The BCPC Congress

7-8 November 2023, Harrogate, UK

Potential for reducing pesticide use
lessons from networks of demo farms

Nicolas Munier-Jolain

INRAE

Agroécologie Dijon Unité de Recherche

IPM works

HORIZON 2020 N. 101000339

ÉCOPHYTO DEPHY | RÉDUIRE ET AMÉLIORER L'UTILISATION DES PHYTOS

Context

- **A strong societal and political pressure to reduce pesticide use in Europe**
  European Green Deal, Farm-to-fork strategy >> target : -50% by 2030

- **Some pioneer farmers do use less pesticides than neighbouring farms**
  implementing a holistic vision of Integrated Pest Management (IPM), *based on combinations of non-chemical approaches, including a stronger use of ecology-based processes, more diversity and more biodiversity, eventually combined with innovative technologies (robotics, precision agriculture, Decision Support Systems, biocontrol).*

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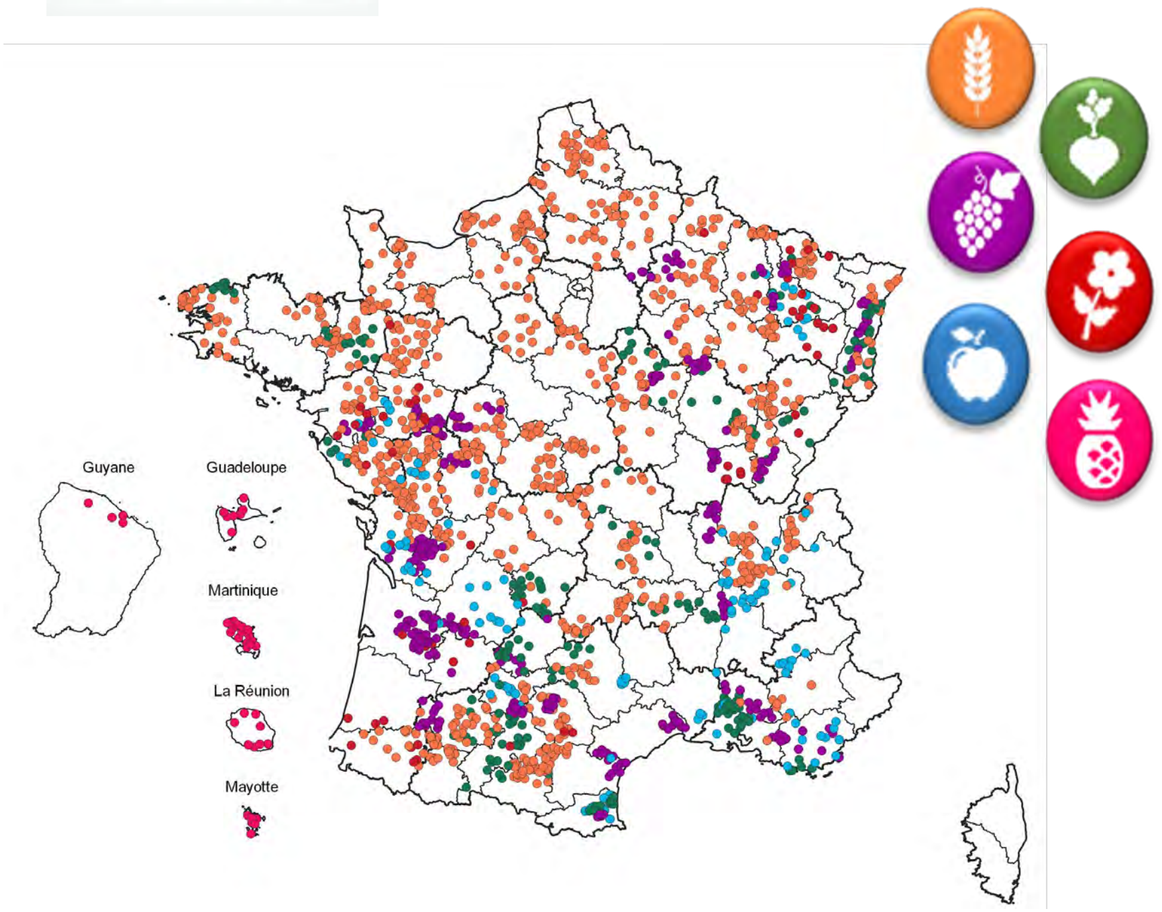
Main objective : demonstrate with those pioneer farmers…
…that IPM indeed works
reduces the reliance on pesticides
while boosting economic profitability at the farm level

IPM works

In France : the DEPHY network of demo farms



Launched in 2010

- **Up to 3.000 volunteer farmers**
  6 agricultural sectors *arable crops, vineyards, orchards, vegetables, ornamentals, tropical crops*

- **Large agricultural partnership**
  chambers of agriculture, farming organizations, academic & applied research…

- **Explicit objective: decrease pesticide use**

- **Explicit approach: cropping system re-design >>**
  holistic view of IPM
  “find my own solutions adapted to my specific context!”
  … through individual and collective support, promoting peer-to-peer knowledge exchange

- A shared information system to collect data

Evolution of the Treatment Frequency Index
from initial practices to 2018-2020

	TFI
Arable Crops : -26%	2,6 → 1,9
Vegetables : -33%	3,5 → 2,3
Ornamentals : -38%	6 → 3,7
Tropical Crops : -18%	4,7 → 3,8
Viticulture : -24%	10,4 → 7,9
Orchards : -35%	15,3 → 10

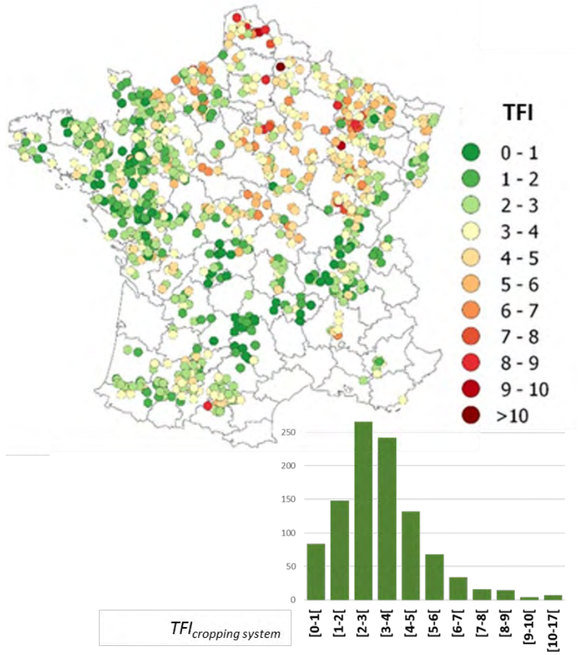
“These averages hide a wide variability across farms!”

A unique database for producing knowledge on IPM systems

PhD Martin Lechenet, 2017

Sector : Arable Field Crops

1. What are the technical strategies ***of farmers using little amounts of pesticides ?***
2. Low TFI = low productivity? Low profitability? ***Cost-efficiency of IPM***
3. Scenario of general adoption of IPM-based systems at the country level – ***what consequences?***



TFI : Treatment Frequency Index

1 Profiles with low TFI always combine several management measures

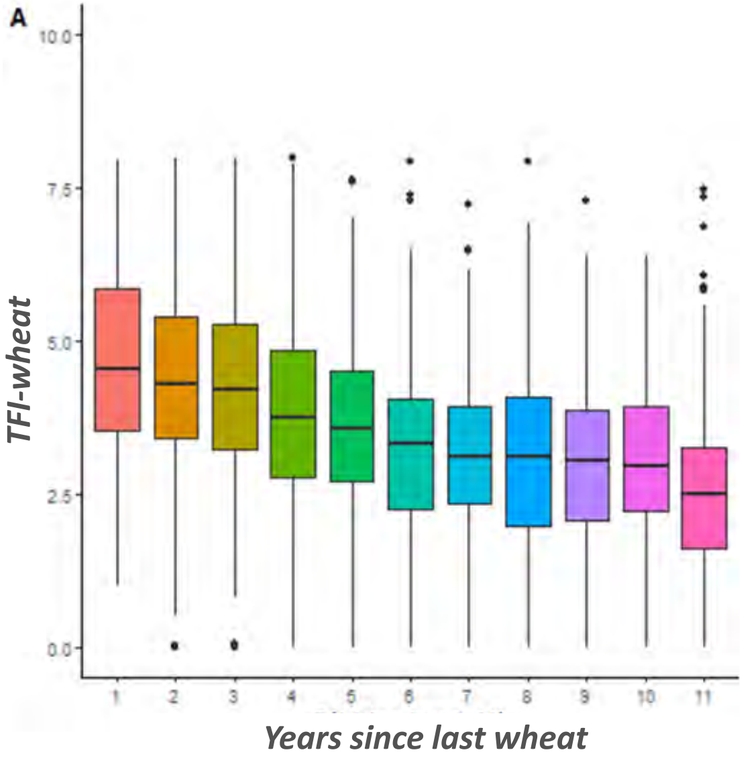
- ✓Temporary grasslands
- ✓Crop diversification : rustic crops, sowing seasons
- ✓Cultivar diversification, desease resistant cultivars
- ✓Cereal delayed sowing dates
- ✓Reduced doses
- ✓Soil tillage – alternating ploughing
- ✓Moderate fertilisation

Lechenet et al., Agricultural Systems 2016

A unique database for producing knowledge on IPM systems

1. What are the technical strategies ***of farmers using little amounts of pesticides ?***

   Effects of crop diversification



Guinet et al., unpublished

A unique database for producing knowledge on IPM systems

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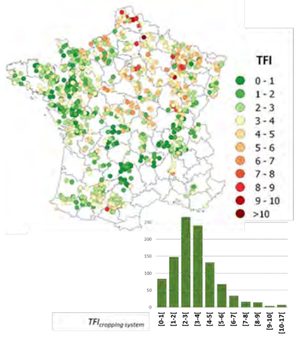
2. Low TFI = low productivity? Low profitability? ***Cost-efficiency of IPM***

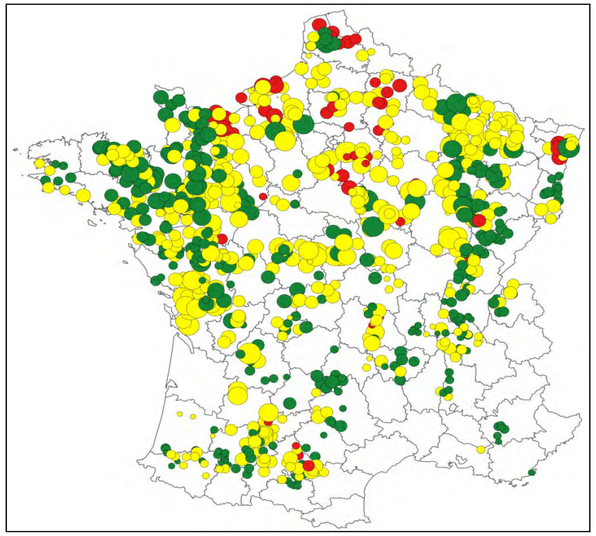
2 ***Correlation between pesticide use and performances*** ***scale = Cropping System***

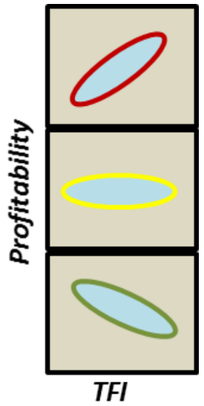


TFI : Treatment Frequency Index

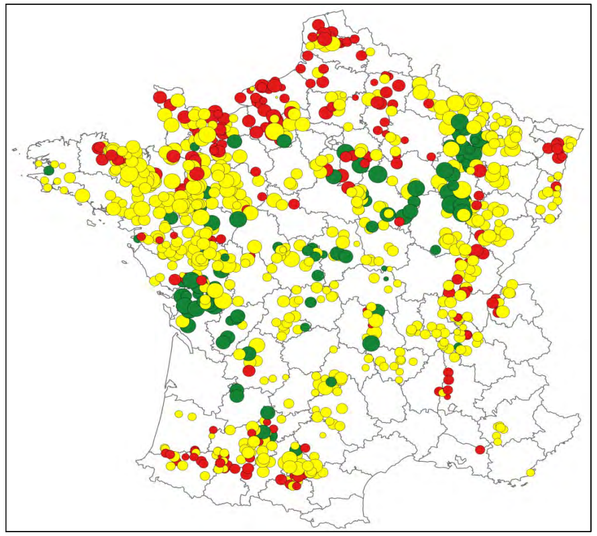
- Positive slope : antagonism
- Nil slope : no antagonism
- Negative slope : no antagonism

productivity





profitability



Lechenet et al., Nature Plants 2017

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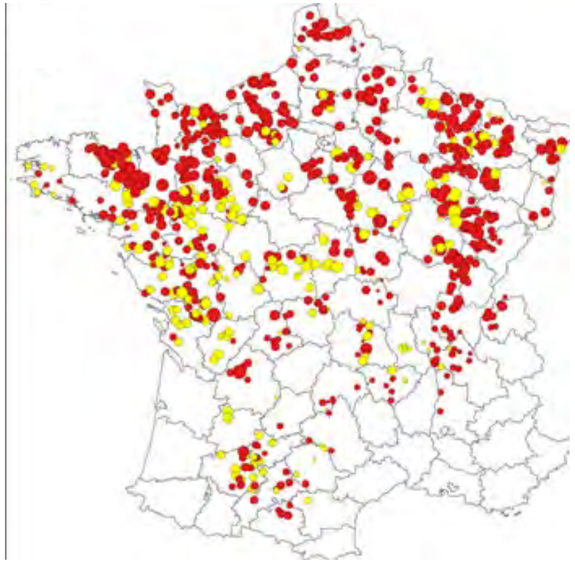
Sector : Arable Field Crops

Correlation between pesticide use and performances ***scale = Wheat crop***

“Scale matters !”

productivity



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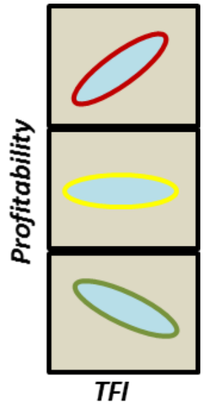
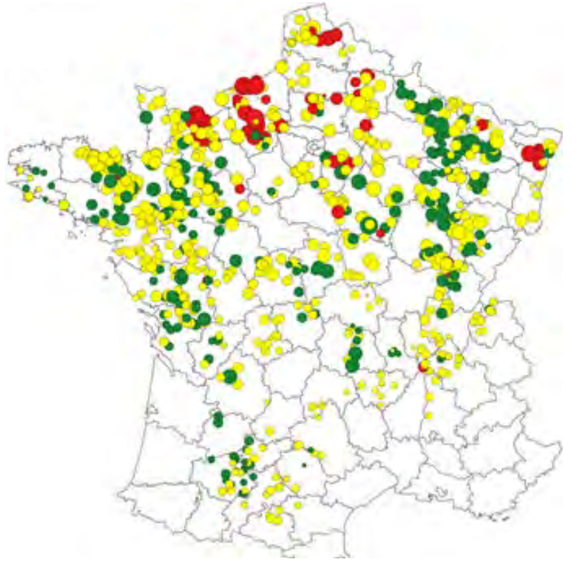


profitability



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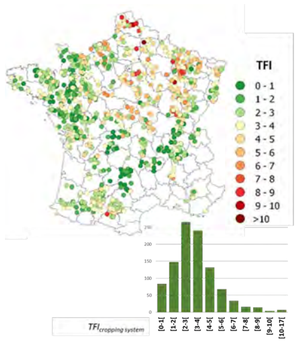
Sector : Arable Field Crops

3. Scenario of general adoption of IPM-based systems at the country level – ***what consequences?***



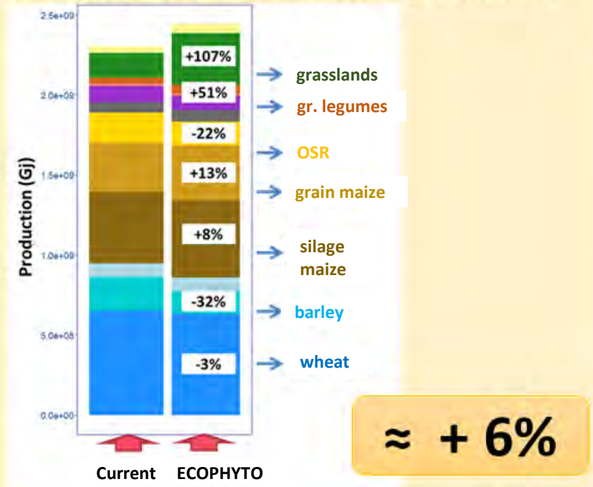
TFI : Treatment Frequency Index

3

Pesticide use

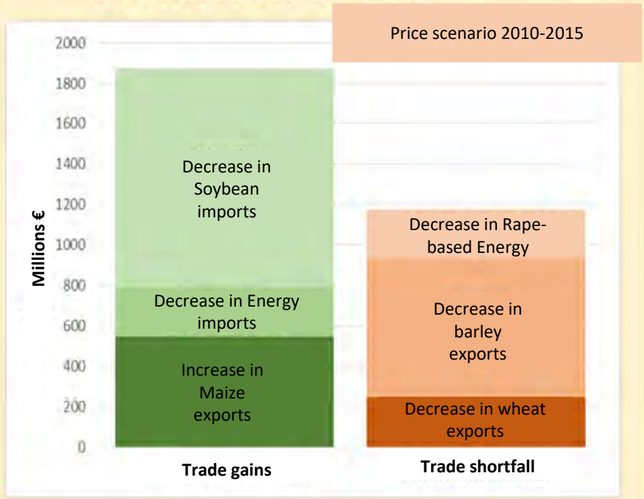
≈ - 40 %

Productivity of French agriculture



≈ + 6%

French trade balance

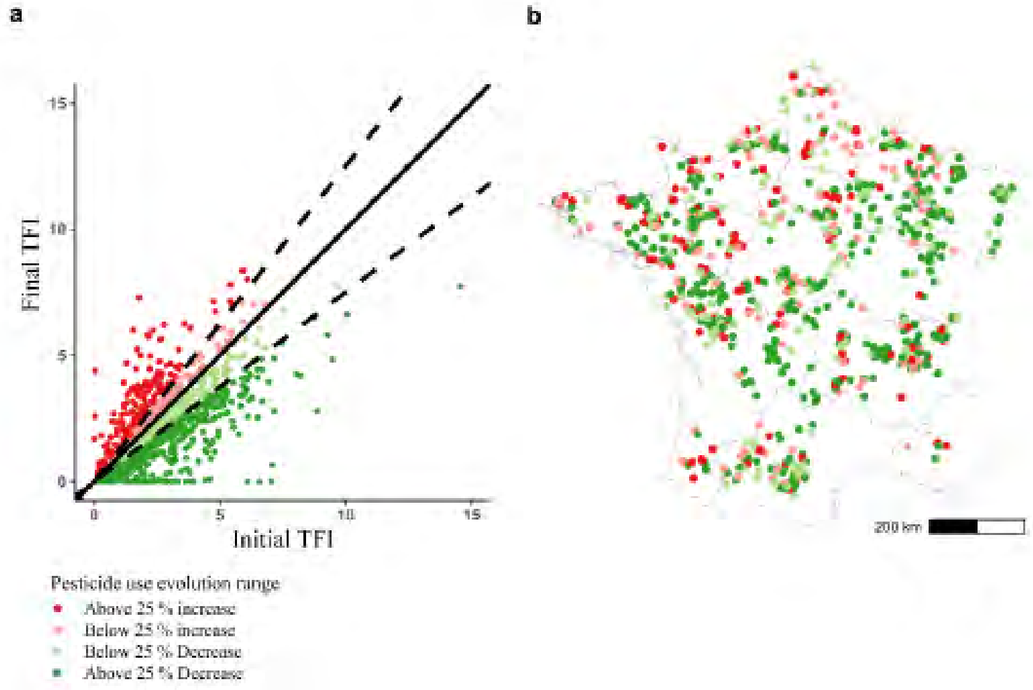


A unique database for producing knowledge on IPM systems

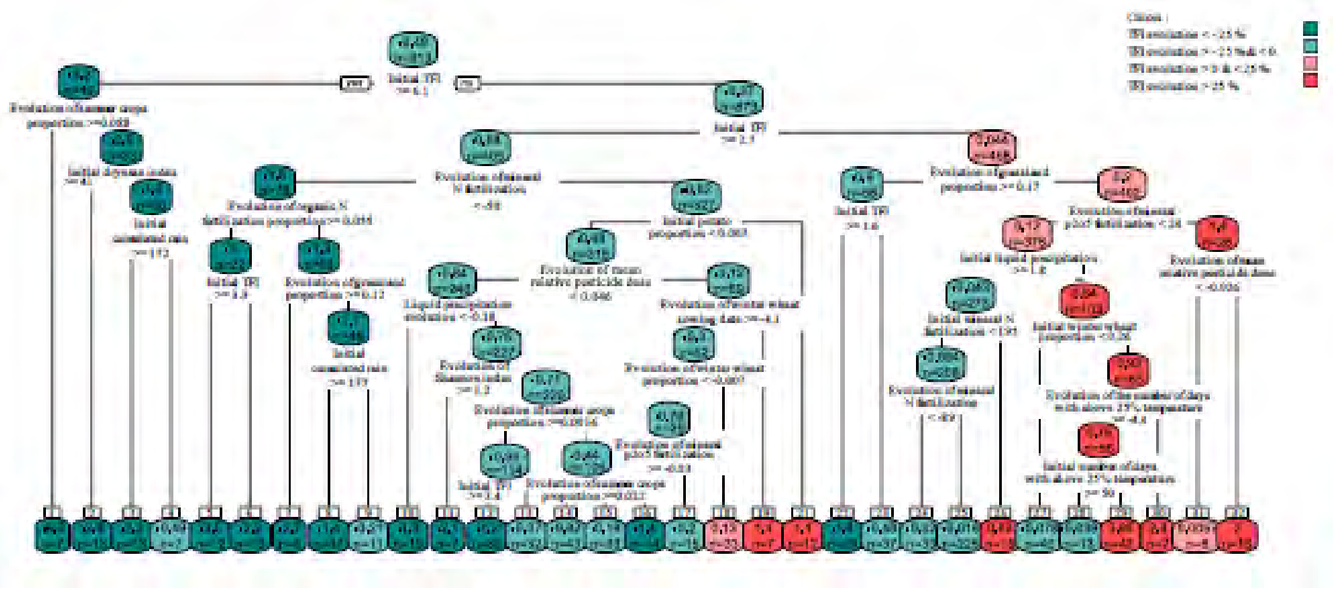
PhD Romain Nandillon, in progress

Evolution of practices along time (≈ 10 years)

Sector : Arable Field Crops



Classification tree : combination of factors explaining Δ IFT$_{final - initial}$



Nandillon et al., submitted

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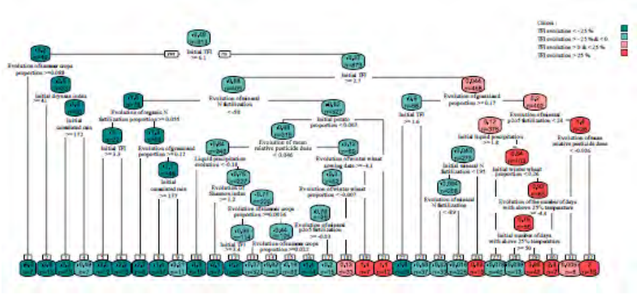
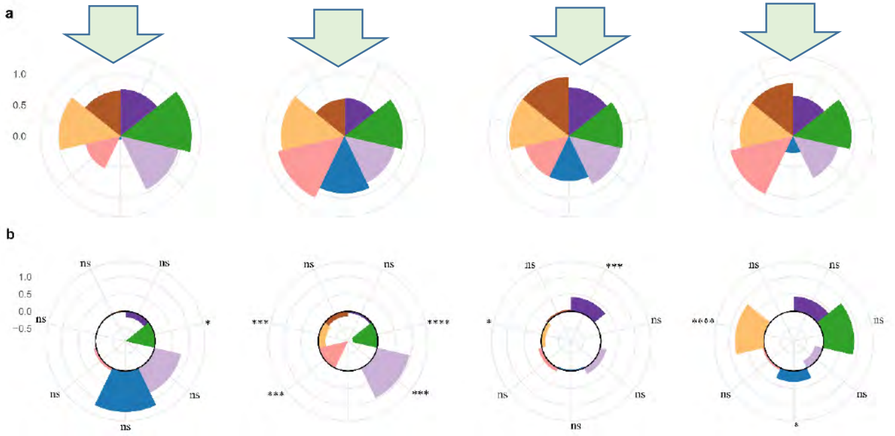


Cluster number	**1**	**21**	**26**	**31**
Number of farms	7	29	40	18
Average initial TFI	9.65	2.14	1.66	1.72
Average TFI evolution	-6.52 ($P \leq 0.05$)	-1.43 ($P \leq 0.0001$)	-0.08^{ns}	1.99($P \leq 0.0001$)



Initial practices

Evolution over time

Management practices

Mechanical weeding frequency

Total N fertilisation

Ploughing frequency

Mean relative PPP dose

Shallow tillage frequency

Shannon index (rotation)

Proportion of organic N fertilisation

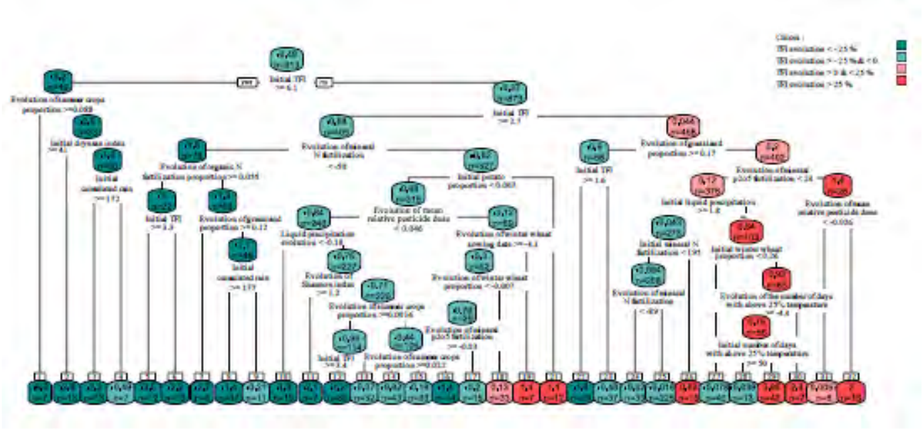
Nandillon et al., submitted

A unique database for producing knowledge on IPM systems

PhD Romain Nandillon, in progress

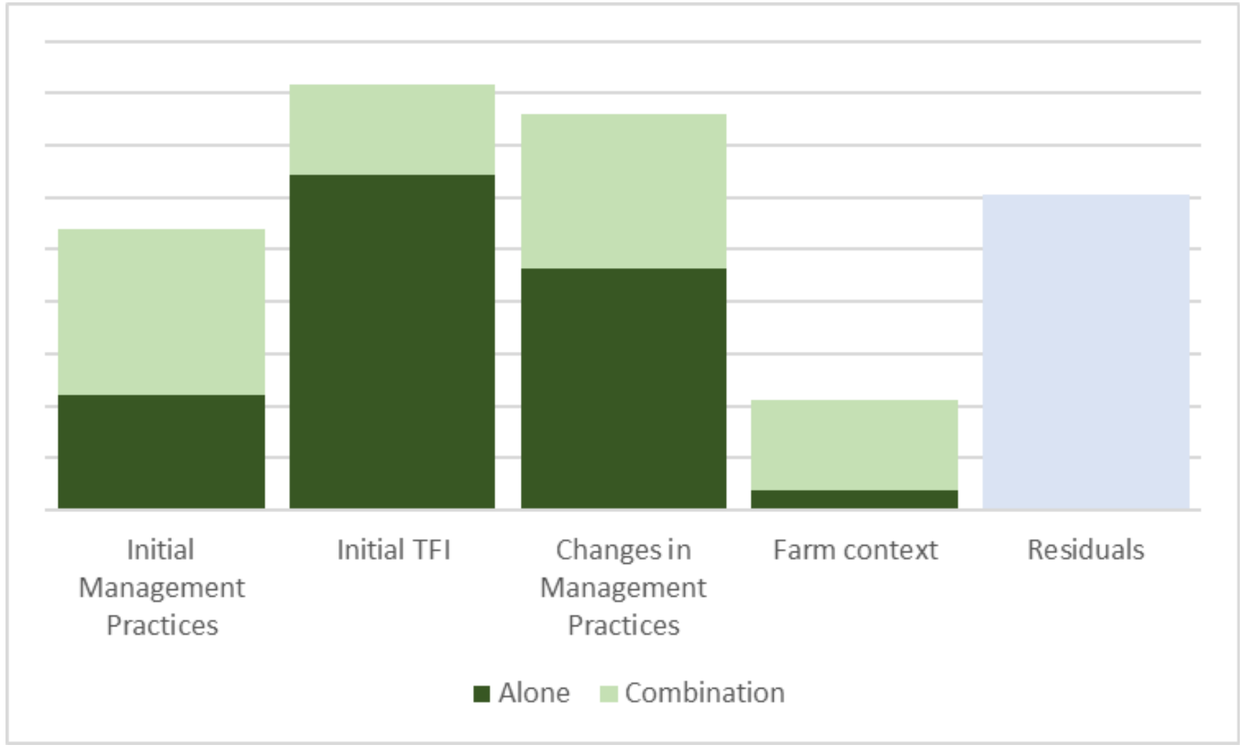
Evolution of practices along time (≈ 10 years)

Sector : Arable Field Crops



Factors explaining Δ IFT$_{final - initial}$

Variance partitionning among groups of factors



Improving decision making for treatments seems to be a major component of the decrease in PPP use

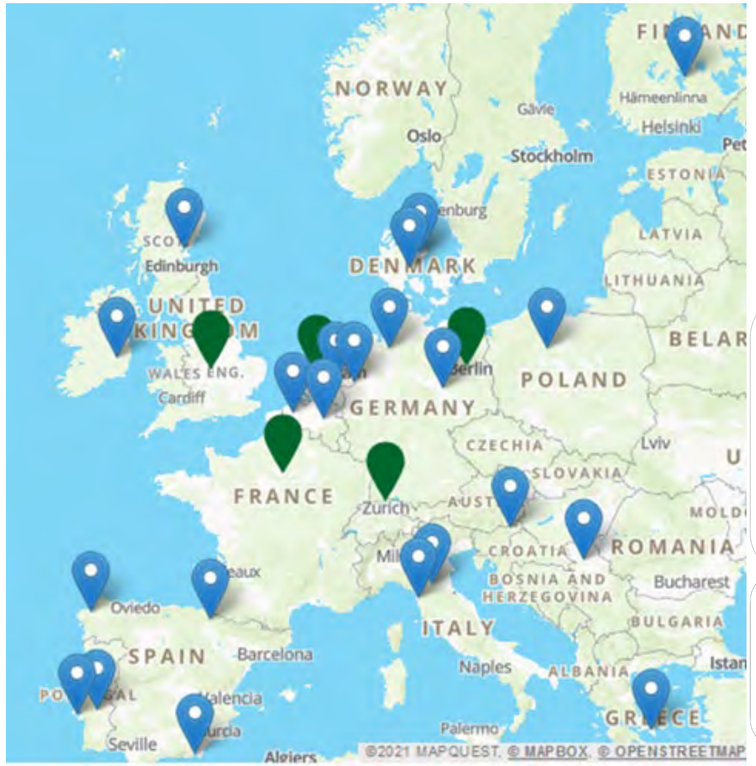
Nandillon et al., submitted

IPMWORKS A European network of demonstration farms promoting low pesticide use and economically efficient management strategies

2020-2024

IPM works

HORIZON 2020
N. 101000339



5 pre-existing national networks

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GROEN

LEAF

JKI

pesti red

22 new networks of demonstration farms
Each led by a « Hub Coach »

PRINCIPLES OF IPM*WORKS* FARM GROUPS

- 10 to 15 farmers *in each hub*
- supported by an advisor-facilitator *Hub Coach*
- farmers exchange practical knowledge
- shared objective *better control pests and diseases with less pesticides, thanks to systemic IPM*
- DEMOs promote cost-effective IPM strategies

« Integrated Pest Management…
… indeed works ! »

FARMDEMO

31 Partners

16 Countries

22 Hub coaches

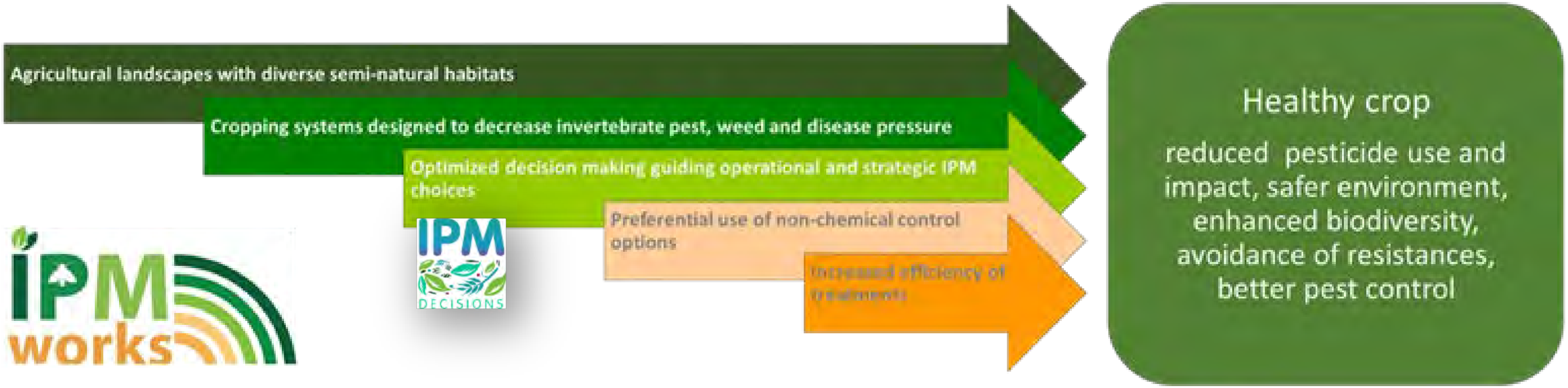
246 Demo Farmers

264 Demo events planned

1 IPM Resource Toolbox

“Holistic” Integrated Pest Management (IPM)

The 5 pillars of holistic IPM



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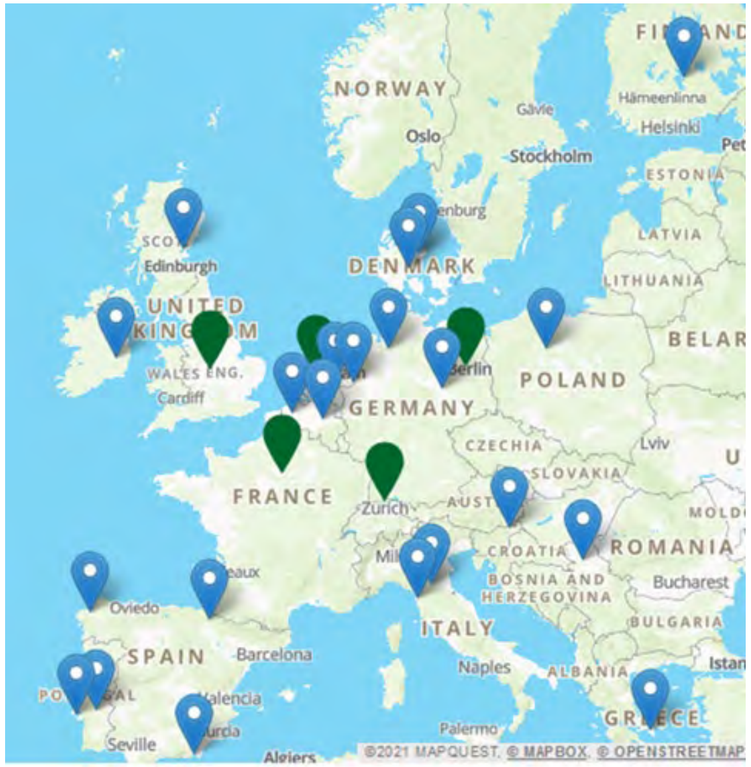

5 sector leaders

in charge of technical knowledge sharing, coordination of activities & communication at the sector level

+ IFOAM coordinating Organic farms

A specific methodology for fostering IPM adoption

Based on peer-to-peer knowledge exchange… and facilitation

- **22 Hub coaches** with a specific Role

'IPMWORKS hubs are guided by a hub coach. Do you want to know how they work? Check it out in this video!'
Jolien Claerbout, Hub Coach at INAGRO, Belgium
https://www.youtube.com/watch?v=7zLqcKrjD7U

1. **Individual advice to farmers** help them « think holistic »… and find non-chemical solutions
2. **Collective coaching of the group**
   facilitate peer-to-peer knowledge exchange
3. **Organisation of Demo events** >> hit other farmers, enlarge the audience
4. **Share information with other Hub Coaches**
   Technical skills of IPM & soft skills for facilitation IPM adoption

5. **+ collect data** describing IPM-strategies
   >> demonstrate to farmers
   - decrease in pesticide use
   - cost-efficiency

A specific methodology for fostering IPM adoption

Based on peer-to-peer knowledge exchange… and facilitation

Strategy for data collection *in IPMWORKS farms*

1 Survey #1 : 2021

Qualitative data : IPM awareness, IPM adoption, approximate of PPP use, and self-assessment

2 Survey #2 : 2023

Quantitative data Details of cropping systems and crop management

>> Computation of indicators of pesticide use and pesticide impact, indicators of cost-efficiency

>> Demonstration that « IPM indeed works ! »

3 Enquête #3 : 2024

Similar to Survey#1

Evaluation of changes in IPM adoption in IPMWORKS farms thanks to the work done in hubs

A compromise between required data for the demonstration…
…and limited time available for hub coaches

A few results *from Survey#1*

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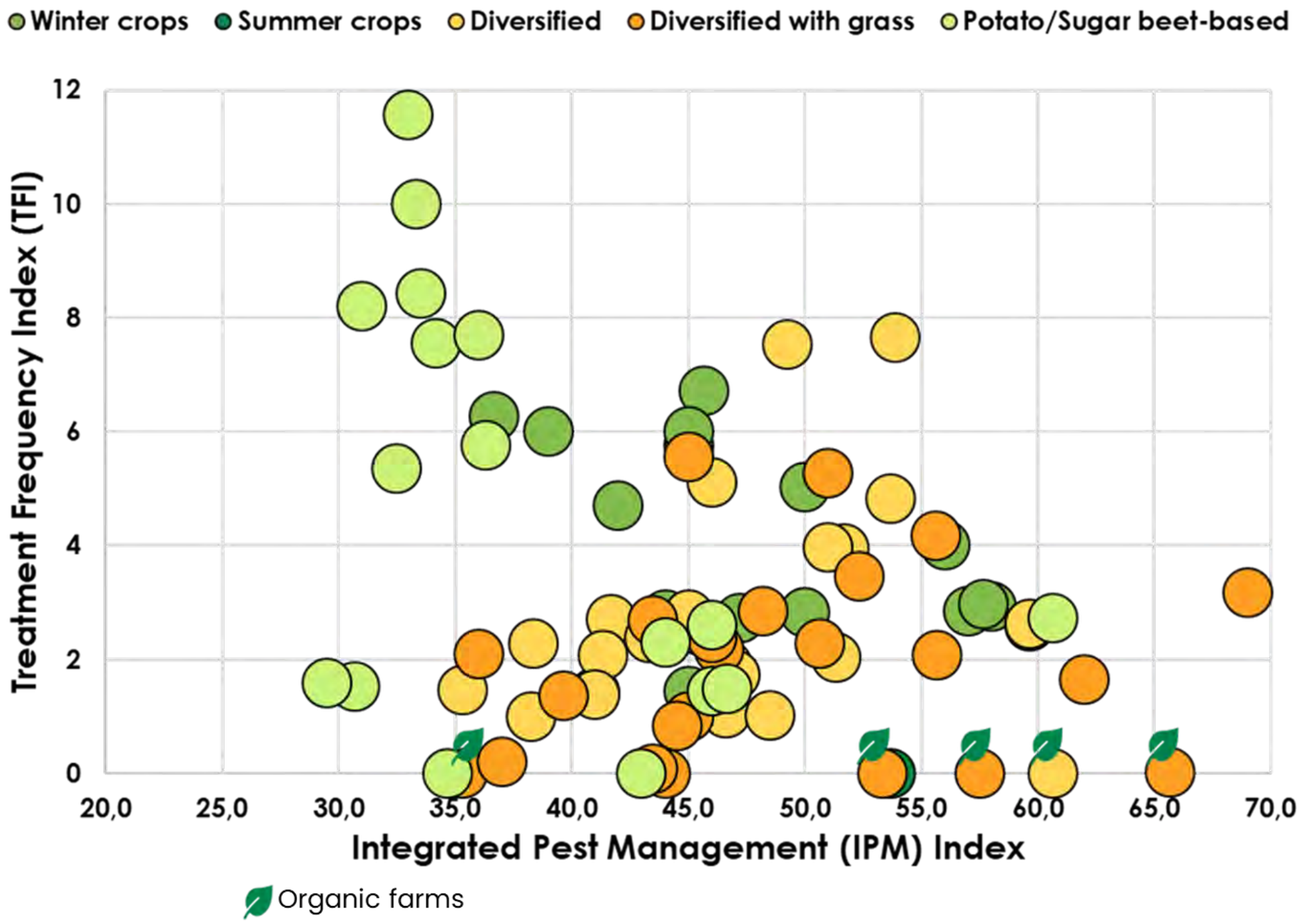
Attempt for an IPM adoption score

sum of scores for a range of IPM measures



A few results *from Survey#1*

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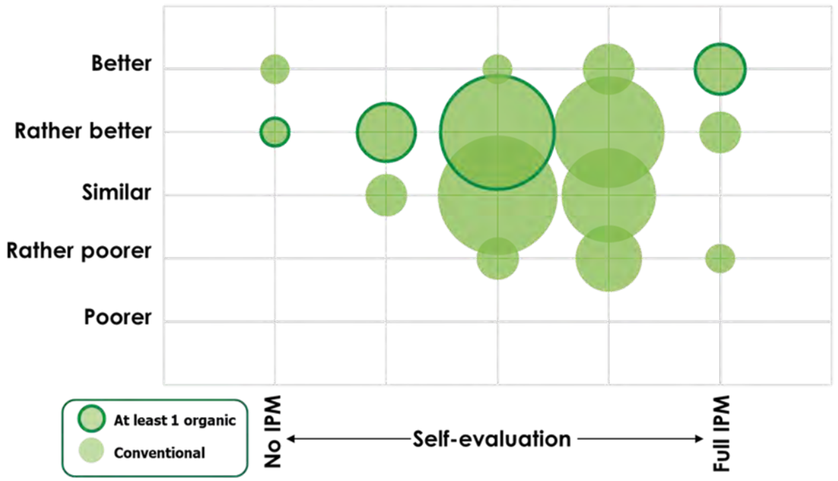
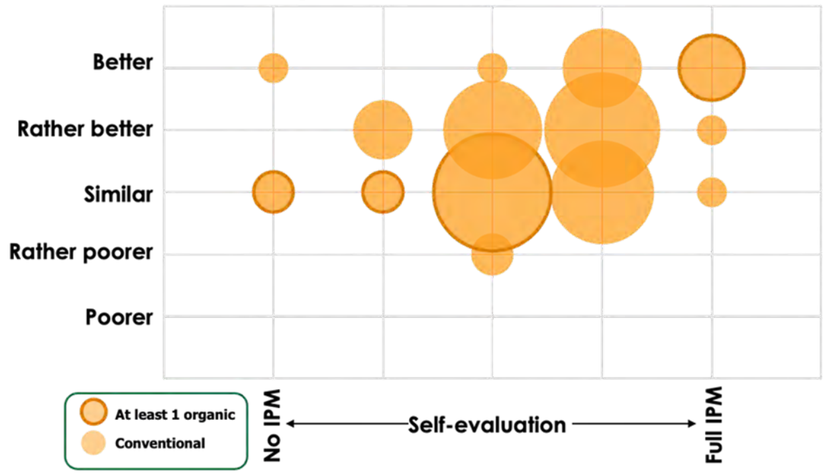
Self-assessment *Quality of pest control*

Self-assessment
as compared to neighbour farms

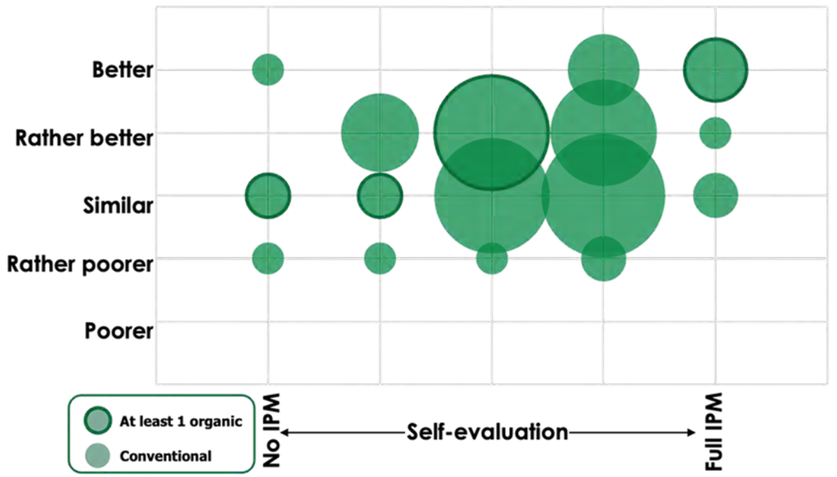
Quality of Weed Control
as compared to neighbour farmers...



Quality of Disease Control
as compared to neighbour farmers...



Quality of Pest Control
as compared to neighbour farmers...



« IPM allows satisfying pest/weed/disease control »

A few results *from Survey#1*

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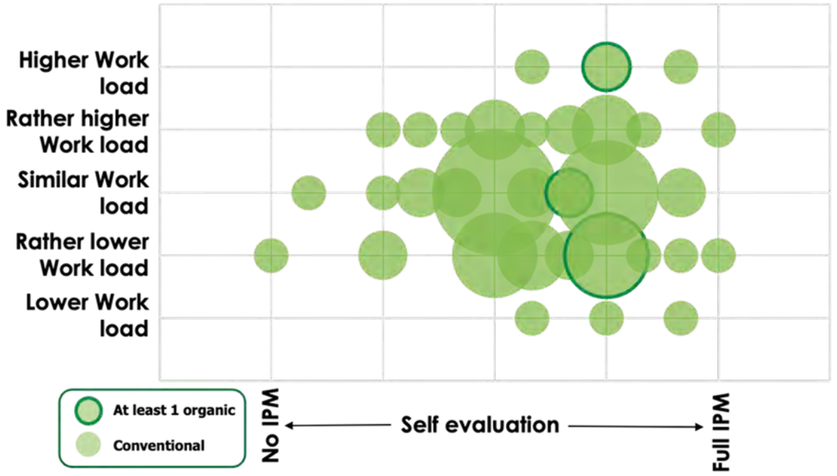
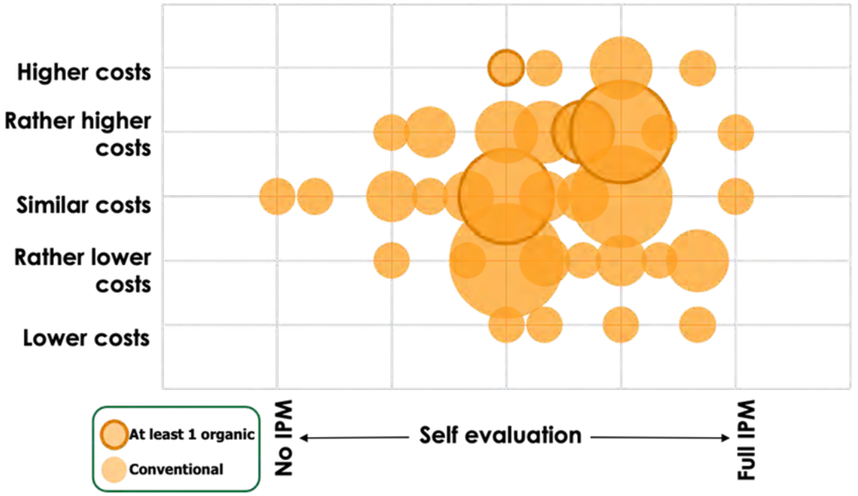
Self-assessment *Economics*

Self-assessment
as compared to neighbour farms

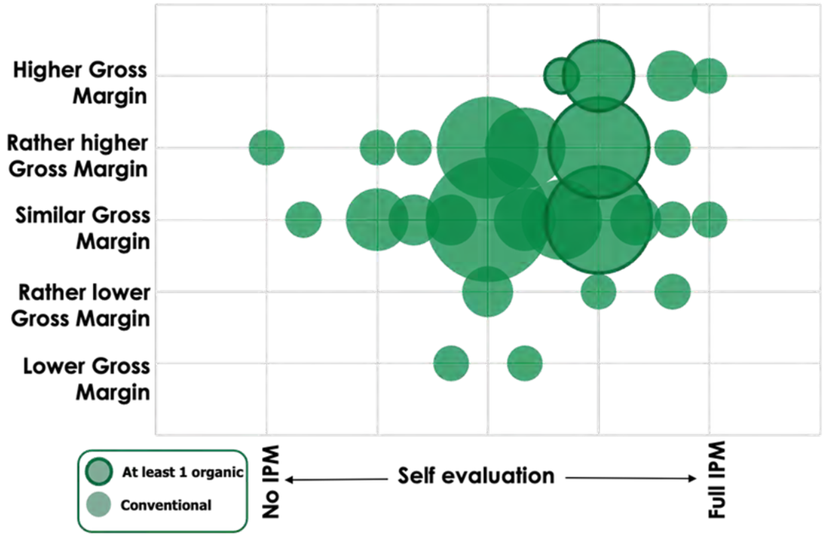
Workload / ha
as compared to neighbour farmers…



Equipment Costs
as compared to neighbour farmers…



Gross Margin
as compared to neighbour farmers…



« IPM is cost-effective » *…to be confirmed with quantitative data*

Some productions https://ipmworks.net/

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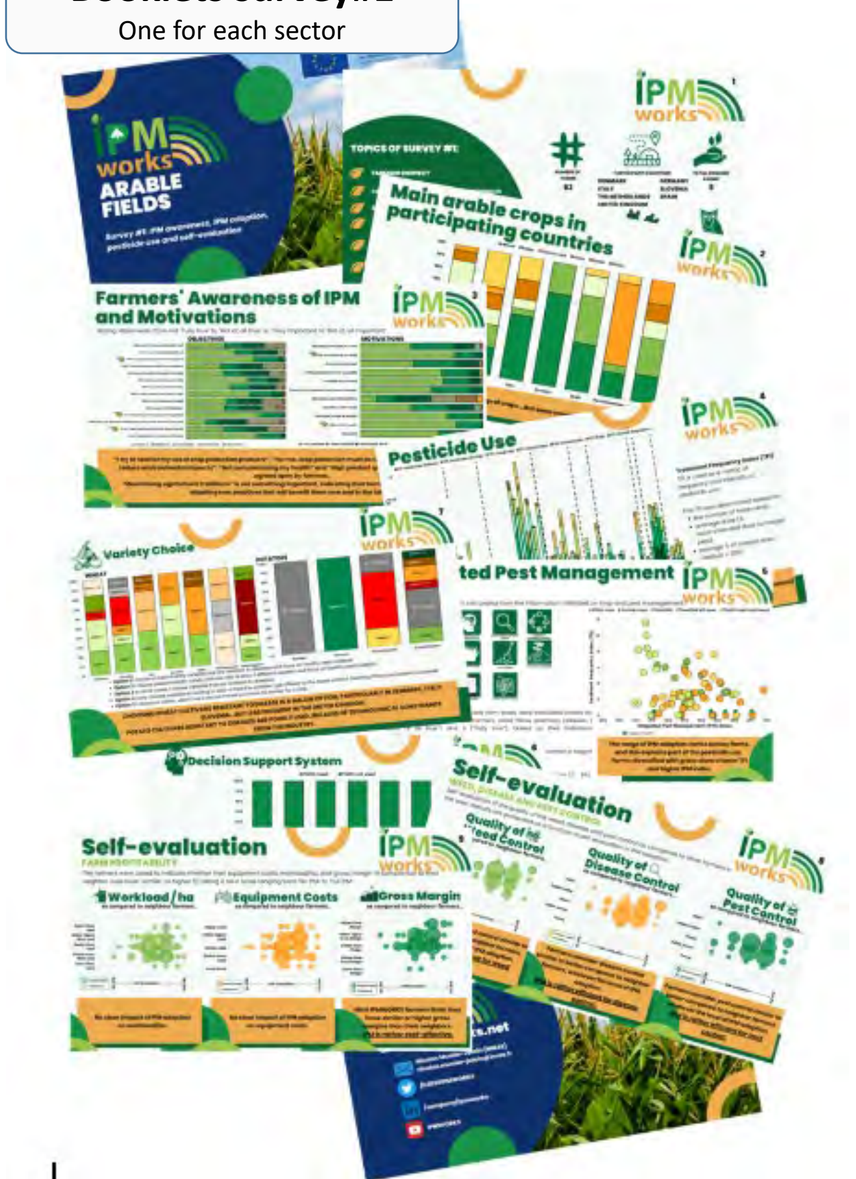
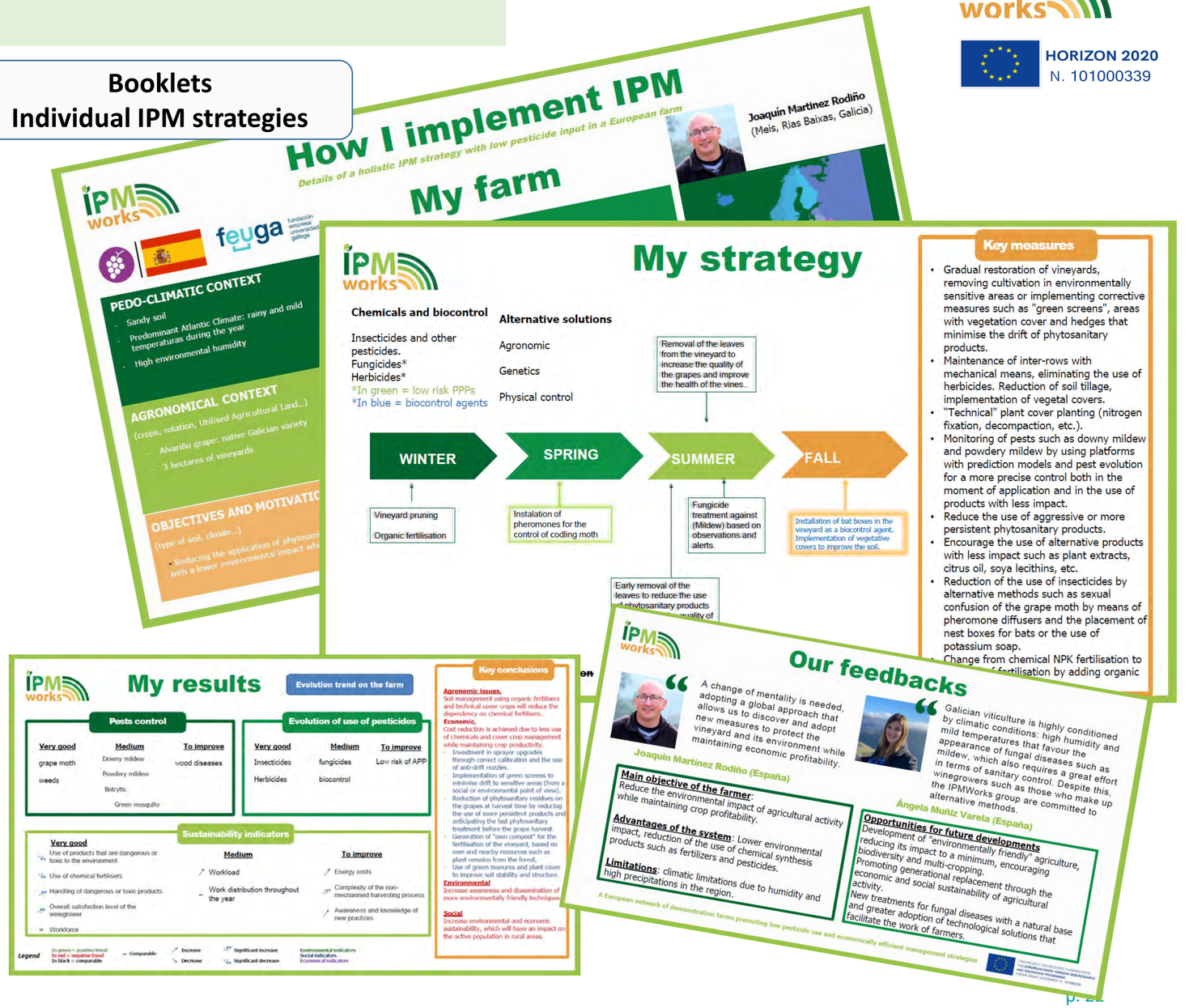
Booklets survey#1
One for each sector



Booklets
Individual IPM strategies



Some productions https://ipmworks.net/

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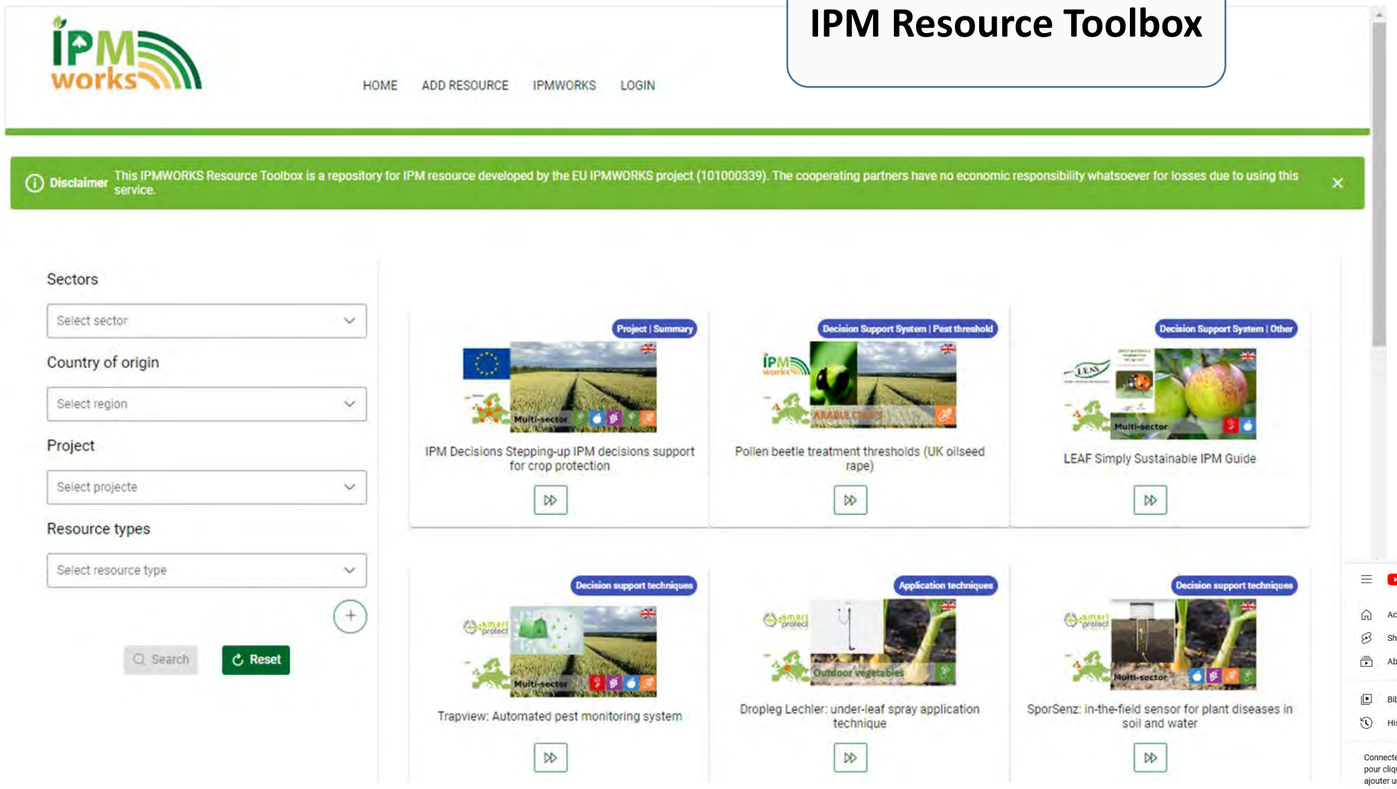
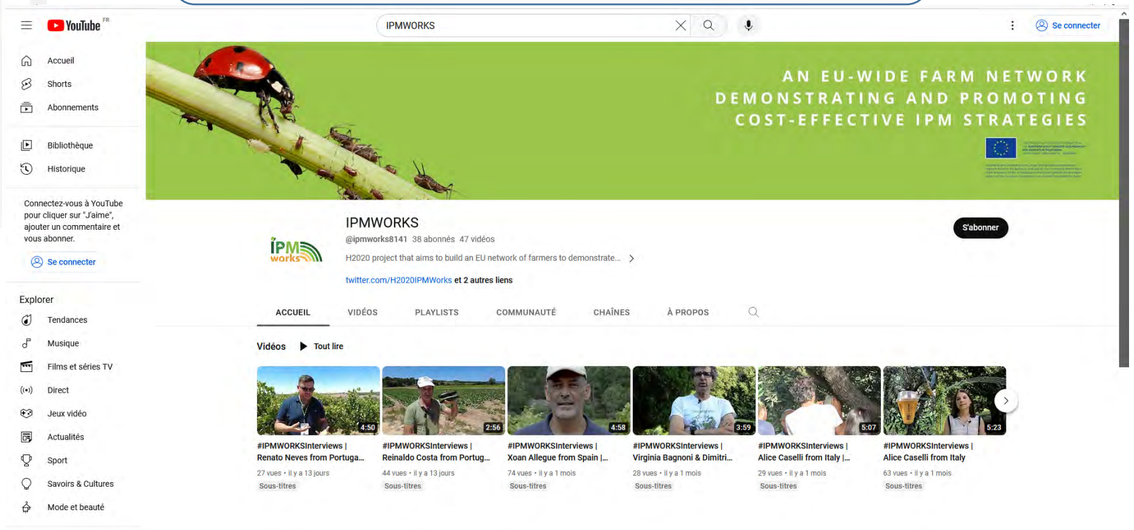
IPM Resource Toolbox



YouTube IPMWORKS YouTube channel



Contribution to debates at European Institutions

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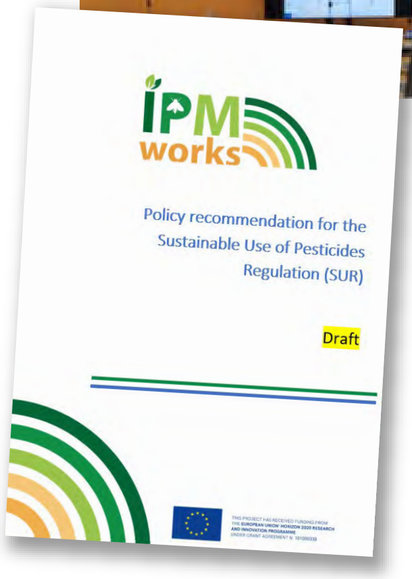
Public Hearing at the European Parliament, Brussels, 23 May 2023

Exhibition at the European Parliament, Strasbourg, 13-16 February 2023



The BCPC Congress, 7-8 November 2023, Harrogate, UK

Thanks for your attention !

INRAE

Agroécologie
Dijon
Unité de Recherche

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IPM works

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