Prioritizing species from the List of EU Quarantine Pests for a Full Analysis

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Sybren Vos et al., European Food Safety Authority

2024 Annual Meeting of the International Pest Risk Research Group

European Commission

Overview

1 – Introduction

2a – Methodology for the full assessment

2b – Methodology for the shortlisting step

3 – Results of the shortlisting

4 – Ongoing work

(Advertisement)

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Introduction - Political background (1/2)

The new plant health regulation **Regulation (EU) 2016/2031**

Article 6 (1) defines priority pests

Pests whose **potential economic, environmental or social impact** is the most severe

Article 6(2) empowers the EC to adopt **a delegated act establishing a list of priority pests based on specific criteria (Annex I)**

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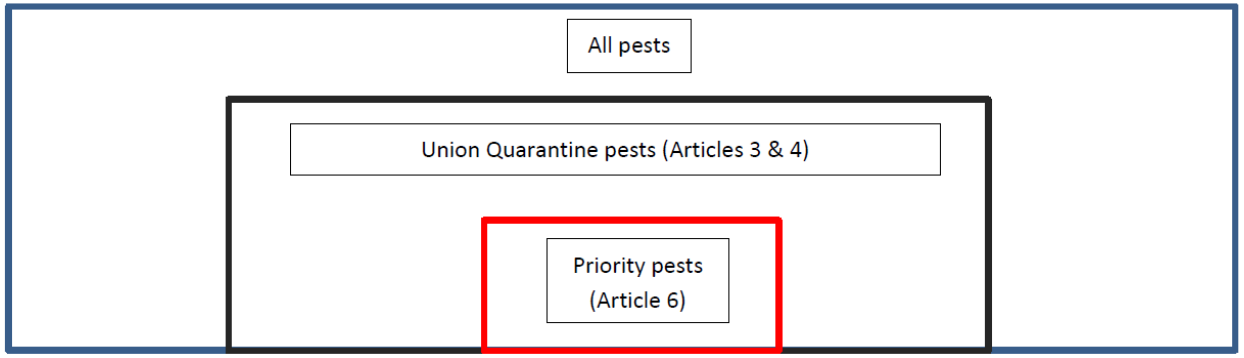
Introduction - Political background (2/2)



Note: the figure is not to scale

- Not present in the EU, present in a limited area or with scarce, irregular, isolated and infrequent presences.
- Most severe economic, environmental **or** social impact

Annual surveys (Art. 24)
Contingency plan (Art. 25)
Simulation exercises (Art. 26)
Action plan for eradication (Art. 27)

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Introduction – End Goal

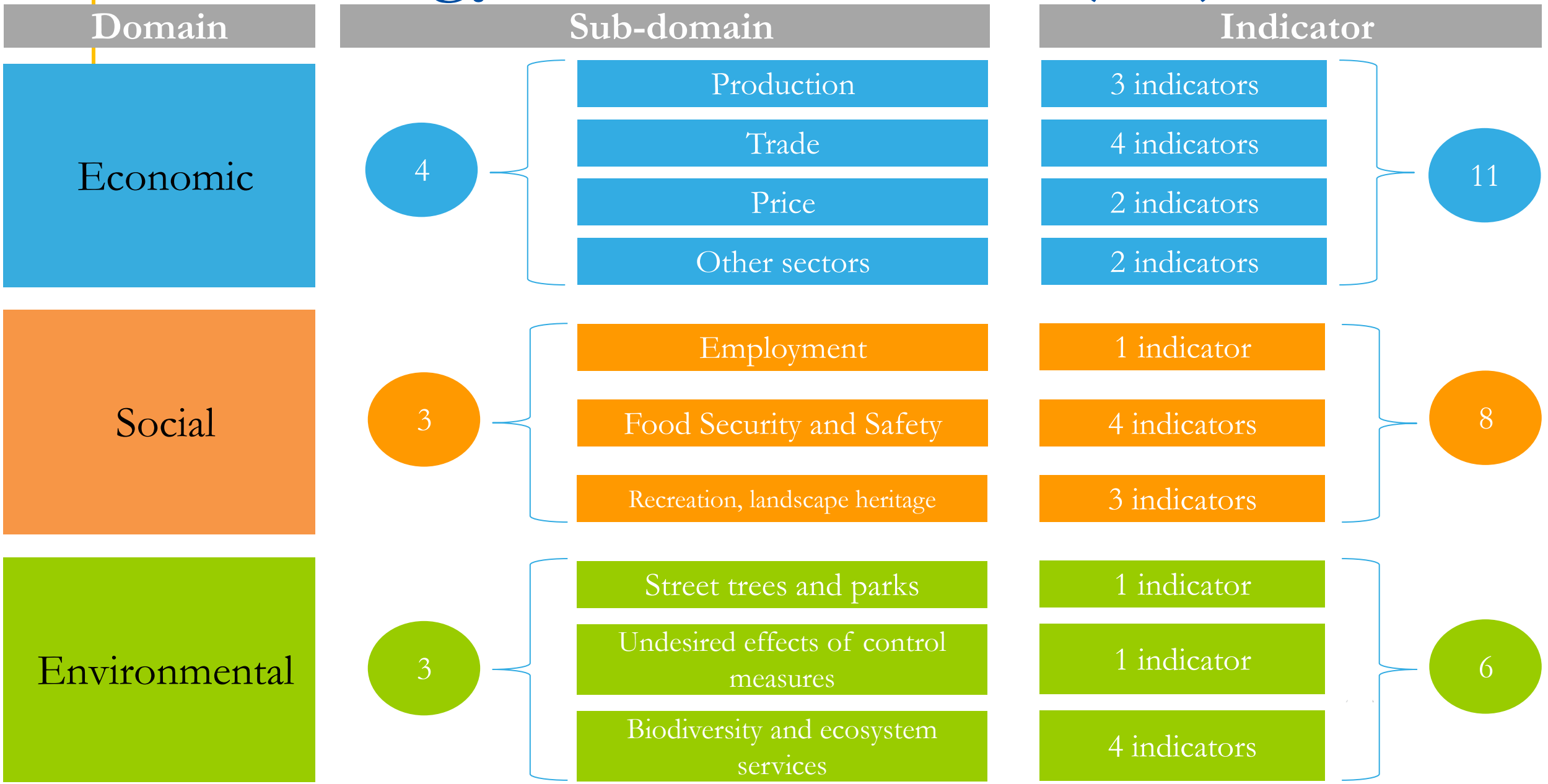
Ranking quarantine pests based on economic, social and environmental impacts

Methodology – Full Assessment (1/4)

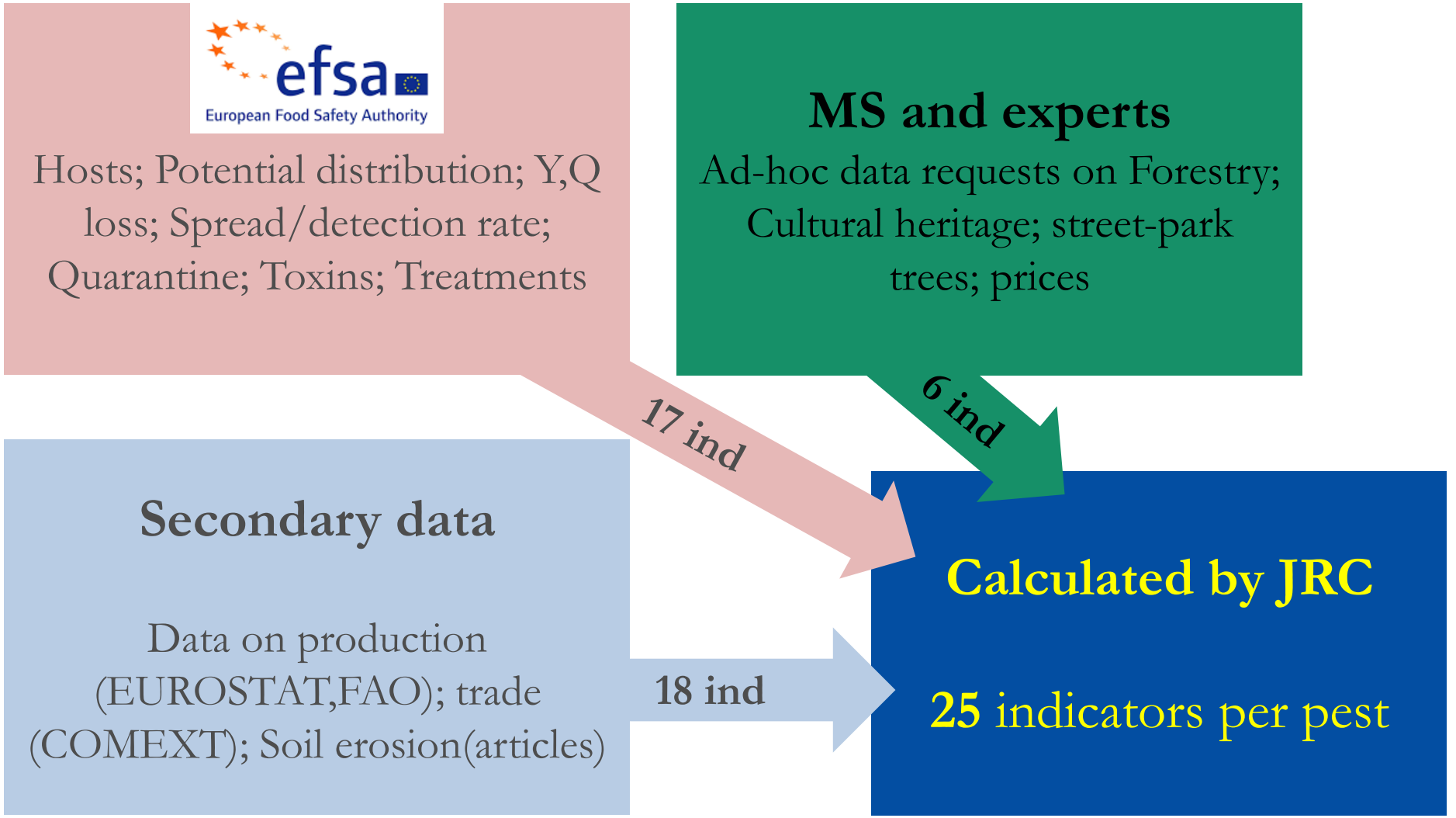
- First attempt to implement article 6(2) of the Plant Health Regulation 2016/2031 undertaken between 2018 and 2019
- Developed a composite indicator (The Impact Indicator for Priority Pests 'I2P2', Sánchez et al. 2019) to evaluate the potential economic, social and environmental impacts of pests if widespread in the Union Territory
- Indicator applied to 28 Union Quarantine Pests put forward by MS and decided in the framework of the PAFF
- Indicator **very data hungry** including several ad-hoc data requests to MS and EKEs conducted by EFSA

Sánchez, B.; Barriero-Hurle, J.; Soto-Embodas, I.; Rodriguez-Cerezo, E. (2019). *The Impact Indicator for Priority Pests (I2P2): a tool for ranking pests according to Regulation (EU) No 2016/2031*. JRC Technical Report, Publications Office of the European Union, Luxembourg.

Methodology – Full Assessment (2/4)



Methodology – Full Assessment (3/4)



Methodology – Full Assessment (4/4)

Skip for Time

- Pest is **already present throughout the area of potential establishment** in the EU.
- Pest has reached **a stable spatial distribution / maximum potential abundance** based on the current environmental conditions and production practices.
- Yield/quality losses are evaluated in a **time frame long enough to take into account the temporal variation** in pest population dynamics.

List based on the past assessment

ANNEX
List of priority pests

Agrilus anxius Gory
Agrilus planipennis Fairmaire
Anastrepha ludens (Loew)
Anoplophora chinensis (Thomson)
Anoplophora glabripennis (Motschulsky)
Anthonomus eugenii Cano
Aromia bungii (Faldermann)
Bactericera cockerelli (Sulc.)
Bactrocera dorsalis (Hendel)
Bactrocera zonata (Saunders)
Bursaphelenchus xylophilus (Steiner et Bührer) Nickle *et al.*
Candidatus Liberibacter spp., causal agent of Huanglongbing disease of citrus/citrus greening
Conotrachelus nenuphar (Herbst)
Dendrolimus sibiricus Tschetverikov
Phyllosticta citricarpa (McAlpine) Van der Aa
Popillia japonica Newman
Rhagoletis pomonella Walsh
Spodoptera frugiperda (Smith)
Thaumatotibia leucotreta (Meyrick)
Xylella fastidiosa (Wells *et al.*)

L 260/8 EN Official Journal of the European Union 11.10.2019

COMMISSION DELEGATED REGULATION (EU) 2019/1702

of 1 August 2019

supplementing Regulation (EU) 2016/2031 of the European Parliament and of the Council by establishing the list of priority pests

- 28 pests ranked with I2P2
- 20 included in the list of priority pests

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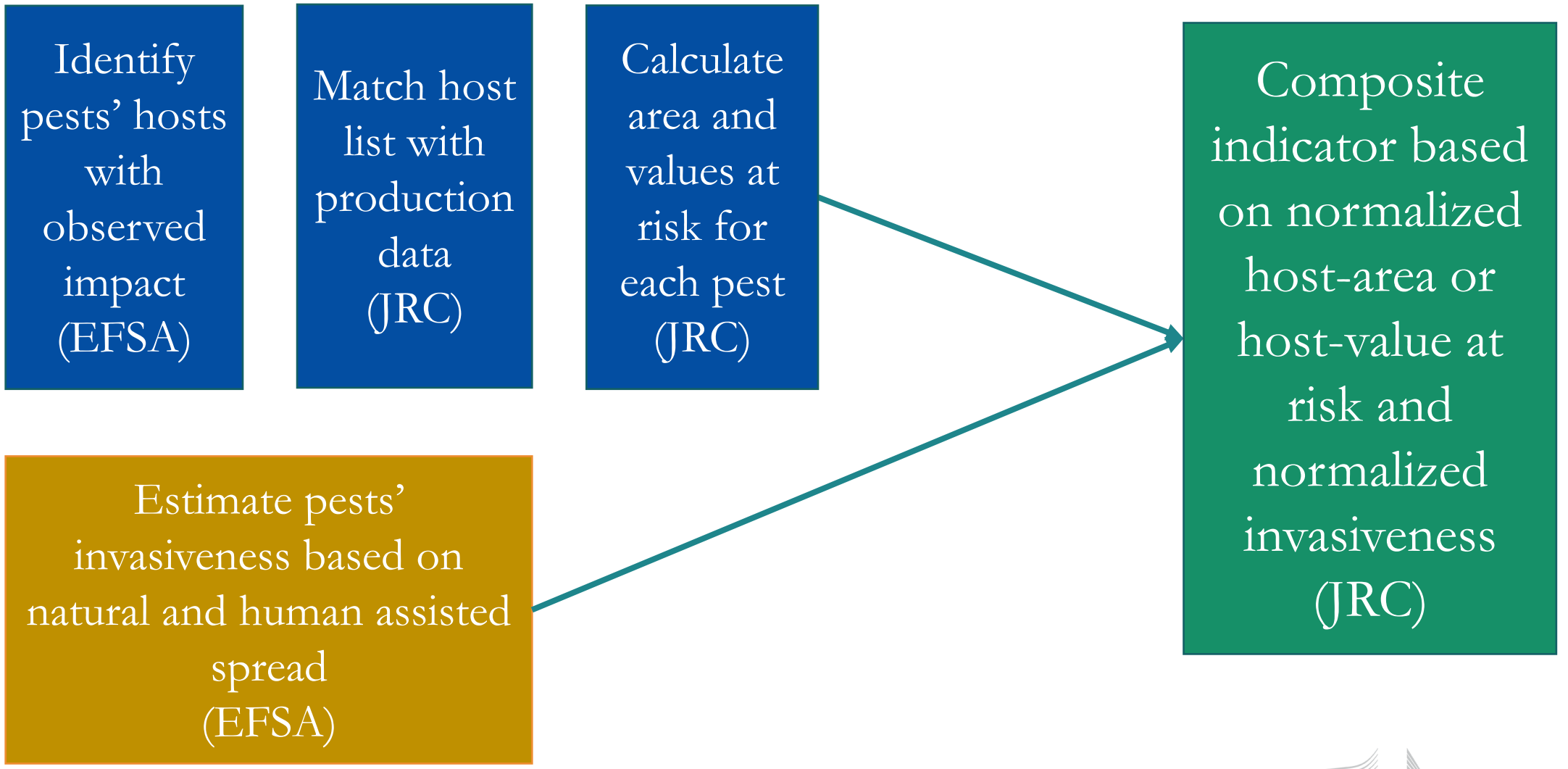
Methodology – Shortlisting (1/6)

- **Motivation: Expand the ranking exercise to all Union Quarantine Pests (~400)**
- Full fledge I2P2 for all pests is not feasible
- Simple indicator that can be used with numerous pests within a reasonable timeframe
  - Focus on readily available data that can be used on an automatized manner
- Apply the simple indicator to the full list of UQPs under Commission Implementing Regulation (EU) 2019/2072 to check consistency
- Use the shortlisting-rank to select a manageable number of pests to be assessed using the full I2P2 approach (considering operational constraints)

Methodology – Shortlisting (2/6)



https://zenodo.org/records/10407910
https://zenodo.org/records/10417716

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Methodology – Shortlisting (3/6)

Filter 5: Spread capacity												
Natural spread							Human assisted spread					Total
Vector or carrier needed		Flight		Natural means			Short distance In field movement Machinery and tools	Long distance Beyond field				
Present in the EU	Absent from the EU	Good flyer	Not good	Airborne: wind-rain	Pollen	Soil or waterborne		Hitchiking	P4P & Seeds	Fruits & vegetables	Wood products	Max
5	1	5	1	3	2	1	2	5	5	2	2	34

https://zenodo.org/records/10407910
https://zenodo.org/records/10417716

Methodology – Shortlisting (4/6)

- Out of the 394 pests EFSA removed 175 pests based on them being macrogroups (20), vectors with no direct impact (65), and pests having no hosts with observed impact (90) (reports below)
- JRC matched hosts to ESTAT area and quantity, FAOSTAT price, and forestry data from MS
- Out of the 219 remaining pests, 9 could not be matched to any economic host data
- The normalized invasiveness-score (EFSA) and normalized host value/area is aggregated to compute a composite index, which is used for ranking the 210 remaining pests

https://zenodo.org/records/10407910
https://zenodo.org/records/10417716

Methodology – Shortlisting (5/6)

- Host quantity/area from ESTAT and prices from FAOstat
- Median values for the years 2017 to 2022
- The 210 evaluated pests cover 73 unique crop- and 86 unique forestry-hosts
- We compute results for each pest-host-country combination, which are aggregated across countries, and for the pest-ranking across hosts
- For forestry, we use the previously collected data on growing stocks, areas, and prices **at genus-level** in different Member States

% of identified hosts matched for the 219 analysed pests:

Min.	25-perc	Median	Mean	75-perc	Max.
0	78	100	83	100	100

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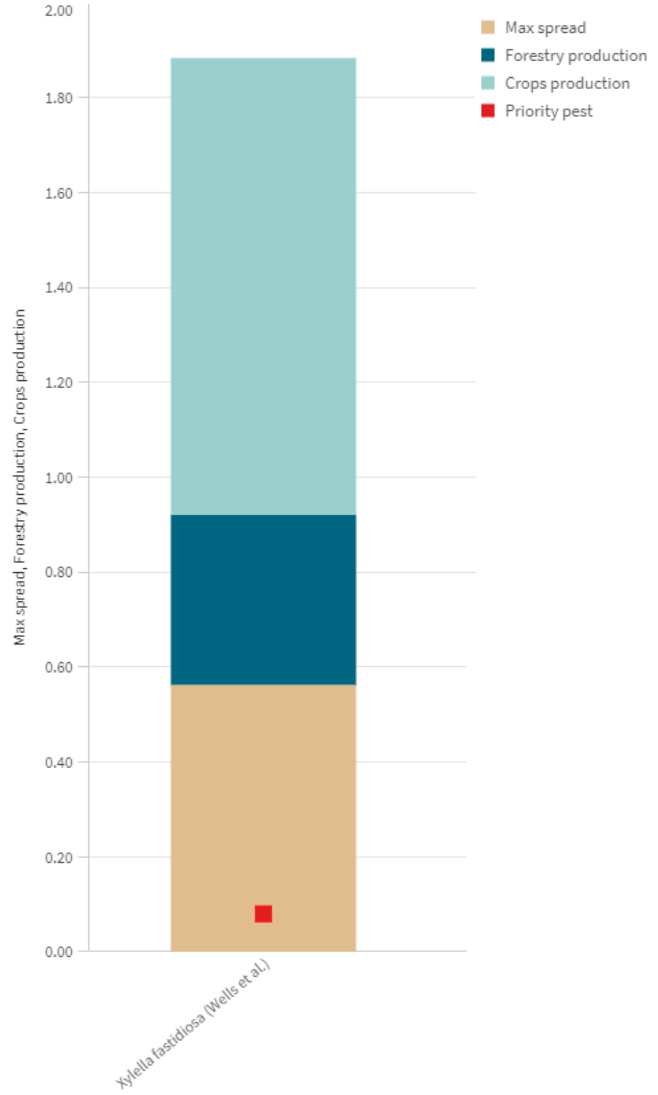
Methodology – Shortlisting (6/6)

- We compute two composite indices:
  - The normalized invasiveness-score (EFSA) + normalized host value
  - The normalized invasiveness-score (EFSA) + normalized host area
- The value of invasiveness, crop-host value/area, and forestry-host value/area all range between 0 and 1 (interpretation as relative scores)
- The individual elements are aggregated using equal weighting (theoretical maximum is 3)



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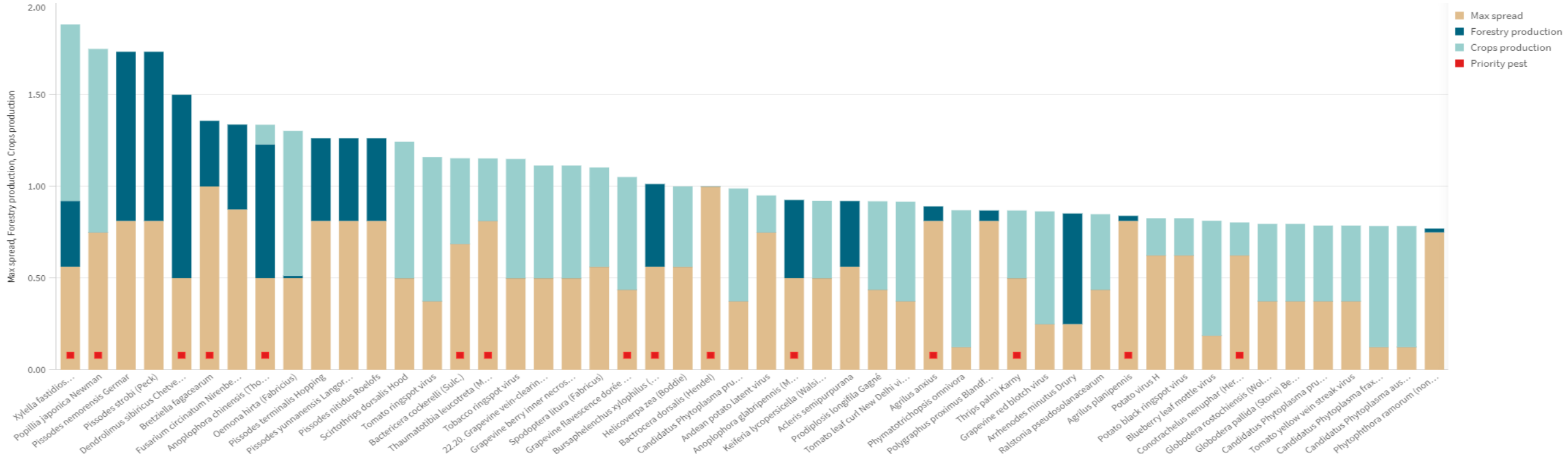
Results – Ranking by host value & invasiveness



Xylella, Popillia, Pissodes, Pissodes, Dendrolimus, etc

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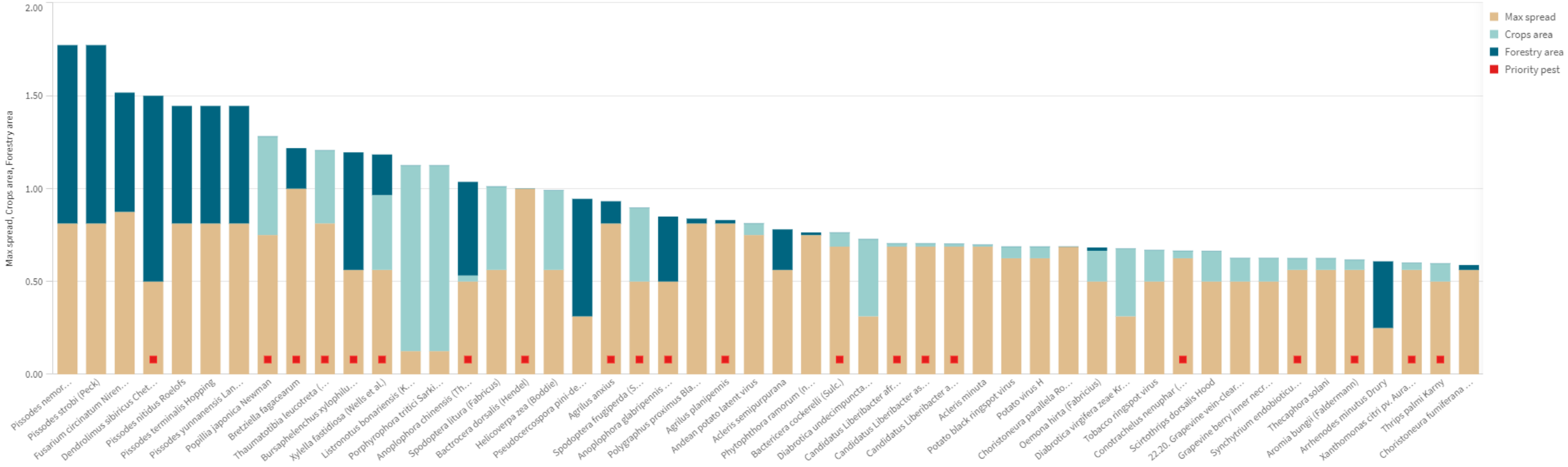
Results – Ranking by host area & invasiveness



Pissodes, Pissodes, Fusarium, Dendrolimus, Pissodes etc

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Results – Top 50 by pest-types

- We look at the top 50 highest ranked pests in both scenarios
- Out of 66 pests, 22 were previously assessed leaving 44 new pests

	Agroforestry	Crop	Forestry	NA	sum
Top 50 by value	3	30	16	1	50
previously analysed	*2*	*6*	*6*	*1*	*15*
Top 50 by area	3	27	18	2	50
previously analysed	*2*	*12*	*6*	*1*	*21*
Top 50 in both	3	14	16	1	34
previously analysed	*2*	*5*	*6*	*1*	*14*

Note: the pest type is entirely defined by our host-matching to crop and forestry databases. NA means not available, and this occurs if the host-key could not be matched to any data. For the 12 identified here, this happens when they affect non-EU crops that have FAOstat keys (coconut, oil palm, date palm, etc.).

Results – Top 50 by scenario

Both scenarios (20 pests)

Pest name	Composite Value	Composite Area
Pissodes nemorensis Germar	1.73	1.77
Pissodes strobi (Peck)	1.73	1.77
Fusarium circinatum Nirenberg & O'Donnell	1.34	1.52
Oemona hirta (Fabricius)	1.30	0.68
Pissodes terminalis Hopping	1.26	1.45
Pissodes yunnanensis Langor & Zhang	1.26	1.45
Pissodes nitidus Roelofs	1.26	1.45
Scirtothrips dorsalis Hood	1.24	0.66
Tobacco ringspot virus	1.15	0.67
Grapevine vein-clearing virus	1.11	0.63
Grapevine berry inner necrosis virus	1.11	0.63
Spodoptera litura (Fabricus)	1.10	1.01
Helicoverpa zea (Boddie)	1.00	0.99
Andean potato latent virus	0.95	0.81
Acleris semipurpurana (Kearfott)	0.92	0.78
Polygraphus proximus Blandford	0.87	0.84
Arrhenodes minutus Drury	0.85	0.61
Potato virus H	0.83	0.69
Potato black ringspot virus	0.83	0.69
Phytophthora ramorum (non-EU isolates) Werres, De Cock & Man in 't Veld,	0.77	0.76

Production value (15 pests)

Pest name	Composite Value
Tomato ringspot virus	1.16
Phymatotrichopsis omnivora (Duggar) Hennebert	0.87
Candidatus Phytoplasma fraxini (reference strain) Griffiths *et al.*	0.78
Candidatus Phytoplasma australiense Davis *et al.* (reference strain)	0.78
Blueberry leaf mottle virus	0.81
Candidatus Phytoplasma pruni-related strain (North American grapevine yellows, NAGYIII) Davis *et al.*	0.99
Grapevine red blotch virus	0.86
Tomato leaf curl New Delhi virus	0.92
Prodiplosis longifila Gagné	0.92
Keiferia lycopersicella (Walsingham)	0.92
Globodera rostochiensis (Wollenweber) Behrens	0.80
Globodera pallida (Stone) Behrens	0.80
Ralstonia pseudosolanacearum Safni *et al.*	0.85
Candidatus Phytoplasma pruni-related strains (Clover yellow edge, Potato purple top Akpot7, MT117, Akpot6; PPT-COAHP, -GTOP)	0.79
Tomato yellow vein streak virus	0.79

Host area (9 pests)

Pest name	Composite Area
Listronotus bonariensis (Kuschel)	1.13
Porphyrophora tritici Sarkisov *et al.*	1.13
Pseudocercospora pini-densiflorae (Hori & Nambu) Deighton	0.95
Diabrotica undecimpunctata howardi Barber	0.73
Acleris minuta (Robinson)	0.70
Choristoneura parallela Robinson	0.69
Diabrotica virgifera zeae Krysan & Smith	0.68
Thecaphora solani (Thirumulachar & O'Brien) Mordue	0.63
Choristoneura fumiferana Clemens	0.59

Agroforestry: 1

Crop: 31

Forestry: 12

Total: 44

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Results – Pests selected by PAFF for I2P2

Both scenarios (20 pests)

Pest name	Composite Value	Composite Area
1. Pissodes nemorensis Germar	1.73	1.77
2. Pissodes strobi (Peck)	1.73	1.77
Fusarium circinatum Nirenberg & O'Donnell	1.34	1.52
Oemona hirta (Fabricius)	1.30	0.68
3. Pissodes terminalis Hopping	1.26	1.45
4. Pissodes yunnanensis Langor & Zhang	1.26	1.45
5. Pissodes nitidus Roelofs	1.26	1.45
Scirtothrips dorsalis Hood	1.24	0.66
Tobacco ringspot virus	1.15	0.67
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6. Spodoptera litura (Fabricus)	1.10	1.01
7. Helicoverpa zea (Boddie)	1.00	0.99
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Tomato yellow vein streak virus	0.79

Host area (9 pests)

Pest name	Composite Area
16. Listronotus bonariensis (Kuschel)	1.13
17. Porphyrophora tritici Sarkisov et al.	1.13
18. Pseudocercospora pini-densiflorae (Hori & Nambu) Deighton	0.95
19. Diabrotica undecimpunctata howardi Barber	0.73
20. Acleris minuta (Robinson),	0.70
21. Choristoneura parallela Robinson	0.69
22. Diabrotica virgifera zeae Krysan & Smith	0.68
Thecaphora solani (Thirumulachar & O'Brien) Mordue	0.63
23. Choristoneura fumiferana Clemens	0.59

Note: Excluded were pests with low risk of introduction, for which diagnostic differentiation is difficult, that are subject to effective control measures and whose priority status would not improve the current phytosanitary system, designated to become RNQPs, with a very narrow geographic distribution and already more widely present in the EU.

Ongoing work

- Improvements to the I2P2 indicators:
  - New environmental indicators are being developed and calculated by EFSA
  - New social forestry indicators are being developed and calculated by JRC
  - Improved sensitivity analysis on the aggregation step by JRC
- I2P2 is being updated with the latest data available for **EU27**
- EKEs (Expert Knowledge Elicitations) are being updated/performed by EFSA
- 23 new pests to be further analysed via the full I2P2 + 23 EKEs to be updated

Timeline

- EFSA update EKEs - October 2024
- JRC update I2P2 calculations - February 2025
- Discussion and adoption in the PAFF
- Publication of new Delegated Act on PP list Q2 2025

Thank you

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European Commission

Previous 28 proposed by MS

INSECTS

1. Agrilus anxius forestry
2. Agrilus planipennis forestry
3. Anastrepha ludens crops
4. Anoplophora chinensis agroforestry
5. Anoplophora glabripennis forestry
6. Anthonomus eugenii crops
7. Aromia bungii agroforestry
8. Bactericera cockerelli crops
9. Bactrocera dorsalis (including B. invadens) crops
10. Bactrocera zonata crops
11. Conotrachelus nenuphar crops
12. Dendrolimus sibiricus forestry
13. Popillia japonica crops
14. Rhagoletis pomonella Tephritidae (non-European)) crops
15. Spodoptera frugiperda crops
16. Thaumatotibia leucotreta crops
17. Thrips palmi crops

BACTERIA

18. Candidatus Liberibacter spp. (citrus greening) crops
19. Clavibacter michiganensis subsp. sepedonicus crops
20. Ralstonia solanacearum crops
21. Xylella fastidiosa crops
22. Xanthomonas citri crops
23. Grapevine flavescence dorée crops

NEMATODES

24. Bursaphelenchus xylophilus forestry

FUNGI

25. Ceratocystis fagacearum forestry
26. Phyllosticta citricarpa crops
27. Synchytrium endobioticum crops
28. Tilletia indica crops

Domain	Sub-domain	Indicator
Economic impact	Production impacts	I.1 Maximum value of production losses
		I.2 Share of EU production affected
		I.3 Difficulty of eradication
	Trade impacts	I.4 Number of importing countries banning trade
		I.5 Value of export losses
		I.6 Share of export losses over total production
		I.7 Trade dispersion
	Price and market Impacts	I.8 Change in domestic price
		I.9 Change in domestic production over imports
	Impacts on other agents	I.10 Upstream effect
		I.11 Downstream effect

Domain	Sub-domain	Indicator
Social impact	Impact on employment	I.12 Job losses
	Impact on Food Security and Food safety	I.13 Share of caloric supply
		I.14 Share of protein supply
		I.15 Share of fat supply
		I.16 Capacity to produce fungal toxins
	Impact on recreation, landscape and cultural heritage	I.17 Share of holdings with OGA
		I.18 Products covered by EU quality labels
		I.19 UNESCO World Heritage sites

Domain	Sub-domain	Indicator
Environmental impact	Impact on street trees, parks and natural and planted areas	I.20 Use of hosts as street trees and in parks
	Undesired impacts of control measures	I.21 Undesired effects of control measures
	Impact biodiversity and ecosystem services	I.22 Soil erosion
		I.23 Number of protected species and habitats related to hosts
		I.24 Share of Natura 2000 area and sites affected
		I.25 Share under sustainable management practices

I2P2 indicator: JRC & EFSA - integrating economics & pathology

European Commission

JRC TECHNICAL REPORTS

The Impact Indicator for Priority Pests (I2P2): a tool for ranking pests according to Regulation (EU) No 2016/2031

Sánchez, Berta
Barreiro-Hurle, Jesús
Soto Embodas, Iria
Rodriguez-Cerezo, Emilio

2019

Joint Research Centre

EUR 29793 EN

European Commission

Directorate-General for Health and Food Safety (DG SANTE)

A joint methodology on

SCIENTIFIC REPORT

EFSA Journal

ADOPTED: 17 May 2019

doi: 10.2903/j.efsa.2019.5731

Report on the methodology applied by EFSA to provide a quantitative assessment of pest-related criteria required to rank candidate priority pests as defined by Regulation (EU) 2016/2031

European Food Safety Authority (EFSA),
Richard Baker, Gianni Gilioli, Carsten Behring, Denise Candiani, Andrey Gogin, Tomasz Kaluski, Mart Kinkar, Olaf Mosbach-Schulz, Franco Maria Neri, Riccardo Siligato, Giuseppe Stancanelli and Sara Tramontini

Abstract

In agreement with Article 6(2) of the Regulation (EU) 2016/2031 on protective measures against pests of plants, the European Commission has been tasked by the Council and European Parliament to establish a list of Union quarantine pests which qualify as priority pests. The prioritisation is based on the severity of the economic, social and environmental impact that these pests can cause in the Union territory. The Commission's Joint Research Centre (JRC) is in charge of developing a methodology based on a multi-criteria decision analysis and composite indicators. In this context, EFSA has provided technical and scientific data related to these pests, in particular: (i) the potential host range and distribution of each of these pests in the Union territory at the level of NUTS2 regions; (ii) parameters quantifying the potential consequences of these pests, e.g. crop losses in terms of yield and quality, rate of spread and time to detection. Expert knowledge elicitation methodology has been applied by EFSA in order to provide those parameters in a consistent and transparent manner.

Keywords: control, detection, host plants, potential distribution, quality loss, spread, yield loss

Requestor: European Commission

Question number: EFSA-Q-2017-00558

Correspondence: alpha@efsa.europa.eu

efsa
European Food Safety Authority

Data Interoperability Project

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European Commission, Joint Research Centre, D4 Economics of the Food System

2024 Annual Meeting of the International Pest Risk Research Group

Farm Accountancy Data Network (FADN)

- FADN monitors farms' income and business activities
- FADN is the only source of microeconomic data based on harmonized bookkeeping principles
- Based on national surveys and only covers commercial agricultural holdings
- Aims to provide representative data according to three categories: region, economic size and type of farming
- Holds thousands of variables on expenses, capital, farm structure, and output
- **Considered sensitive data that generally come without the collected GPS coordinates**

https://agriculture.ec.europa.eu/data-and-analysis/farm-structures-and-economics/fadn_en#:~:text=The%20farm%20accountancy%20data%20network,farms'%20income%20and%20business%20activities.

Approved request for FADN with GPS coordinates

- Justification for EC internal access:
  - Modelling work in D4
  - Activities within CORES4AGRI
  - Collaboration AGRI – **JRC within AA on Data Interoperability**

D4 tasks in the Data Interoperability AA

Phase 1 – integrated database

- Task 1.1 is the Python-based workflow for the data integration into FADN
- Task 1.2 is the showcase on generalizability of the workflow on new data (landscape complexity)
- **Task 1.3 is the calculation of farm-level indicators based on the environmental data**
- Task 1.4 is linking DataM with the JEODPP to explore the feasibility of hosting an operational workflow after the completion of the project

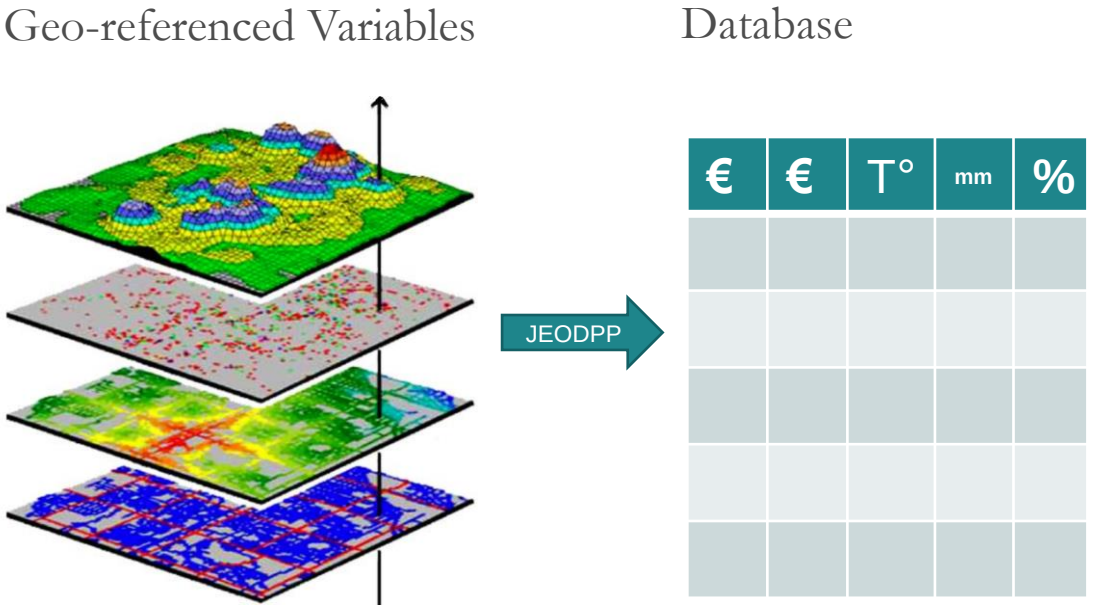
Phase 2 – Use cases

- Task 2 is a collection of case studies (to be shown in a minute)
- Task 3 is an assessment of the hurdles to arrive at an independently operational workflow as well as the publication of the already integrated environmental data

Proposal: build a comprehensive database holding environmental and farm-level economic variables to enable more holistic modelling work and ex-post analysis of policy impacts

We would match around 200,000 geo-referenced variables with FADN data via the geo-location of the farm holding. **Variables currently comprise**:

- **Climate from ECMWF*** on daily data ranging from 2000 to 2023 on cloud cover, precipitation, solar radiation, snow, vapour pressure, wind speed, humidity, temperature
- **Soil data from ESDAC** on physical soil, chemical soil properties, heavy metal concentration, soil erosion, change in organic carbon, soil degradation indices
- **Biodiversity data** on natural pest control, pollination services, biodiversity intactness



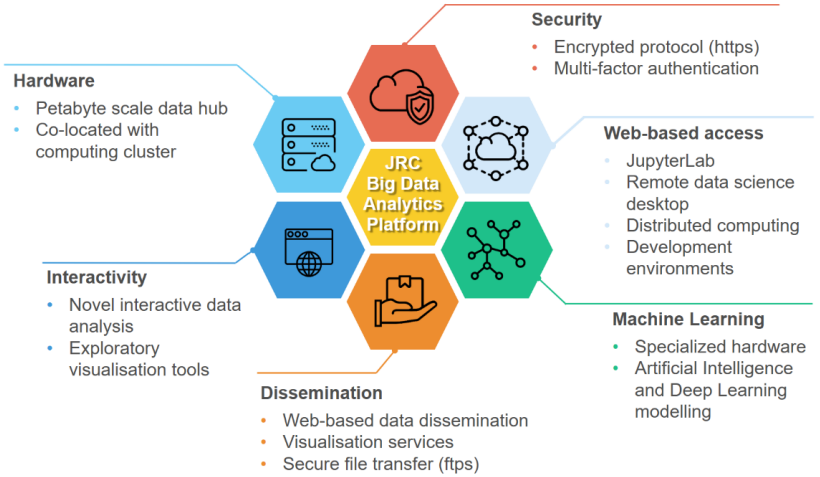
Final product is a dataset of FADN data extended with environmental variables

European Commission

*https://cds.climate.copernicus.eu/cdsapp#!/dataset/sis-agrometeorological-indicators?tab=overview

Methodology - Overview

- Use of **high-performance computing** on the JEODPP
- Our approach is **generic** and can **easily be extended** to new/different data when they become available in the future
- **Three approaches** to **linking data** are computed:
  - Point-based values based on the farm-location
  - Radius-based zonal statistics (mean, min, max, s.d., several quantiles) of values within a 5 and/or 10 km radius around the reported farm-location
  - Regional (NUTS3 and/or LAU) zonal statistics of values
- **Data processing to annual indicators**
  - The tables holding the quantiles of the daily climate information will be processed to annual farm-level indices that can be used for modelling
    - Climate indices following the Copernicus definitions
    - **Agronomically relevant indicators on growing season for key crops**
    - **Pest-pressure indicators for a selection of pathosystems**



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