Identification of risk factors and the relevant data
- Implementation of survey cards
- Feedback (survey cards, guidelines, tool kit)

→ A harmonised approach will also improve contingency planning

Support to EU Member States

Workshops on surveillance:

- Cooperation agreement grants for crisis preparedness
- EFSA survey toolkit and contingency planning
- Statistical tools: RiBESS+ and tailored pest survey design

Citrus Black spot with the Malta NPPO

Workshop 1 CBS survey in Malta 08-10 Oct 2018

Final Workshop 26-28 Nov 2019 in Lisbon

Emerald Ash Borer with Estonian Agricultural Board

Workshop 1 EAB survey in Tallinn 23-25 Jan 2019

Final Workshop next January in Tallinn

***Xylella fastidiosa* with the EFSA network on risk assessment in Plant Health**

Network Workshop in Parma 6-8 March 2019

Final Workshop next March in Parma

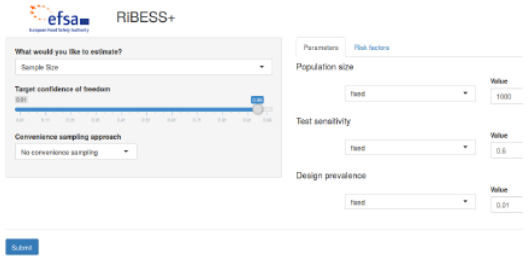
Main Objectives of the Workshops

- Share and interact with the MS on the use of the EFSA toolkit:
    - Pest survey card
    - Pest specific guidelines
    - Ribess+ software

- Statistically risk based surveillance

- Integrate the relevant knowledge on the pest in the survey design

- Provide tailored support for survey



- With MS comments and feed back, revise the tool kit for ensuring it is practical

Ongoing research

Promising future for innovative surveillance programs, e.g. identification of risk areas by remote sensing (pre-visual), innovative diagnostics…

NATURE PLANTS LETTERS

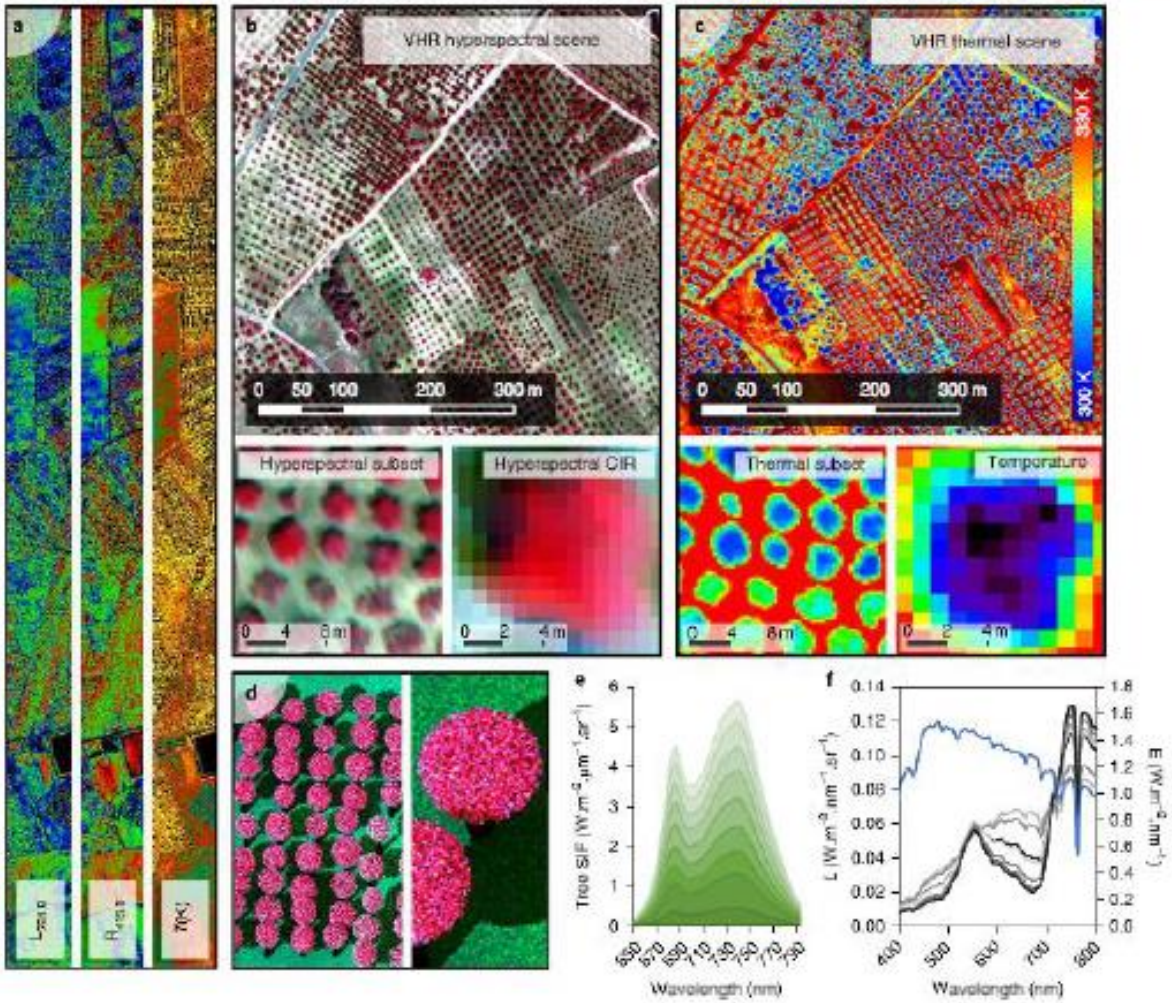


Fig. 1 | Imagery acquisition and plant-trait fluorescence retrievals. a, Strips of airborne images of 40 cm hyperspectral radiance collected at the O_2-A band, reflectance at 415 nm (used to calculate NPQI) and temperature (T, in K). **b**,**c**, Subsets of the very high-resolution (VHR) colour-infrared (CIR) hyperspectral (**b**) and thermal imagery (**c**) enable the identification of single trees to extract tree-crown radiance (L), reflectance (R) and temperature. **d**,**e**,**f**, Monte Carlo simulation modelled SIF emission via 3D scenes generated with FluorFLIGHT (**e**) from tree radiance (L) and irradiance (E) (**f**) to quantify fluorescence efficiency by radiative transfer.

Zarco-Tejada et al., 2018

Conclusions and further steps

- To design a survey for detection and delimiting surveys on a statistically sound base, choices for data have to be made by Member States for their specific situation

- General and specific guidelines for survey design will be available by March 2020

- Specific guidelines will be provided in separate documents and describe step by step the process of the survey design for the three pilot pests

- A manual for guiding the user through the tools (RIBESS+, Sampelator) will be provided

Pest surveys Working Group Members

EFSA Staff from different Teams/Units:

AHAW G. Zancanaro

AMU J. Cortinas

PLH M. Diakaki, M. Camilleri, M. Kinkar, S. Vos (Chair)

EFSA PLH Panel : S. Parnell, A. Vicent + Panel reviewers

External experts: E. Lazaro + 9 pest experts

Tasking grants G. Schrader et al.

M. Schenk et al.

Netherlands Food and Consumer Product Safety Authority
Ministry of Economic Affairs