A monitoring and evaluation booklet, usable for network dissemination & communication purposes

Deliverable D5.5

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An EU-wide farm network demonstrating and promoting cost-effective IPM strategies

Coordination and Support Action (CSA)

01 October 2020 – 31 March 2025 (54 months)

Deliverable D5.5

A monitoring and evaluation booklet, usable for network dissemination & communication purposes

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Abstract

This deliverable presents the booklets summarising results from the three surveys conducted in IPMWORKS across each of the five sectors defined in the project: Arable Field Crops, Vineyards, Orchards, Greenhouse Horticulture, and Outdoor Vegetables and Ornamentals. The three surveys investigated (i) farmer's IPM awareness, technical IPM adoption, and self-assessment at the beginning of the project, (ii) details of cropping systems and IPM strategies, enabling the computation of quantitative indicators of pesticide use, pesticide impact, and economic sustainability, and (iii) progress made in IPMWORKS farms during the course of the project.

The survey results, presented in the booklets, support the main messages of IPMWORKS:

- Holistic IPM enables a reduction in pesticide use;
- Holistic IPM is effective for managing weeds, diseases, and invertebrate pests, thereby avoiding yield losses;
- Holistic IPM permits farmers to maintain farm productivity and profitability, while reducing pesticide use without threatening food security.

Contents

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1. Objectives

The core of the IPMWORKS network is the 22 hubs of IPM demonstration farms set up at the beginning of the H2020 project. Each hub is based on 10 to 15 farmers, from the same region, living close enough to be able to meet regularly, growing the same type of crops and sharing similar pest problems. Those pioneer farmers were either

- already implementing a holistic approach to Integrated Pest Management (IPM), and therefore using less chemical pesticides as compared to most local farmers,
- or motivated to further advance their adoption of IPM and reduce their reliance on chemical pesticides, thanks to-peer-to-peer learning and knowledge exchange within the hub.

All farmers were motivated to engage in knowledge exchange both within the hub and with other farmers of the region, give and receive advice, test new IPM-based solutions, and develop confidence in innovative solutions thanks to technical discussions within the hub.

Each hub is coordinated by a Hub Coach, an advisor and facilitator, who plays a very important role and is responsible for:

- providing individual advice to farmers, to help them find non-chemical solutions for pest management, adapted to each specific farm case, and to help them design their pest management strategy with a holistic approach;
- organising and facilitating knowledge exchange among farmers, to enhance peer-to-peer learning;
- organising demonstration events, based on success stories in IPM adoption within the hub, describing practical on-farm strategies and IPM solutions implemented in IPMWORKS farms, focussing on placing the various aspects of pest management into a holistic vision of the farm strategy;
- ensuring a technical watch on new emerging IPM solutions, making use of external expertise and of the internal EU-wide IPMWORKS network of Hub Coaches.
- collecting both qualitative and quantitative data in IPMWORKS farms. In the project this was organised through three surveys:
    - **Survey#1,** carried out at the beginning of the project to collect qualitative information on farmer's IPM awareness, information about the technical IPM

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options combined in existing IPM strategies, and farmer's self-assessment of level of IPM adoption, workload, yields, economic performances.

- **Survey#2,** starting in the middle of the project, to collect details of IPM-based cropping systems, including details of pesticide treatments, to be able to compute quantitative indicators of pesticide use, pesticide impact, and economic performances. The web-based interface AGROSYST, already used by the DEPHY network in France for collecting data and computing sustainability indicators, was adapted for the European context of IPMWORKS for this purpose, and IPMWORKS Hub Coaches were trained to use this interface
- **Survey#3,** carried out at the end of the project, to collect a qualitative self-assessment of farmers about the progresses made in IPM adoption during the course of the project, and the consequences for pest control, yields, workloads and economic performances.

Data collection was organised in the following way:

- Preparing the questionnaires of Survey#1 (one version for each sector: Arable Field Crops, Vineyards, Orchards, Greenhouse Horticulture, and Outdoor Vegetables and Ornamentals and the online system dedicated to data collection (implemented with Drag N' Survey). The questionnaires were discussed during project meetings, and validated by sector leaders (i.e., IPMWORKS partners in charge of coordinating technical knowledge sharing for a given sector);
- Adapting the AGROSYST system for the purpose of Survey #2 (see Deliverable 5.2 'An Information System to describe and evaluate the IPM strategies deployed across the network'), preparing and disseminating guidelines for Hub Coaches, organising training webinars for Hub Coaches.
- Preparing the questionnaires of Survey#3 (one version for each sector: Arable Field Crops, Vineyards, Orchards, Greenhouse Horticulture, and Outdoor Vegetables and Ornamentals and the online system dedicated to data collection (again implemented with Drag N' Survey). The questionnaires were discussed during project meetings, and also validated by sector leaders;

Data processing, and the preparation of communication booklets were organised as following:

- Data from Survey#1 was processed in 2023, and results were described in booklets (one for each sector). Results were discussed, and booklets were reviewed by partners and sector leaders, before dissemination to Hub Coaches;
- Data from Survey#2 and Survey#3 was processed at the end of the project (November 2024 - March 2025), and results were described in booklets (one for each sector). Results

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were discussed, and booklets were reviewed by partners and sector leaders, before dissemination to Hub Coaches.

- Results from Survey#1 and Survey#3 were used to develop two Excel-based tools (interactive dashboards) designed as an interactive way to present the results, and to provide feedback to IPMWORKS Hub Coaches and farmers.
- For each of the IPMWORKS farms for which all data were available from the three surveys, including data enabling the computation of indicators of economic sustainability, a 2-page leaflet was designed for feedback to farmers, in the form of benchmarking (comparison of the outcomes from one given farm, collected from surveys #1-2-3, with the other IPMWORKS farms of the sector). The leaflets were disseminated to Hub Coaches.
- Data and indicators computed from Survey#2 was used to perform a DEXiPM-based multi-criteria assessment, for a selection of farms from sectors Arable Field Crops and Vineyards, over a gradient of IPM adoption.

This document presents the content of the three series of booklets compiling results from surveys. This includes examples of pages extracted from the various booklets, for different sectors, along with the main messages supported by the results. All 15 booklets (3 surveys x 5 sectors) are shown in full in the annex of the document.

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2. Booklets #1- Initial survey

The five booklets (for the five sectors) are available from the IPMWORKS website, and from the IPM Resource Toolbox, using search keys 'Project'=IPMWORKS, 'Resource title'=booklet.

Each booklet is separated into several sections:

- General information: number of farms, countries, main crops…
- Farmers awareness and motivations regarding IPM;
- Graphs presenting the level of IPM adoption for some main non-chemical IPM solutions (cultivars, biocontrol, etc);
- An estimate of pesticide use, based on the farmer's own information of the amount used compared to regular field rate, approximating the French Treatment Frequency Index (TFI);
- The relationship between an IPM adoption index developed in the project (a score accumulating sub-scores associated with each IPM-related technical option) and the estimate of pesticide use;
- The synthetic results of the self-assessment of farmers for weed, invertebrate pests and disease control, workload, equipment costs and economic profitability, as a function of the self-assessment of the level of IPM adoption.

The following figures shows some examples of booklet pages, along with the main messages supported by the results.

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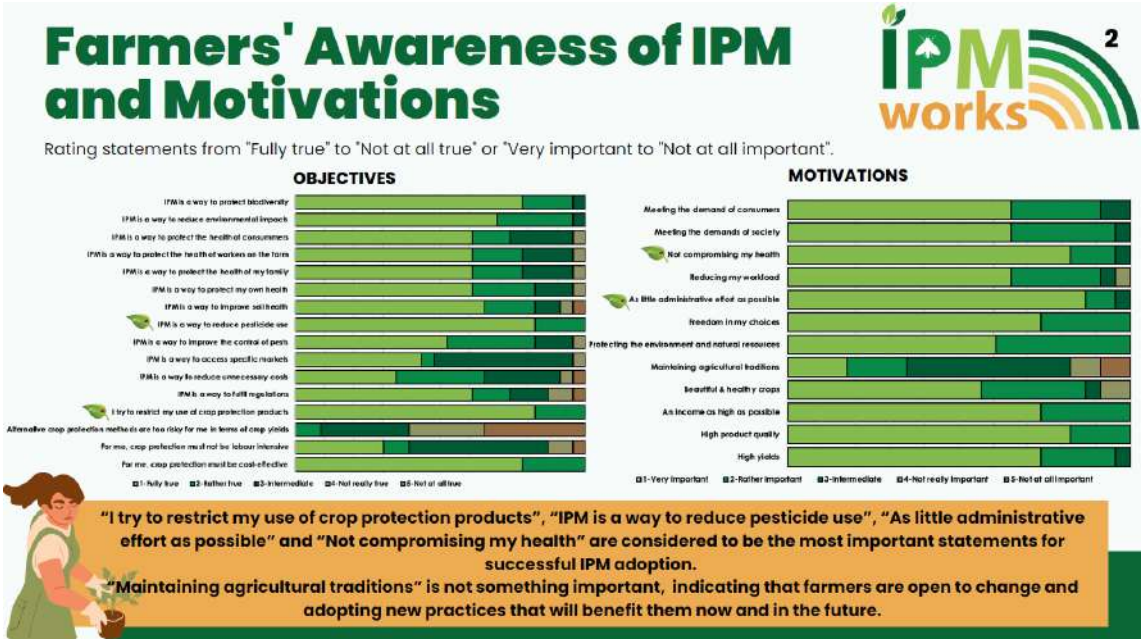

Figure 1: Page displaying results of farmers' awareness and motivations regarding IPM, for the sector of Greenhouse horticulture.

Among the different results displayed in Figure1, we can highlight the following:

- 100% of farmers of the sector state that "IPM is a way to decrease pesticide inputs". This indicate that the topic of reducing pesticide inputs is agreed by all farmers recruited in IPMWORKS.
- "Not compromising my own health" seems to be the major motivation for IPM in the sector of greenhouse horticulture, even more important than "Protecting the environment and natural resources".
- Of course, "high income" and "high product quality" are among the major motivations (higher than "maximising yields").
- "Liberty in my choices" is one of the major concerns of farmers.

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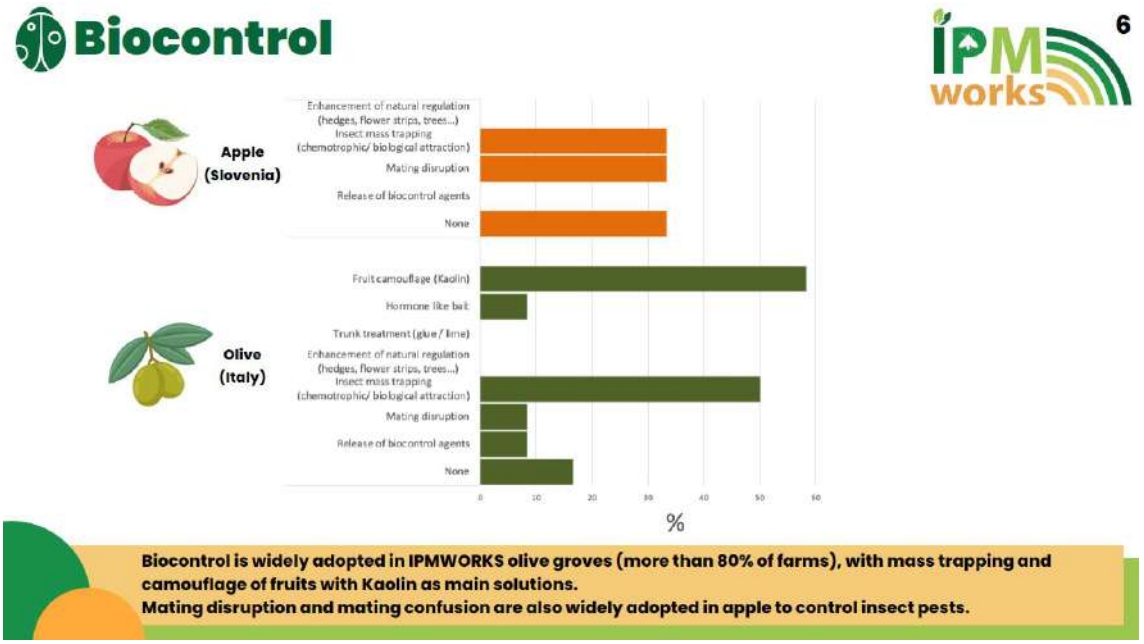

Figure 2: Page displaying the level of adoption of biocontrol solutions for Orchards IPMWORKS farms (apples in Slovenia and Olive groves in Italy)

The main insights about biocontrol implemented in IPMWORKS orchards (Figure 2) are:

- More than 80% of farmers are using at least one biocontrol solution in Olive groves, which is higher than in Slovenian apple orchards.
- Insect mass trapping and fruit camouflage are the two most adopted biocontrol solutions in Olive trees.
- Biocontrol in apple orchards in Slovenia relies mainly on mating disruption and insect mass trapping.

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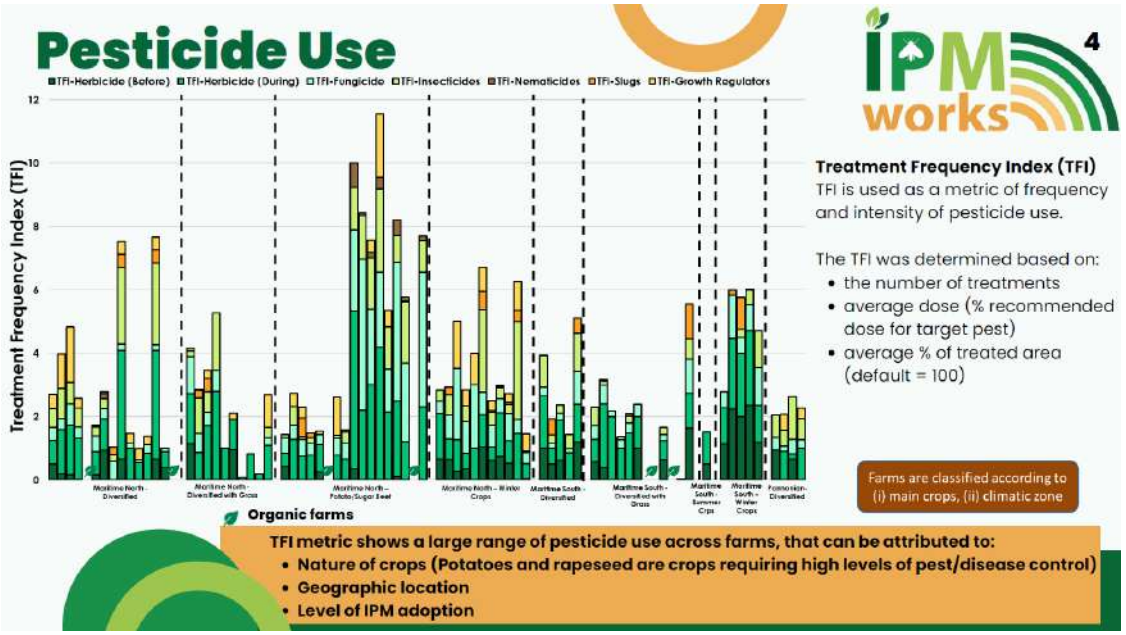

Figure 3: Page displaying Treatment Frequency Index (TFI), computed at the level of cropping systems (i.e. average of TFI of individual crops) for IPMWORKS farms of the sector of Arable Field Crops.

An estimate of TFI was estimated from the information provided by farmers on numbers of treatments for herbicides/fungicides/insecticides/others for each crop, the average dose compared to the reference registered dose, and the average proportion of field area treated (Figure 3). Farms are classified as a function of a typology of climatic conditions and of a typology of cropping systems (winter crops vs. summer crops vs. diversified vs. industrial crops vs. including grasslands).

- A large variability of pesticide use was recorded, both across types of cropping systems and climate, but also within a given type of farms, illustrating a gradient of IPM adoption.

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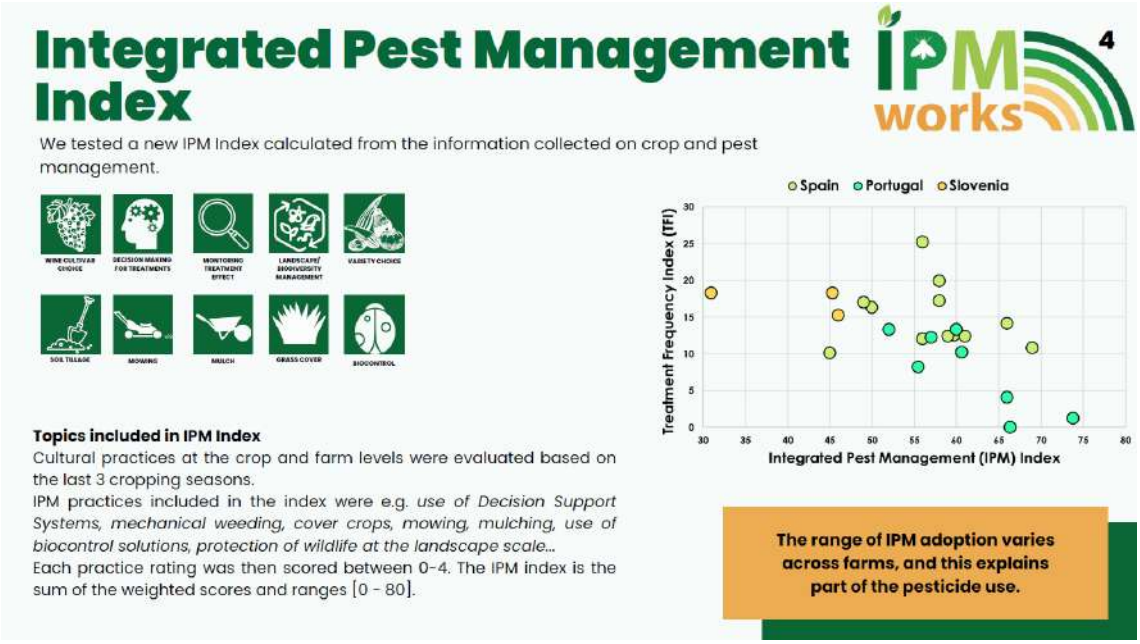

Figure 4: Page displaying the relationship between an Index of IPM adoption and Treatment Frequency Index, for vineyard sector IPMWORKS farms.

To compare Treatment Frequency Indexes with the level of IPM implementation, an index was developed in the project (Figure 4). The score of IPM adoption cumulates sub-scores as a function of information collected on various IPM-related technical options (e.g., use of Decision Support Systems, mechanical weeding, cover crops, mowing, mulching, use of biocontrol solutions, protection of wildlife at the landscape scale).

- There was a good correlation between the index of IPM adoption and the Treatment Frequency Index, both at the level of the whole dataset for vineyards, and within each hub of viticulture farms. This result supports the inference that the adoption of holistic IPM works well for decreasing the reliance on pesticides.

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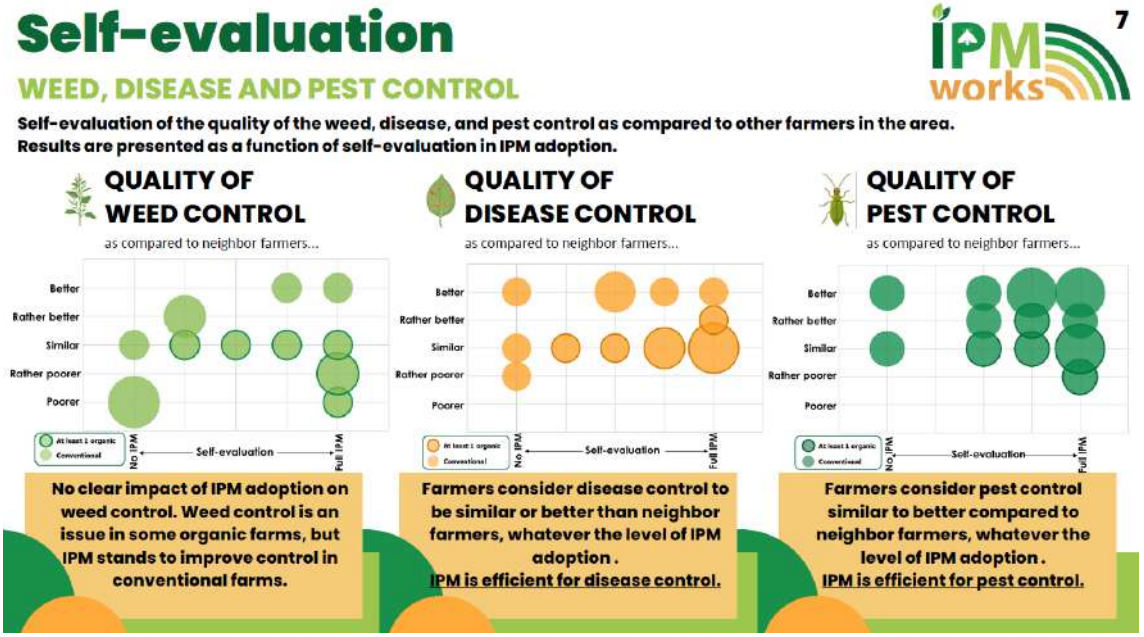

Figure 5: Page displaying results of the self-evaluation of farmers in the sector of Arable Field Crops, regarding the quality of weed/disease/pest control (as compared to neighbour farmers), on a gradient of the level of IPM adoption, according to farmers' opinion. The size of the bubbles is proportional to the number of farms. Bubbles with dark circles indicate that at least one farm of the bubble is organic.

Farmers were asked to make a self-evaluation of the quality of pest management (Figure 5):

- For the three groups of pests, most IPMWORKS farmers, including those who state that they are implementing full IPM, think that their weed/disease/pest control is as good as, or even better, than in neighbouring farms.
- The farms indicating problems with weed control are either organic farms, or farm with a low level of Integrated Weed management
- The results support the message that holistic IPM provides satisfying control of weeds, diseases and pests, in spite of the decrease in the reliance on pesticides.

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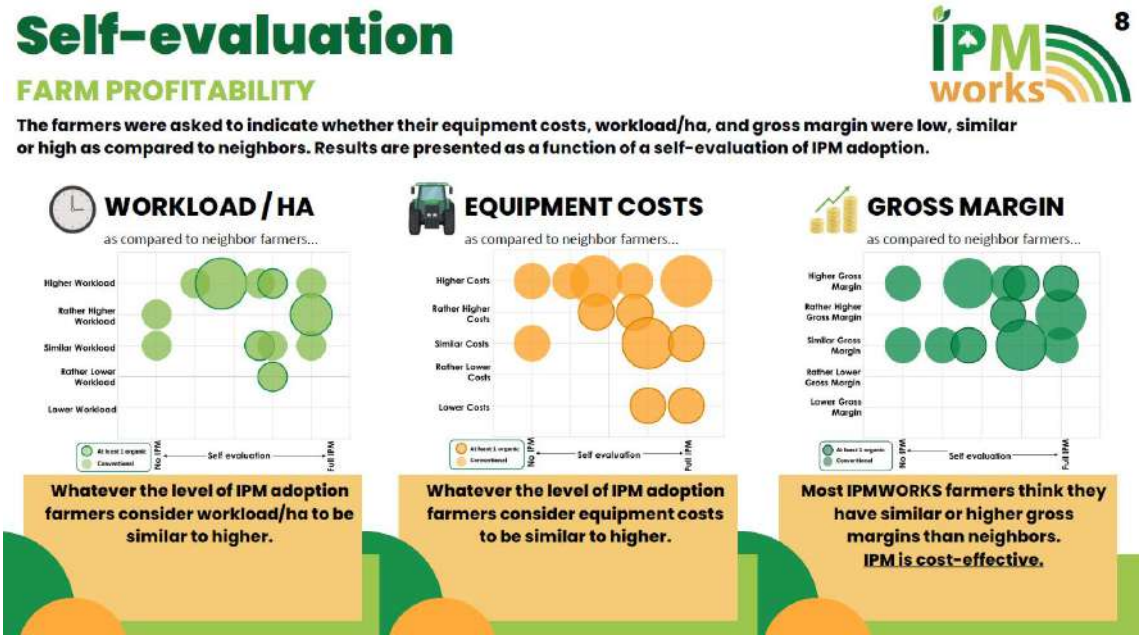

Figure 6: Page displaying results of the self-evaluation of farmers in the sector of Arable Field Crops, regarding some important indicators for IPM assessment, namely workload, equipment costs, and farm profitability (as compared to neighbour farmers), on a gradient of the level of IPM adoption, according to farmers' opinion. The size of the bubbles is proportional to the number of farms. Bubbles with dark circles indicate that at least one farm of the bubble is organic.

Like the level of pest control, the self-evaluation on workload, equipment costs and gross margin was targeted in the self-evaluation (Figure 6):

- In this sector of Arable Field Crops, workload tends to be higher in those farms where full IPM is implemented, especially in organic farms.
- However, there is no clear trend of increase in equipment costs for those farms where IPM is fully implemented.
- All IPMWORKS farmers think that the profitability of their farm is either similar or higher than in neighbour farms, including those farmers who state that they are implementing full IPM. Even though qualitative and declarative, this result supports the statement that holistic IPM can provide good economic outcomes, even though decreasing reliance on pesticides.

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3. Booklets #2 – Quantitative survey

The five booklets from Survey #2 (for the five sectors) are available from the IPMWORKS website, and from the IPM Resource Toolbox, using search keys 'Project'=IPMWORKS, 'Resource title'=booklet.

Each sector booklet is separated into several sections:

- Treatment Frequency Index by farm (average of crops grown in each farm), by country. Bar plots distinguish TFI-Herbicide, TFI-Fungicide, TFI-Insecticide, TFI-Other chemicals, and TFI-'low impact pesticides'. This section includes some results from PESTIRED, the Swiss network of demo farms affiliated to IPMWORKS.
- Treatment Frequency Index by crop, by country.
- Relationship between pesticide use and pesticide impact, by comparing Treatment Frequency Index and Harmonised Risk Indicator (HRI-1) at the cropping system scale.
- Relationship between pesticide use and indicators of economic sustainability (available only for Arable Field Crops, where economic indicators could be computed for a larger number of farms). This section also includes data from the Swiss network PESTIRED.

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Computation of quantitative indicators

All quantitative indicators presented in this report were computed by the AGROSYST system, based on data inputs from Hub Coaches:

- TFI values used French computation methods coded in the AGROSYST system, using French reference doses for each product and each crop species, i.e. the lowest registered dose of a given product for a given crop, across the various potential target pests of the product. This implies that an individual treatment at a registered dose, for a target pest requiring a high dose, might induce an individual TFI value higher than 1.
- Workload, assessed as hours per hectare, was computed based on the AGROSYST equipment database, including work output for each equipment type. This indicator quantifies workload of each field operation, including manual operations, but excluding time for field monitoring, preparation of equipment, road transport, paper work…
- Prices (agricultural products, inputs, equipment) were extracted from the AGROSYST database, coming from FranceAgriMer institute.

Using standardised indicators computed with the same method, based on standardised prices and reference data, facilitates the comparison of farms from different countries, from an agronomic point of view. However, computed economic indicators might be slightly different from indicators from other sources, computed locally from real economic data.

The following figures shows some examples of booklet pages, along with the main messages supported by the results.

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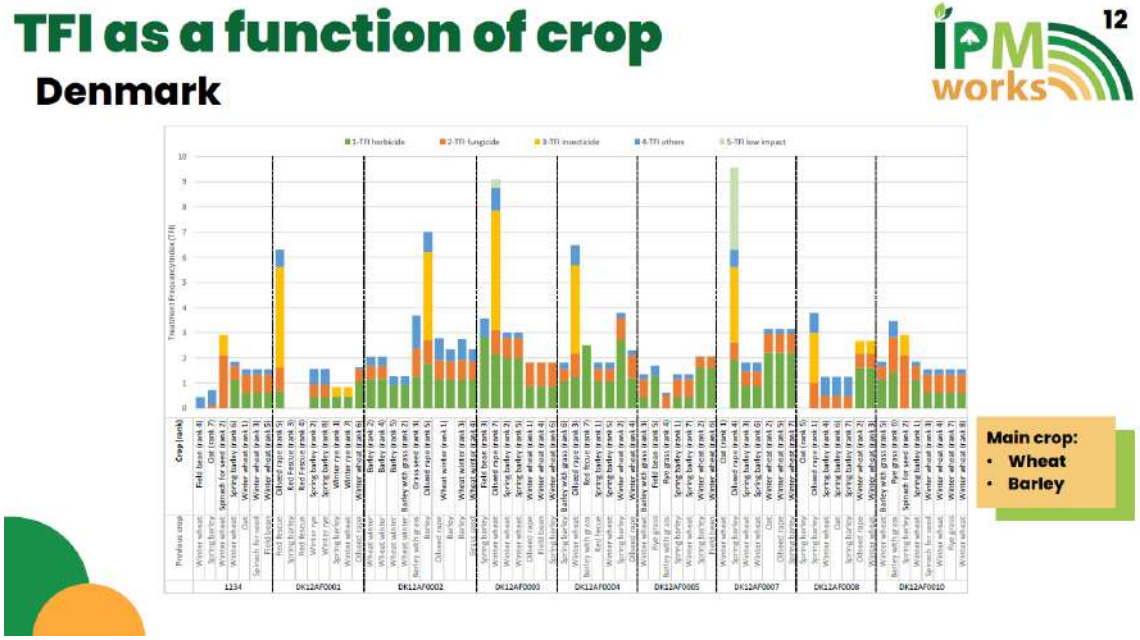

Figure 7: Page displaying Treatment Frequency Index per crop, for IPMWORKS Danish farms (sector Arable Field Crops).

Data collected from Survey#2 was used to compute the Treatment Frequency Index, an indicator of reliance on pesticides, presented at the level of crops in Figure 7, for the Danish IPMWORKS farms.

- In Arable Field Crops, results highlight a large range of pesticide requirement across crop types. Oilseed rape is the crop grown in the IPMWORKS Danish farms with the highest pesticide requirement, especially because of high TFI-insecticides.
- For a given crop, TFI can vary substantially across farms. For example, wheat TFI ranges from 1.6 to 3.1

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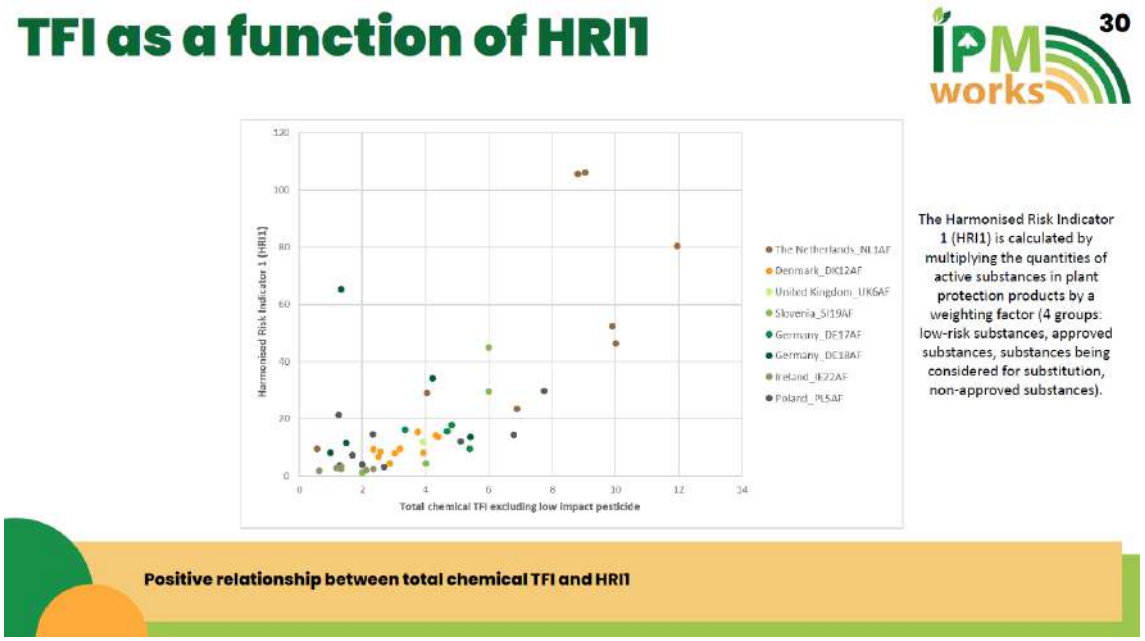

Figure 8: Page displaying the relationship between Treatment Frequency Index and Harmonised Risk Indicator (HRI-1), both computed at the level of cropping systems (average of crops grown in the cropping system), for the sector of Arable Field Crops.

Data collected from survey #2 was used to analyse the relationship between an indicator of pesticide use (TFI) and an indicator of pesticide impact (HRI1), both assessed at the cropping system level (Figure 8).

- There was a relatively good (but not linear) relationship between pesticide use and pesticide impact, at the scale of cropping system. The higher the level of pesticide use (measured by TFI), the higher the risk of spraying with an active substance with a high ecotoxicological risk (and therefore with a high HRI coefficient).

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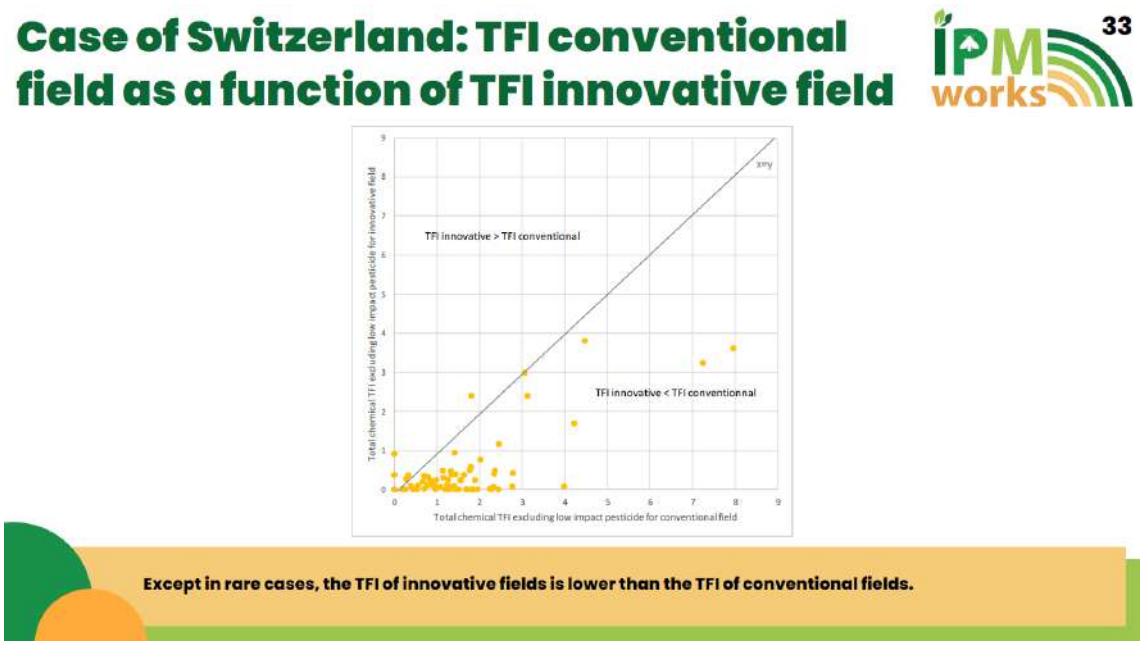

Figure 9: Page displaying pesticide use in the specific case of Swiss farms from the PESTIRED network. Each dot is the average TFI over 4 years in a given farm, comparing 'Conventional' plots (X-axis) and 'Innovative' plots (Y-axis).

In the PESTIRED network (Swiss network affiliated to IPMWORKS, sector Arable Field Crops), two field plots are monitored within each farm, namely a 'Conventional' plot ("business as usual"), and an 'Innovative' plot, with the same crop, but all IPM-based non-chemical solution implemented, as much as possible. Figure 9 illustrates the differences in pesticide use, quantified through the Treatment Frequency Index (TFI), between 'Conventional' and 'Innovative' cropping systems

- In most PESTIRED farms, TFI values are rather low, even in the 'Conventional' plots.
- PESTIRED allows quantification of pesticide use reduction through the implementation of holistic IPM.

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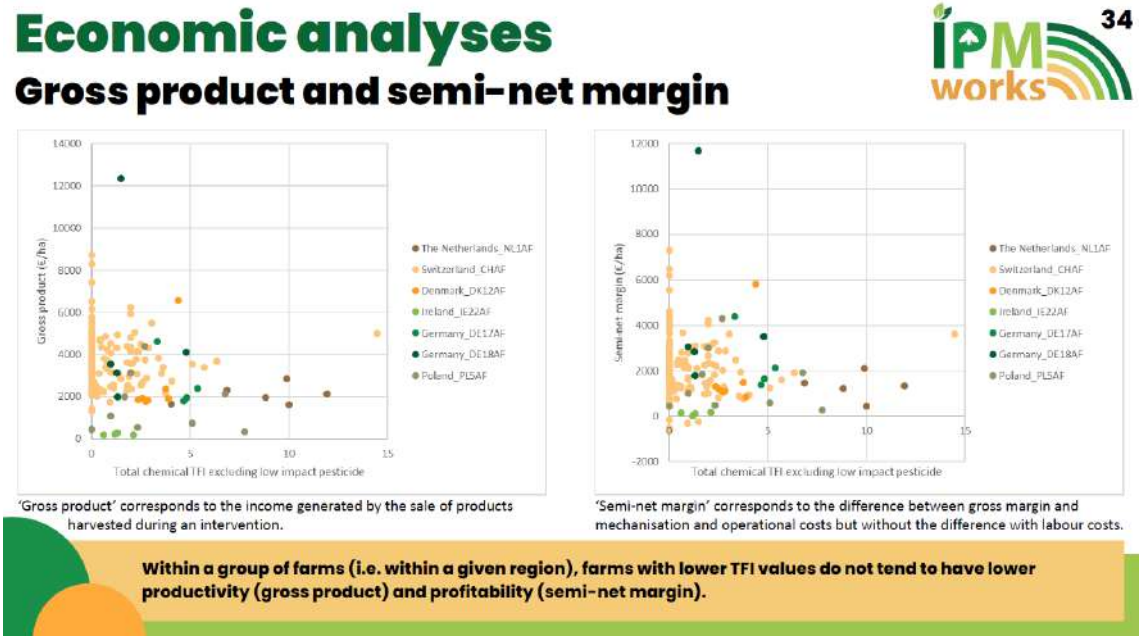

Figure 10: Page displaying relationships between pesticide use (Treatment Frequency Index computed at the cropping system level, as an average of TFI in each crop of the crop rotation) and (i) gross product, and (ii) semi-net margin (gross product – input costs – equipment costs), for IPMWORKS farms of the sector of Arable Field Crops (including Swiss farms of PESTIRED).

Economic indicators (gross product, input costs, equipment costs, semi-net margins) could be computed for a sub-sample of farms where all the details were available, in the sector of Arable Field Crops. Analysing these indicators on a gradient of pesticide use (TFI) provides insight on the economic consequences of the level of IPM adoption (Figure 10).

- For a given hub/country, graphs show quite a wide range of pesticide use (related to the level of IPM adoption), but no clear relationship with Gross product or Gross margin. This result supports the important message that reducing the reliance on pesticide through holistic IPM is possible without impairing either farm productivity or farm profitability.

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4. Booklets #3 – progresses made during the project

The five booklets (for the five sectors) are available from the IPMWORKS website, and from the IPM Resource Toolbox, using search keys 'Project'=IPMWORKS, 'Resource title'=booklet.

Each booklet is separated into several sections:

- Evolution of IPM awareness and motivation of IPMWORKS farmers during the course of the project.
- Evolution of the technical implementation of IPM in IPMWORKS farms during the course of the project.
- Self-evaluation of IPMWORKS farmers regarding their evolution of pesticide use during the course of the project.
- Self-evaluation of IPMWORKS farmers regarding trends in weed/pest/disease problems during the course of the project, analysed as a function of the evolution of pesticide use.
- Self-evaluation of IPMWORKS farmers regarding trends in costs (pesticide, equipment, salary costs) during the course of the project, analysed as a function of the evolution of pesticide use.
- Self-evaluation of IPMWORKS farmers regarding trends in yields, workload and profitability during the course of the project, analysed as a function of the evolution of pesticide use.

The following figures shows some examples of booklet pages, along with the main messages supported by the results.

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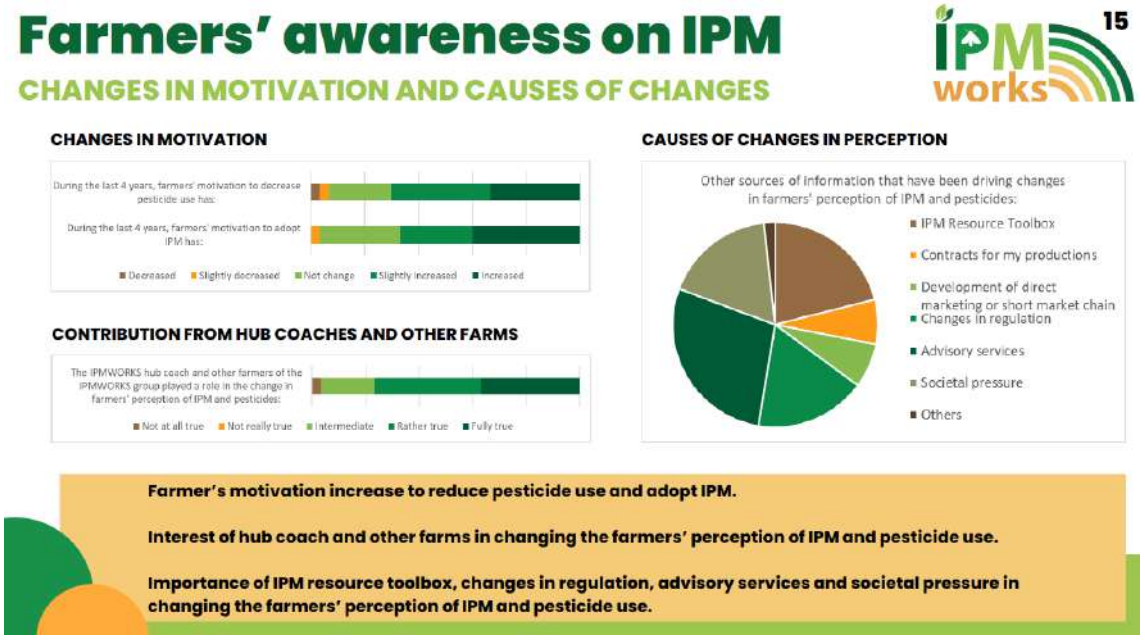

Figure 11: Page displaying the evolution of IPM awareness and motivations by IPMWORKS farmers from the sector 'Vineyards', and causes for changes in their perception.

The main results about trends in awareness and motivation among IPMWORKS farmers are shown in Figure 11, for one sector (vineyards).

- About 60-70% of farmers stated that their motivation to adopt further IPM and to reduce pesticide use has increased or slightly increased during the course of the project.
- Almost 80% of farmers from the 'vineyards' sector state that the work done within the IPMWORKS project, with the Hub Coach and peer-to-peer knowledge exchange within the hub, has played a role in their perception of pest management (statement either 'fully true' or 'rather true'). This result validates the methodological approach developed by the IPMWORKS project to promote IPM adoption, based on peer-to-peer learning and the concept of Hubs and Hub Coaches.

Booklets from other sectors display very similar results.

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Figure 12: Page displaying changes in IPM-related technical options, at the crop level, in IPMWORKS farms of the sector Arable Field Crops.

The survey allows to identify the IPM technical options that were further adopted by IPMWORKS farmers during the project. Figure 12 presents results for the sector of Arable Field Crops. For this sector, the main insights are:

- The adoption of disease-resistant cultivars is by far the technical option that has been most adopted, followed by adaptation of sowing dates and adaptation of fertilisation modalities, to reduce weed/disease/pest pressure.
- Biocontrol solutions are limited for this sector, and no further adoption was observed during the project.
- Improvement of decision making by using Decision Support Systems is only rarely mentioned as a technical option that has been increasingly adopted during the course of the project.

Of course, the technical options adopted by farmers are very sector-specific. See the booklets of each sector to see the survey results for other sectors.

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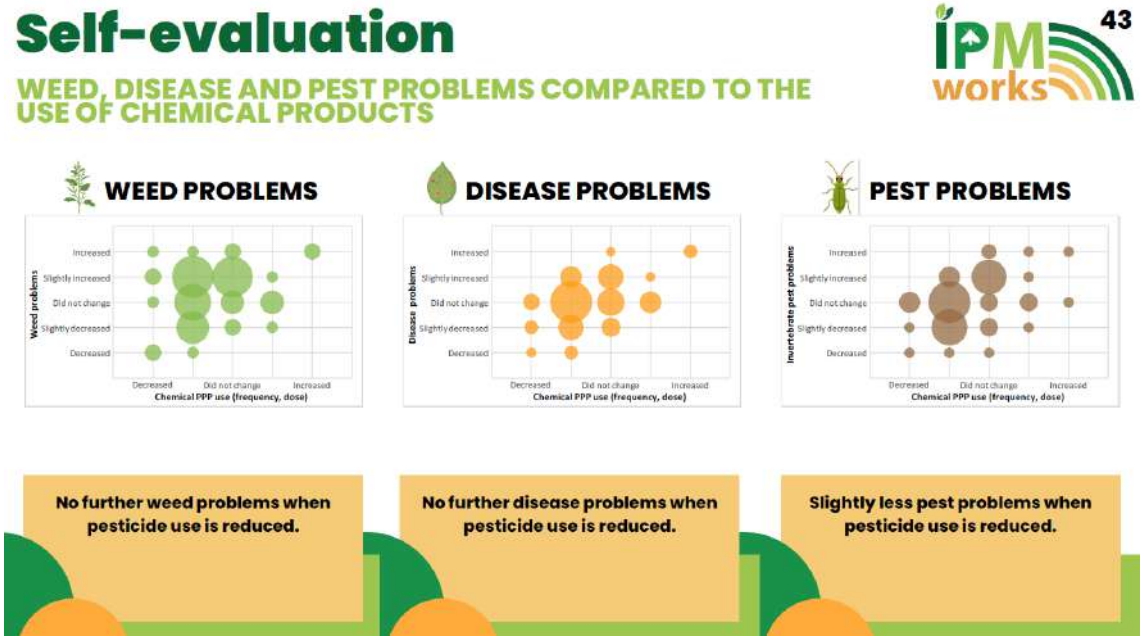

Figure 13: Page displaying the self-evaluation of trends in weed/disease/pest problems during the course of the project, by IPMWORKS farmers of the sector Arable Field Crops, analysed as a function of trends in pesticide use.

Survey#3 included a self-assessment of farmers about the evolution of the quality of weed, disease, and invertebrate pest control. Figure 13 illustrates results for the sector of Arable Field crops.

- Most IPMWORKS farmers state that they either reduced pesticide or did not change pesticide use. Very few state that they had to increase pesticide inputs during the period of monitoring.
- Disease and invertebrate pest problems tended to decrease in those IPMWORKS farms where fungicides and insecticides use decreased along the course of the project. This result supports the main message that IPM provides an efficient control of pests and diseases, even though decreasing the reliance on pesticides.
- The trend is similar for weeds, even though a few farmers who decreased herbicide inputs also stated that their weed problems slightly increased. This could indicate that weed management with low herbicide inputs is challenging in Arable Field Crops, as often recognised.

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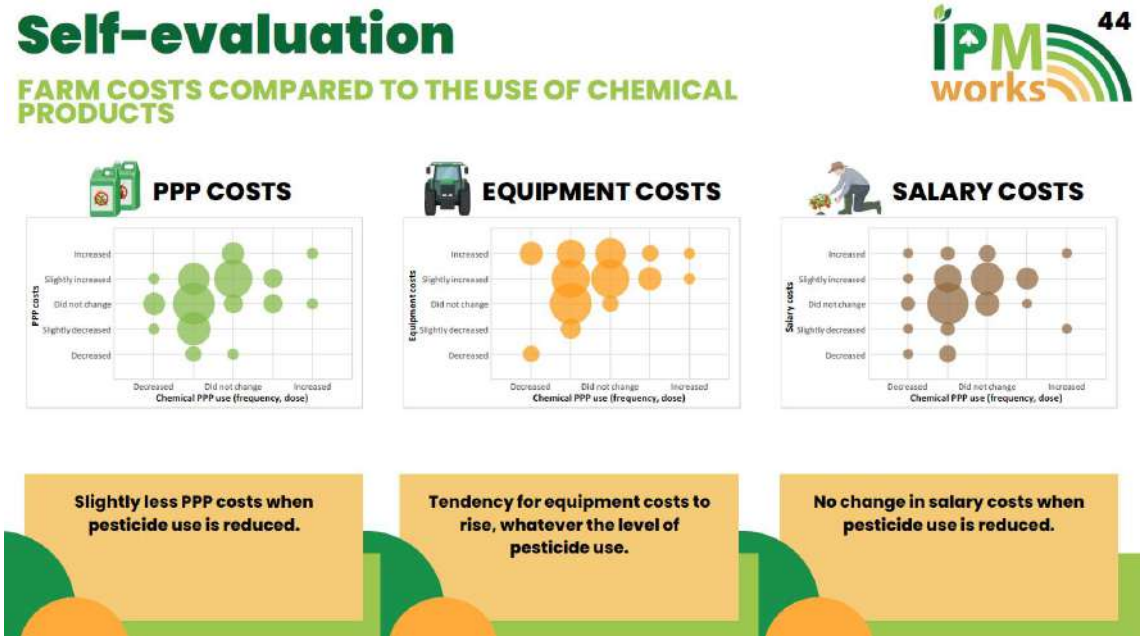

Figure 14: Page displaying the self-evaluation of trends in pesticide costs, equipment costs, and salary costs during the course of the project, by IPMWORKS farmers of the sector Arable Field Crops, analysed as a function of trends in pesticide use.

The last section of Survey#3 deals with the self-assessment of farmers regarding the consequences of changes in pest management strategies for farm economics. Figure 14 presents results for trends in pesticide costs, equipment costs, and salary costs, as a function of trends in pesticide use, for the sector Arable Field Crops.

- Logically, a decrease in pesticide use tended to lower pesticide costs.
- Equipment costs generally increased during the course of the project for all farmers, without any clear relation to the trend in pesticide use.
- The results also showed no clear relationship between the trends in pesticide use and shifts in salary costs.

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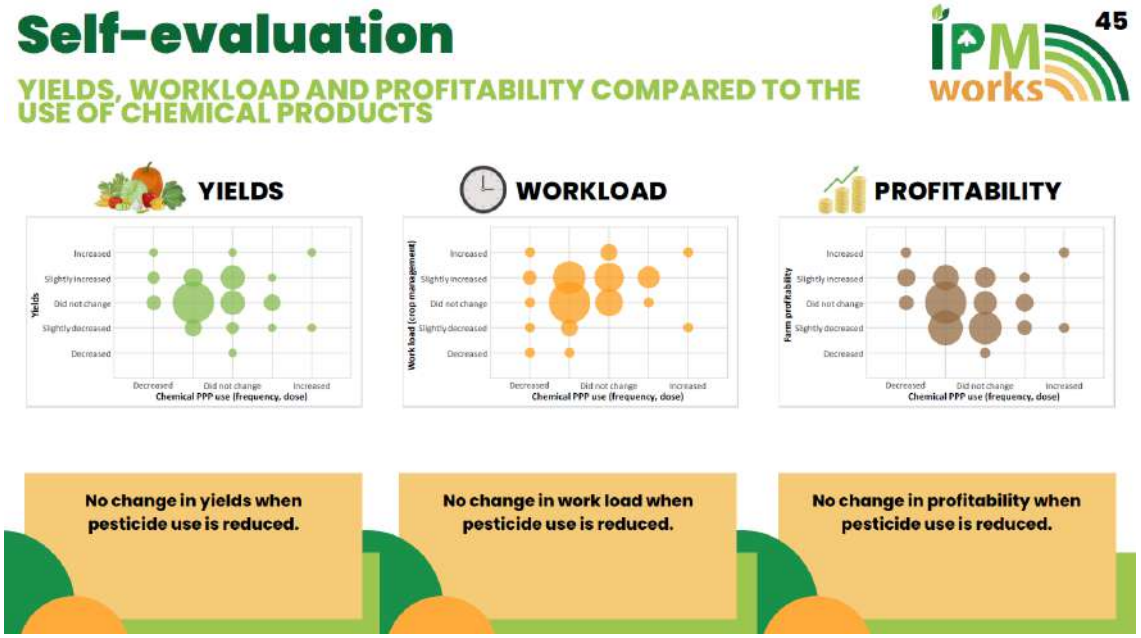

Figure 15: Page displaying the self-evaluation of trends in yields, workload, and profitability, during the course of the project, by IPMWORKS farmers of the sector Arable Field Crops, analysed as a function of trends in pesticide use.

Consequences of further reduction in pesticide inputs through further IPM adoption on farm economics are presented in Figure 15 for Arable Field Crops. The main insights are:

- No clear relationship between trends in pesticide use and crop yields is observed. This supports the message that IPM is efficient for pest management and prevent yield losses. It also confirms that reducing pesticide use does not compromise the agricultural productivity, or threaten food security in Europe.
- Similarly, no clear relationship is observed between trends in pesticide use and workload. Most farmers who reported a decreased pesticide use also stated that this did not affect their workload.
- Finally, no clear relationship is observed between trends in pesticide use and farm profitability. This result reinforces the key message that reducing the reliance on pesticides through holistic IPM is possible without negatively impacting farm profitability.

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5. Access to booklets and data

The booklets produced from the three surveys performed during the IPMWORKS project are available from the IPMWORKS website, and from the IPM Resource Toolbox, using search keys 'Project'=IPMWORKS, 'Resource title'=booklet.

The booklets were disseminated to the IPMWORKS consortium to provide feedback to Hub Coaches and farmers, and to support all partners in communicating IPMWORKS outcomes.

In accordance with the project's Data Management Plan, the anonymised datasets of the three surveys covering the five sectors were published in the INRAE data repository assigning a DOI (https://doi.org/10.57745/UTNXCR), making it publicly available.

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6. Annexes

List of annexes

Awareness and motivation for IPM, main IPM options, pesticide use and self-assessment

- Annex 1.1 - Booklet #1 – Sector Arable Field Crops
- Annex 1.2 - Booklet #1 – Sector Vineyards
- Annex 1.3 - Booklet #1 – Sector Orchards
- Annex 1.4 - Booklet #1 – Sector Outdoor Vegetables and Ornamentals
- Annex 1.5 - Booklet #1 – Sector Greenhouse Horticulture

Quantitative indicators of pesticide use, pesticide impacts, and economic profitability

- Annex 2.1 - Booklet #2 – Sector Arable Field Crops
- Annex 2.2 - Booklet #2 – Sector Vineyards
- Annex 2.3 - Booklet #2 – Sector Orchards
- Annex 2.4 - Booklet #2 – Sector Outdoor Vegetables and Ornamentals
- Annex 2.5 - Booklet #2 – Sector Greenhouse Horticulture

Progress made in IPM adoption during the course of the project

- Annex 3.1 - Booklet #3 – Sector Arable Field Crops
- Annex 3.2 - Booklet #3 – Sector Vineyards
- Annex 3.3 - Booklet #3 – Sector Orchards
- Annex 3.4 - Booklet #3 – Sector Outdoor Vegetables and Ornamentals
- Annex 3.5 - Booklet #3 – Sector Greenhouse Horticulture

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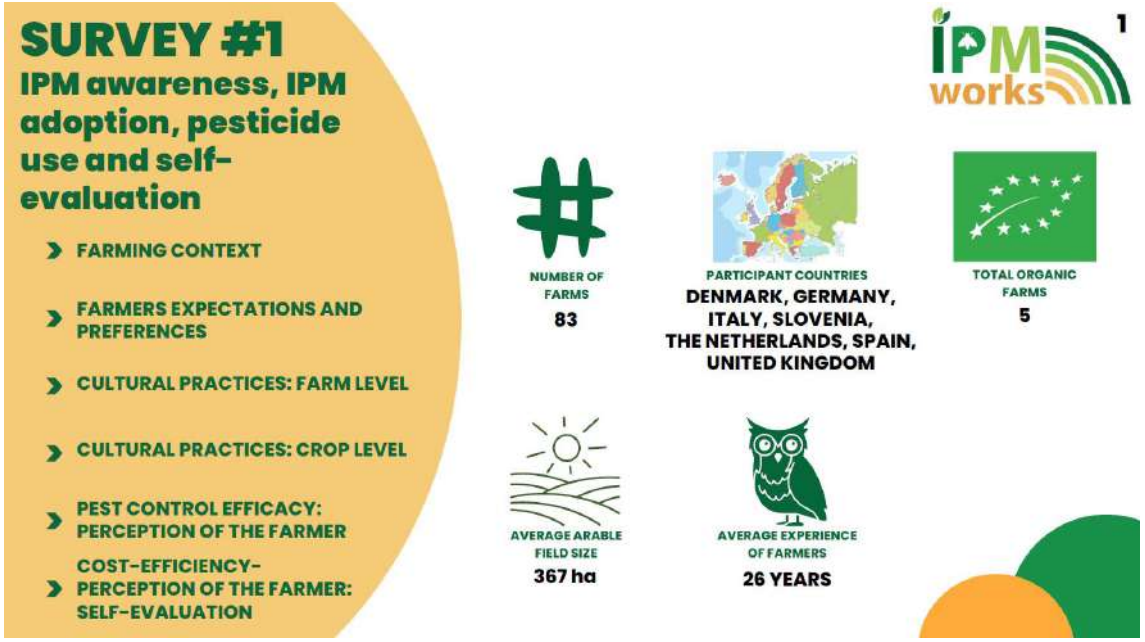
6.1. Annex 1.1 - Booklet #1 – Sector Arable Field Crops



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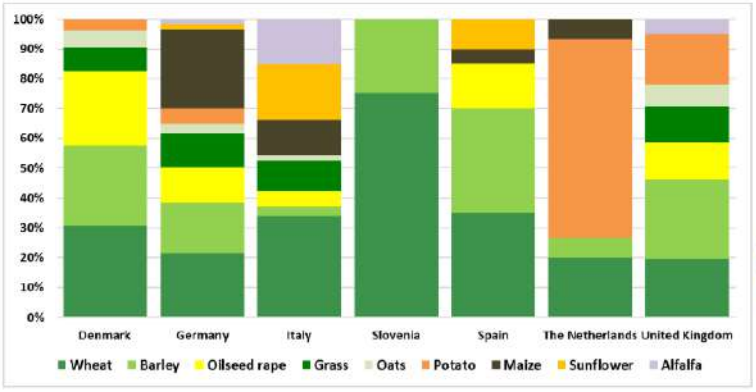
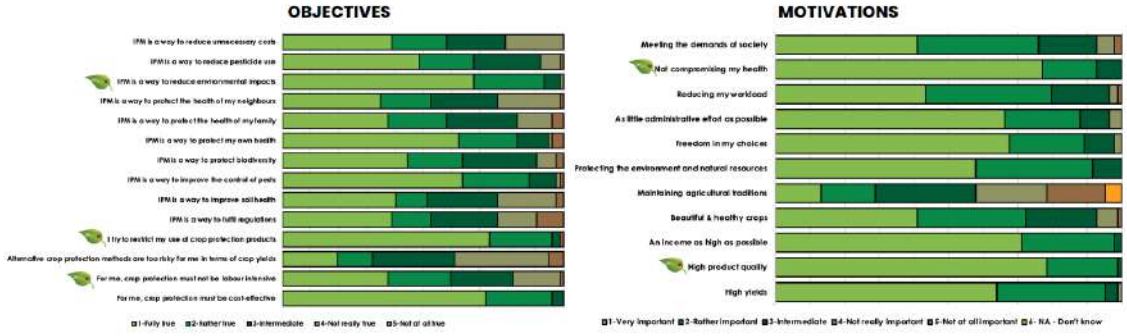
Main arable crops in participating countries



The network covers a wide range of crops ... but some countries are more diversified than others.

Farmers' Awareness of IPM and Motivations

Rating statements from not "Fully true" to "Not at all true" or "Very important to "Not at all important".



"I try to restrict my use of crop protection products", "For me, crop protection must be cost-effective", "IPM is a way to reduce environmental impacts", "Not compromising my health" and "High product quality" are statements highly agreed upon by farmers.
"Maintaining agricultural traditions" is not something important, indicating that farmers are open to change and adopting new practices that will benefit them now and in the future.

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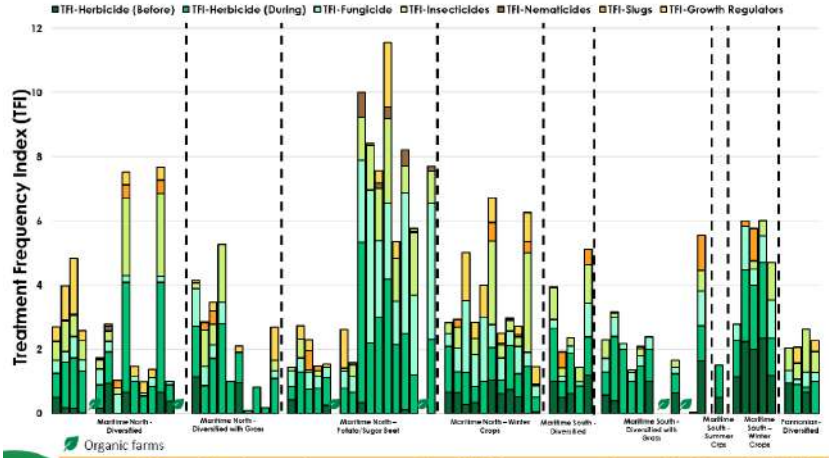
Pesticide Use

4



Treatment Frequency Index (TFI)
TFI is used as a metric of frequency and intensity of pesticide use.

The TFI was determined based on:
- the number of treatments
- average dose (% recommended dose for target pest)
- average % of treated area (default = 100)

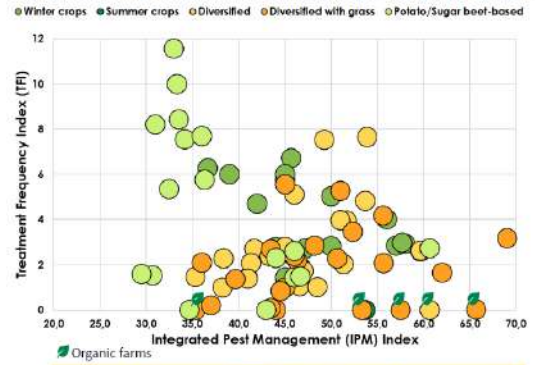
Farms are classified according to
(i) main crops,
(ii) climatic zone.

TFI metric shows a large range of pesticide use across farms, that can be attributed to:
- **Nature of crops (Potatoes and rapeseed are crops requiring high levels of pest/disease control)**
- **Geographic location**
- **Level of IPM adoption**

Integrated Pest Management Index

5

We tested a new IPM Index calculated from the information collected on crop and pest management.



The range of IPM adoption varies across farms, and this explains part of the pesticide use.
Farms diversified with grass show a lower TFI and higher IPM index.

Topics included in IPM Index
Cultural practices at the crop and farm levels were evaluated based on the last 3 cropping seasons.
IPM practices included in the index were e.g. *number of crops in the rotation, use of resistant cultivars, adapted sowing dates to escape pests, soil tillage strategy, use of Decision Support Systems, mechanical weeding...*
Each practice rating was then scored between 0-4. The IPM index is the sum of the weighted scores and ranges from [0 - 84].

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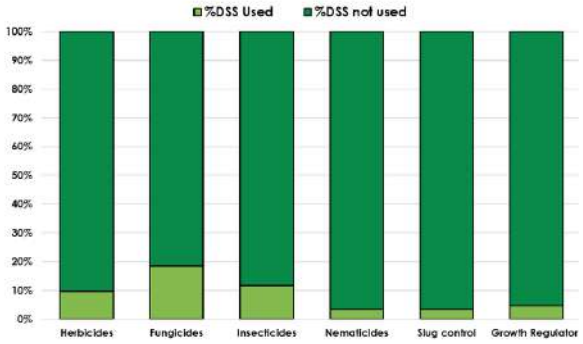
Decision Support System

6



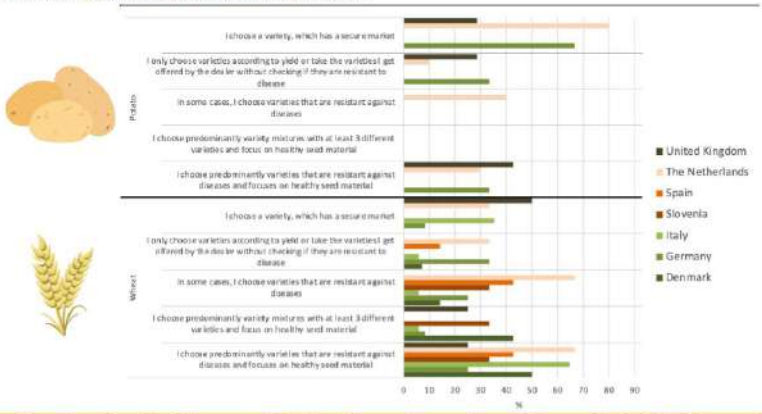
Farmers rarely cited Decision Support Systems (DSS) for the decision making of treatments: herbicides, fungicides, insecticides, nematicides, slug control, and growth regulators.

DSS does not appear to be a major component of IPM strategies in IPMWORKS arable farms. Progress could probably be done in this area.

Variety Choice

7

Criterias for the selection of cultivars in IPMWORKS farms



Choosing wheat cultivars resistant to disease is a major option, particularly in Denmark, Italy, Slovenia... Some farmers are growing mixtures of wheat cultivars to enhance the crop robustness.

Potato cultivars resistant to diseases are rather poorly used, because of technological constraints from the industry.

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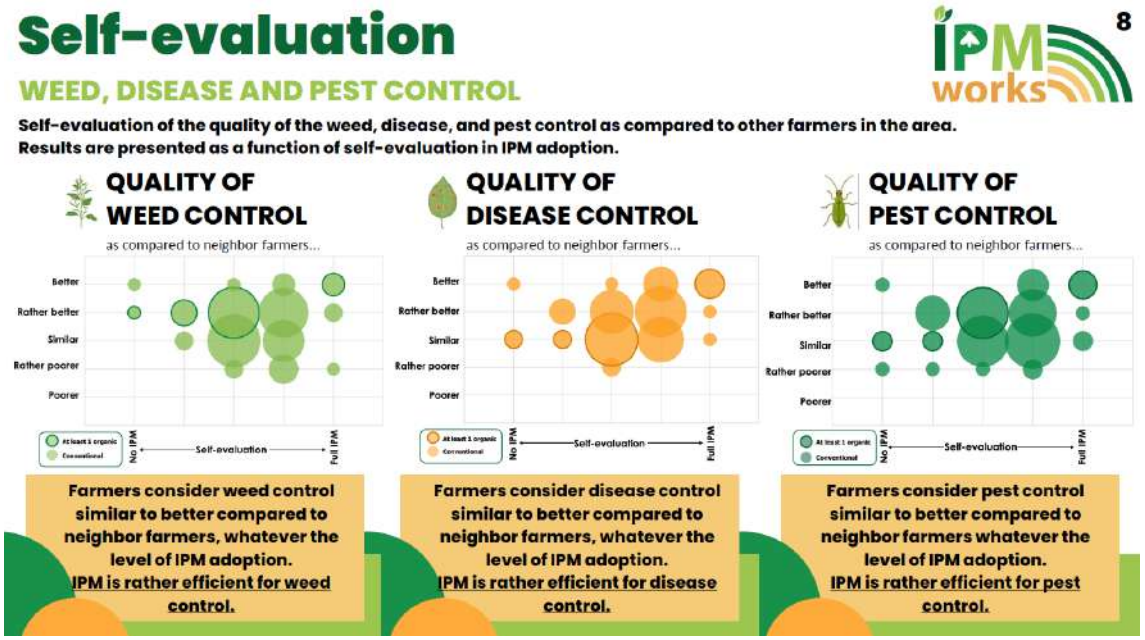

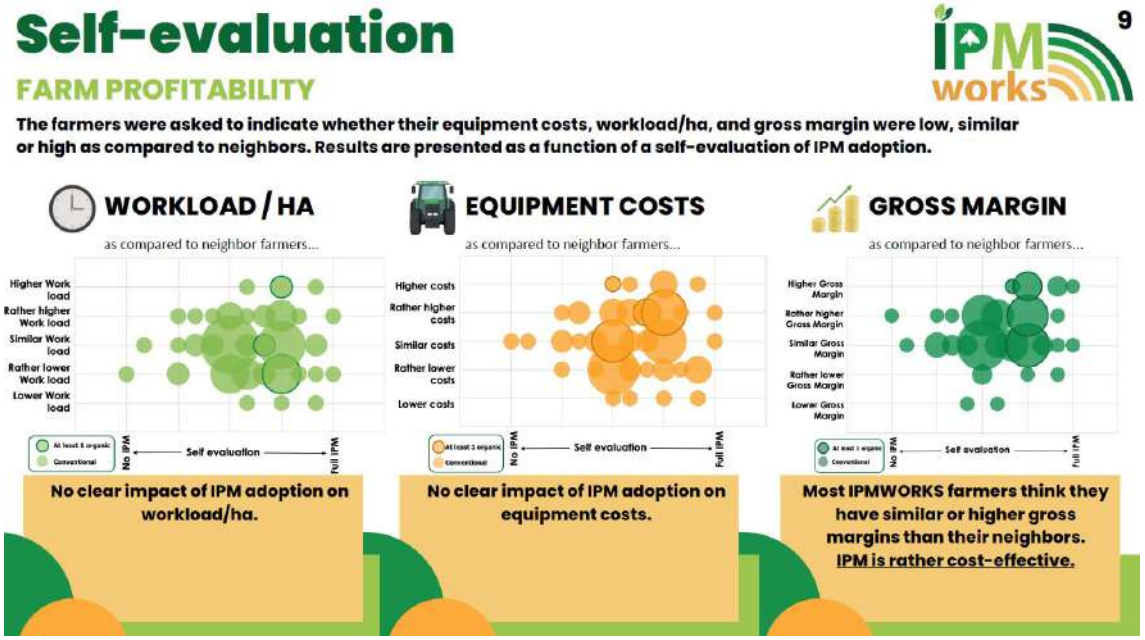

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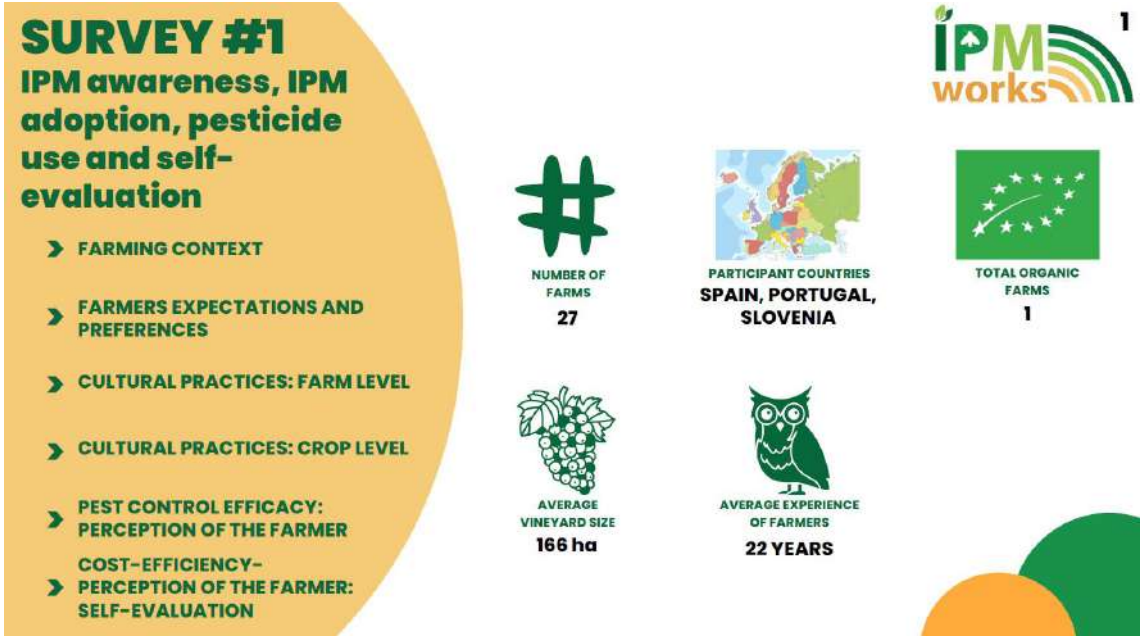
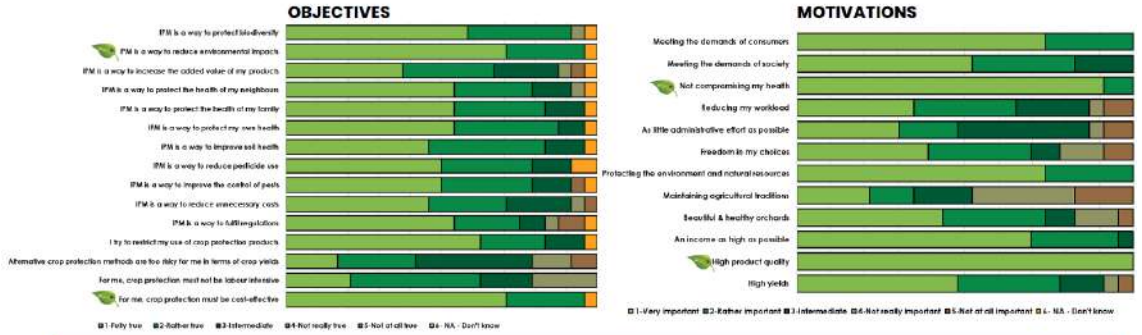
6.2. Annex 1.2 - Booklet #1 – Sector Vineyards



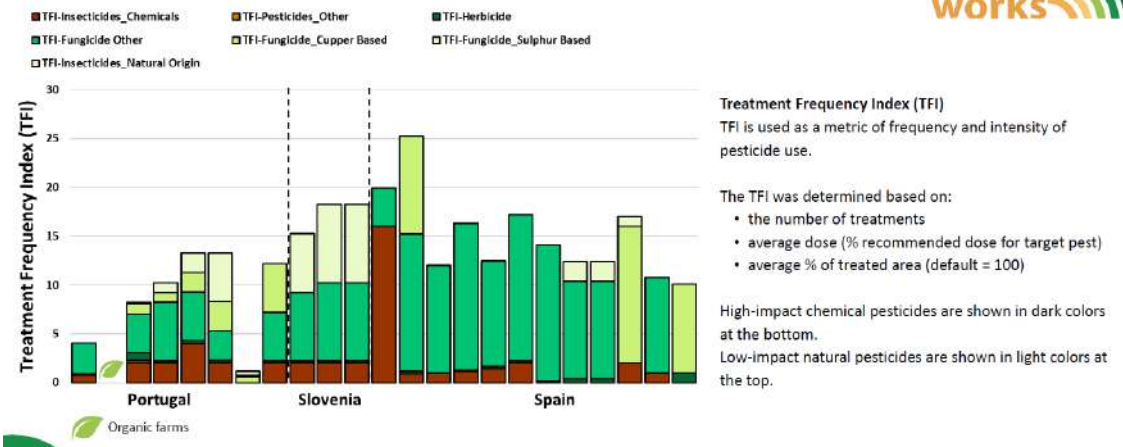
Farmers' Awareness of IPM and Motivations

Rating statements from not "Fully true" to "Not at all true" or "Very important to "Not at all important".



"IPM is a way to reduce environmental impacts", "For me, crop protection must be cost-effective", "Not compromising my health" and "High Product quality" is considered to be the most important factors for IPMWORKS farmers.
Farmers do not consider alternative crop protection methods to be too risky in terms of crop yields.

Pesticide Use



Treatment Frequency Index (TFI)
TFI is used as a metric of frequency and intensity of pesticide use.

The TFI was determined based on:
- the number of treatments
- average dose (% recommended dose for target pest)
- average % of treated area (default = 100)

High-impact chemical pesticides are shown in dark colors at the bottom.
Low-impact natural pesticides are shown in light colors at the top.

TFI metric shows a large range of pesticide use across farms, that can be attributed to:
- **Climatic conditions**
- **Level of IPM adoption**

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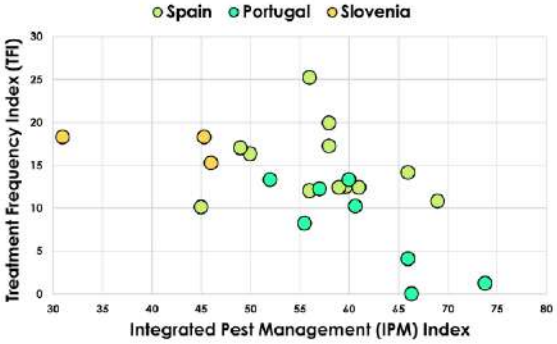
Integrated Pest Management Index

4

We tested a new IPM Index calculated from the information collected on crop and pest management.



Topics included in IPM Index

Cultural practices at the crop and farm levels were evaluated based on the last 3 cropping seasons.

IPM practices included in the index were e.g. *use of Decision Support Systems, resistant cultivars, cover crops, mowing, mulching, use of biocontrol solutions, mechanical weeding, protection of wildlife at the landscape scale...*

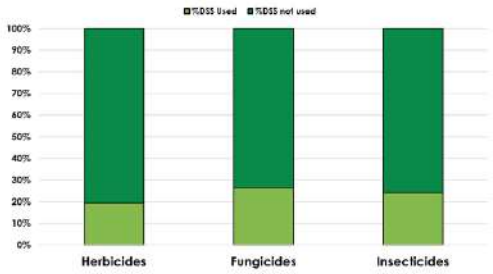
Each practice rating was then scored between 0-4. The IPM index is the sum of the weighted scores and ranges [0 - 80].

The range of IPM adoption varies across farms, and this explains part of the pesticide use.

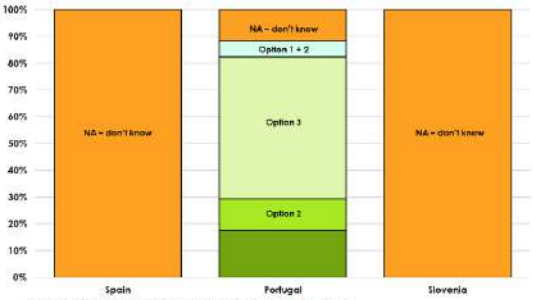
Decision Support System

Variety Choice

5



Farmers cited Decision Support Systems (DSS) for the implementation of herbicides, fungicides, insecticides, nematicides, slug control, and growth regulators, but still with quite a low frequency.



- **Option 1** Cultivar(s) resistant to major diseases
- **Option 2** Cultivar(s) resistant to major pests
- **Option 3** Cultivar(s) sensitive to all major pests and diseases

Constraints on vineyards make the use of resistant cultivars difficult.

The survey informs about how far the various components of IPM are already implemented by IMPWORKS farmers in vineyards. Progress could probably be made on the generalization of Decision Support Systems.

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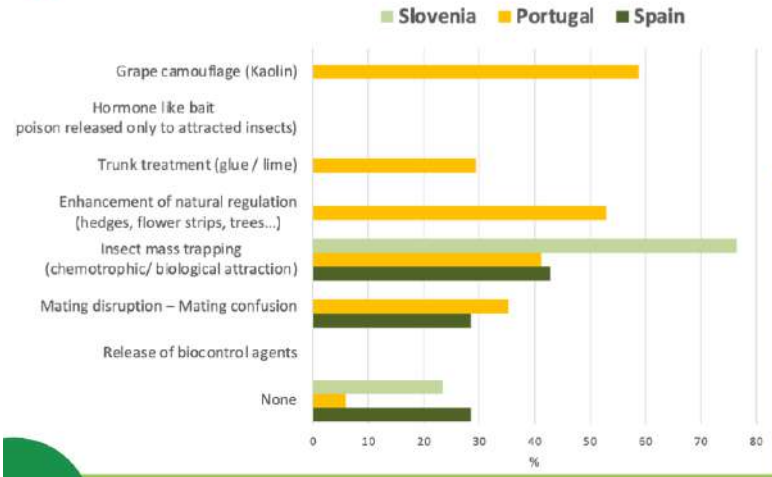
Biocontrol

6



Biocontrol is widely adopted by IPMWORKS farmers in the vineyard sector, particularly in Portugal, but also in Spain and Slovenia.

Insect mass trapping is the most popular approach, in the three regions.

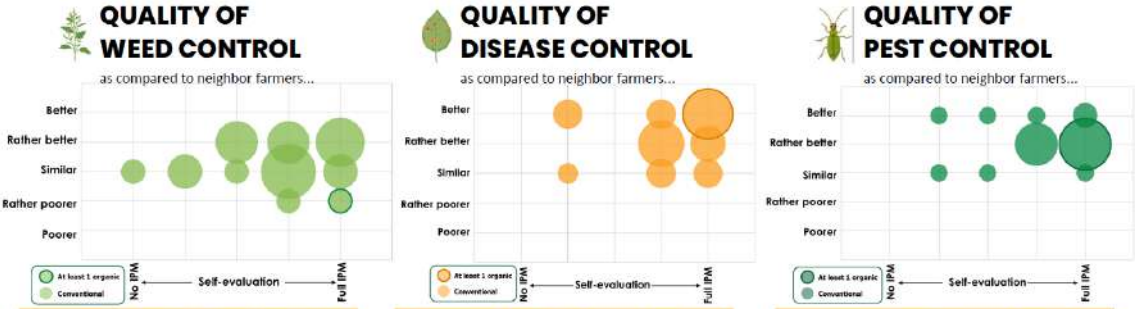
Other biocontrol solutions used are grape camouflage with kaolin, trunk treatment, and enhancement of beneficials around the vineyards (Spain), and mating disruption (both in Spain and Portugal).

Self-evaluation

7

WEED, DISEASE AND PEST CONTROL

Self-evaluation of the quality of the weed, disease, and pest control as compared to other farmers in the area.
Results are presented as a function of self-evaluation in IPM adoption.



Farmers consider weed control to be similar or better than neighbor farmers, whatever the level of IPM adoption.
IPM is efficient for weed control.

Farmers consider disease control to be better than neighbor farmers, whatever the level of IPM adoption.
IPM is efficient for disease control.

Farmers consider pest control similar to better compared to neighbor farmers, whatever the level of IPM adoption.
IPM is efficient for pest control.

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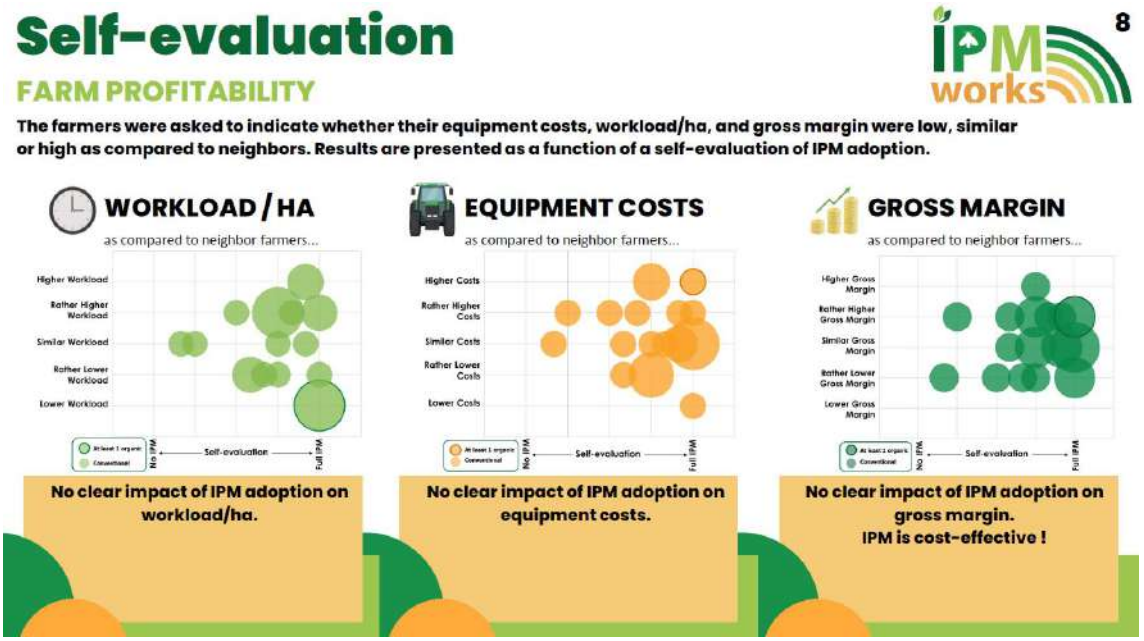

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6.3. Annex 1.3 - Booklet #1 – Sector Orchards

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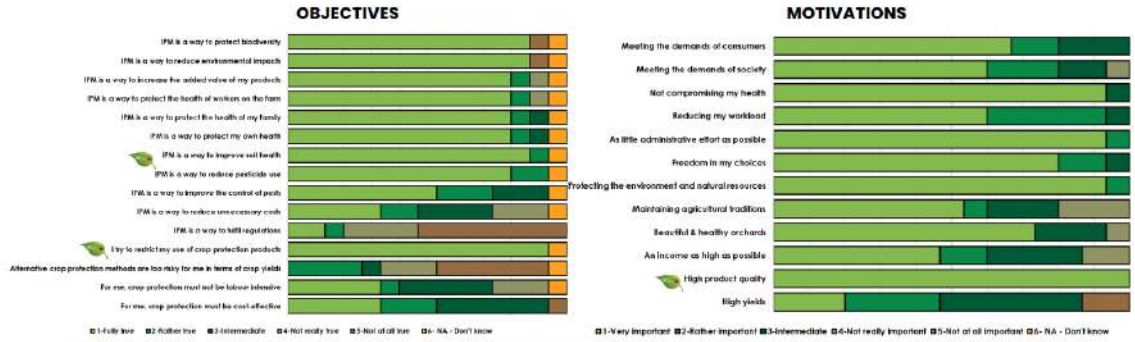
Farmers' Awareness of IPM and Motivations

2

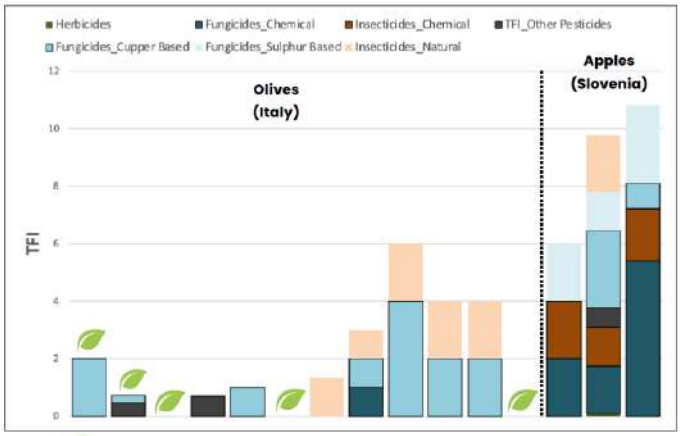
Rating statements from not "Fully true" to "Not at all true" or "Very important to "Not at all important".



"IPM is a way to improve soil health", "I try to restrict my use of crop protection product", and "High Product Quality" is considered to be the most important statements for IPMWORKS farmers.
Protecting the environment, natural resources, and biodiversity is a very important factor influencing farmers' decision to implement IPM.

Pesticide Use

3



Organic farms

Treatment Frequency Index (TFI)
TFI is used as a metric of frequency and intensity of pesticide use.

The TFI was determined based on:
- the number of treatments
- average dose (% recommended dose for target pest)
- average % of treated area (default = 100)

TFI metric shows a large range of pesticide use across farms, that can be attributed to:
- **Nature of crops**
- **Level of IPM adoption**

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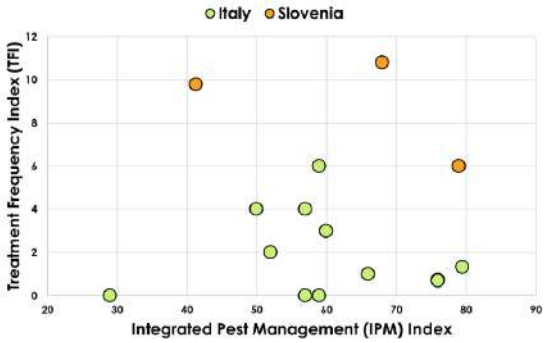
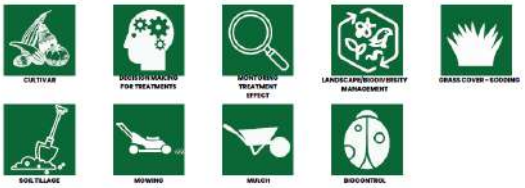
Integrated Pest Management Index

4

We tested a new IPM Index calculated from the information collected on crop and pest management.





Topics included in IPM Index

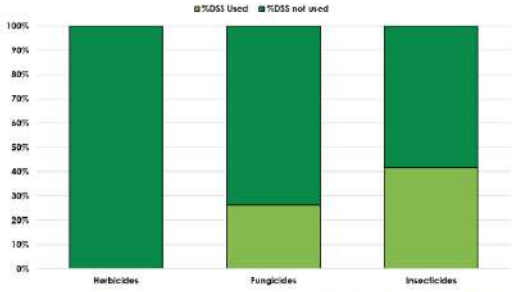
Cultural practices at the crop and farm levels were evaluated based on the last 3 cropping seasons.

IPM practices included in the index were e.g. *use of Decision Support Systems, resistant cultivars, cover crops, mowing, mulching, use of biocontrol solutions, mechanical weeding, protection of wildlife at the landscape scale...*

Each practice rating was then scored between 0-4. The IPM index is the sum of the weighted scores and ranges [0 - 84].

The range of IPM adoption varies across farms, and this explains part of the pesticide use.

Decision Support System

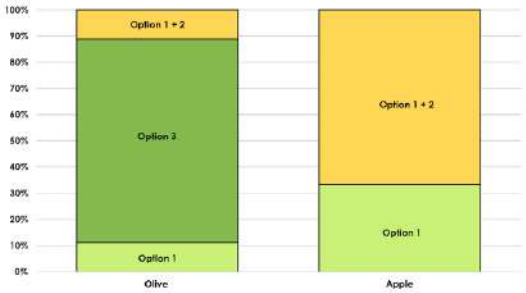


Farmers cited Decision Support Systems (DSS) for the implementation of herbicides, fungicides, and insecticides.

The survey informs about how far the various components of IPM are already implemented by IPMWORKS farmers in orchards.

Variety Choice

5



- **Option 1** All cultivars resistant to major diseases
- **Option 2** Part of cultivars resistant to major diseases
- **Option 3** No cultivar resistant to major diseases
- **Option 4** All cultivars resistant to major insect pests
- **Option 5** Part of cultivars resistant to major insect pests
- **Option 6** No cultivar resistant to major insect pests

Resistant cultivars is not a main factor for olive groves (often old trees)... it is more important when selecting apple cultivars.

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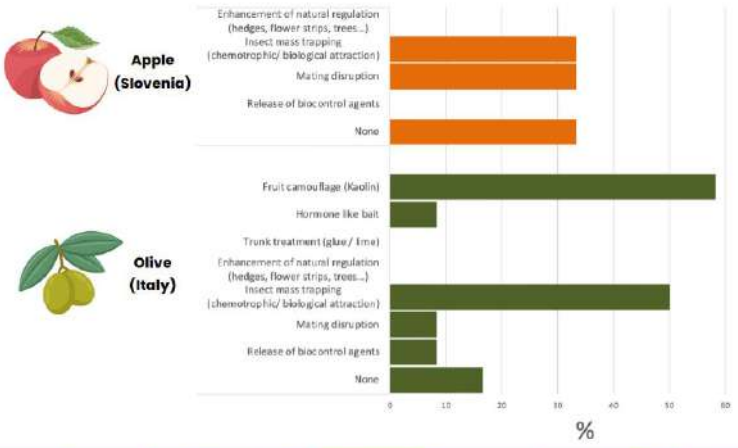
Biocontrol

6



Biocontrol is widely adopted in IPMWORKS olive groves (more than 80% of farms), with mass trapping and camouflage of fruits with Kaolin as main solutions.
Mating disruption and mating confusion are also widely adopted in apple to control insect pests.

Self-evaluation

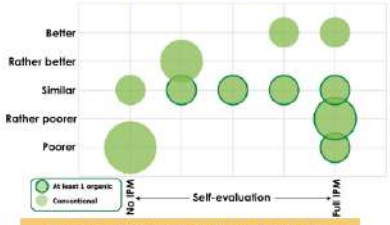
7

WEED, DISEASE AND PEST CONTROL

Self-evaluation of the quality of the weed, disease, and pest control as compared to other farmers in the area.
Results are presented as a function of self-evaluation in IPM adoption.

QUALITY OF WEED CONTROL

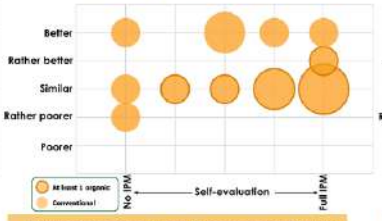
as compared to neighbor farmers...



No clear impact of IPM adoption on weed control. Weed control is an issue in some organic farms, but IPM stands to improve control in conventional farms.

QUALITY OF DISEASE CONTROL

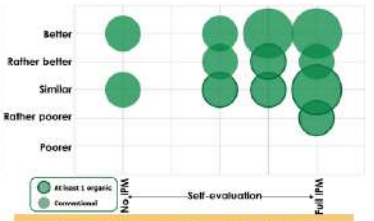
as compared to neighbor farmers...



Farmers consider disease control to be similar or better than neighbor farmers, whatever the level of IPM adoption.
IPM is efficient for disease control.

QUALITY OF PEST CONTROL

as compared to neighbor farmers...



Farmers consider pest control similar to better compared to neighbor farmers, whatever the level of IPM adoption.
IPM is efficient for pest control.

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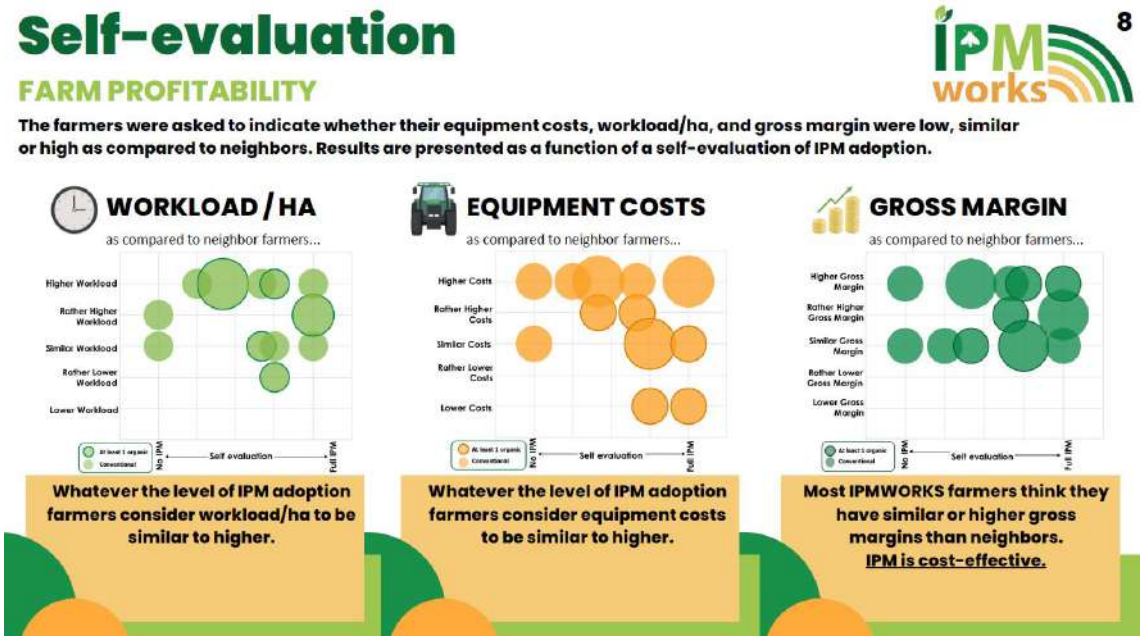

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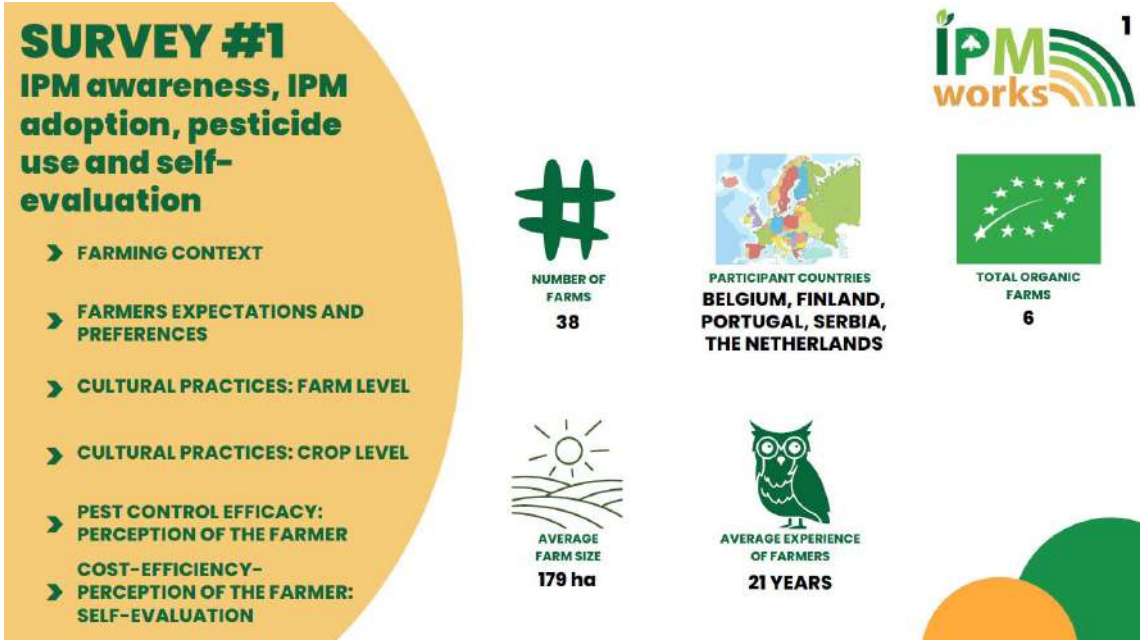
6.4. Annex 1.4 - Booklet #1 – Sector Outdoor Vegetables and Ornamentals



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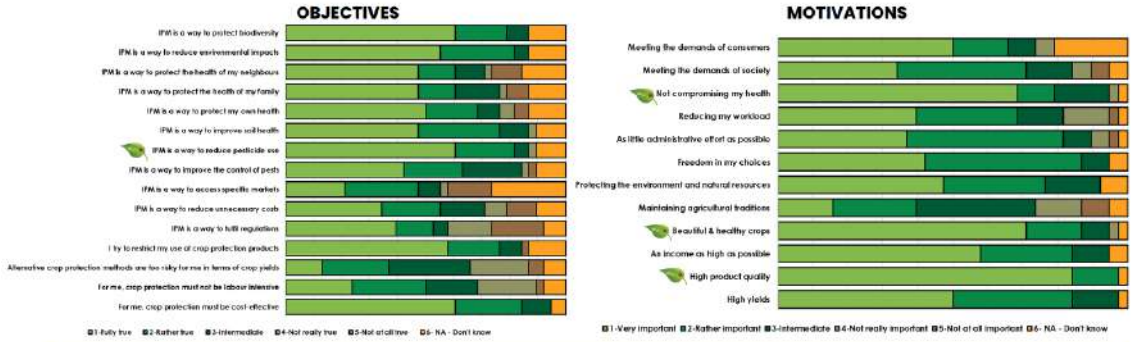
Farmers' Awareness of IPM and Motivations

2

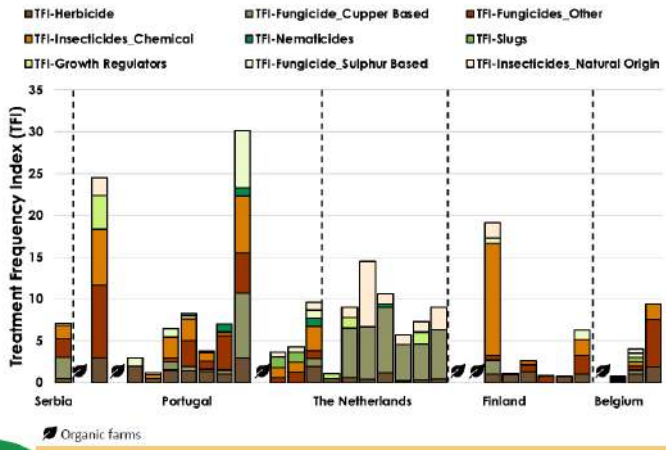
Rating statements from not "Fully true" to "Not at all true" or "Very important to "Not at all important".



"IPM is a way to reduce pesticide use", "Not Compromising my health", Beautiful & healthy crops", and "High product quality" are considered to be the most important statements for successful IPM adoption. Protecting the environment, natural resources, and biodiversity is a very important factor influencing farmers' decision to implement IPM.

Pesticide Use

3



Treatment Frequency Index (TFI)
TFI is used as a metric of frequency and intensity of pesticide use.

The TFI was determined based on:

- the number of treatments
- average dose (% recommended dose for target pest)
- average % of treated area (default = 100)

High-impact chemical pesticides are shown in dark colors at the bottom.
Low-impact natural pesticides are shown in light colors at the top.

TFI metric shows a large range of pesticide use across farms, that can be attributed to:

- **Nature of crops**
- **Level of IPM adoption**

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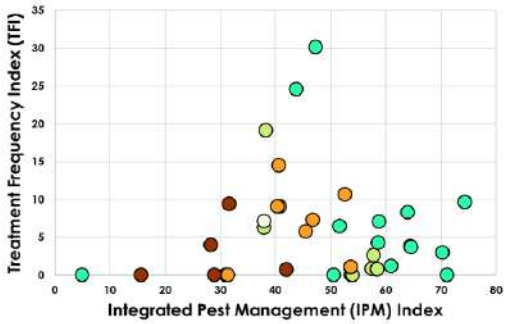
Integrated Pest Management Index

4

We tested a new IPM Index calculated from the information collected on crop and pest management.

● Belgium ○ Finland ● Portugal ○ Serbia ● The Netherlands



Topics included in IPM Index

Cultural practices at the crop and farm levels were evaluated based on the last 3 cropping seasons. Farmers rated these practices between 1 ("Not at all true") and 5 ("Fully true"), based on their individual perspectives.

Each practice rating was then scored between 0-4 and carried a weight of 1 in the calculation of the IPM Index, except "Choice of Pesticides" which had a weight of 2.

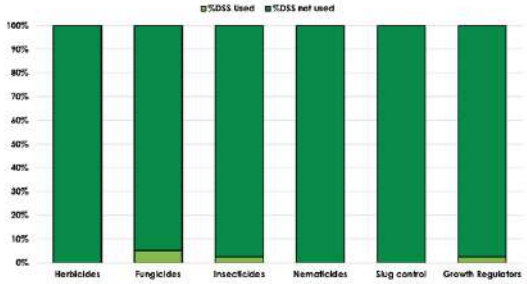
The IPM index is the sum of the weighted scores and ranges from [0 -80].

The range of IPM adoption varies across farms, and this explains part of the pesticide use.

Decision Support System

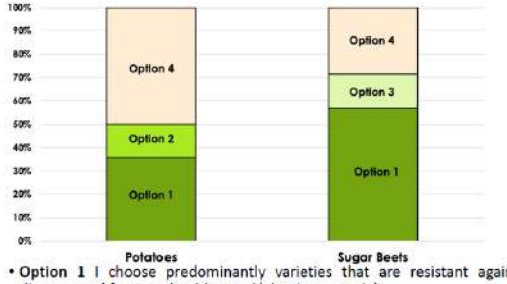
Variety Choice

5



Farmers did not cite any Decision Support Systems (DSS) for the implementation of herbicides, fungicides, insecticides, nematicides, slug control, and growth regulators.

DSS does not appear as a major component of IPM strategies in these farms.



- **Option 1** I choose predominantly varieties that are resistant against diseases and focus on healthy seed/planting material
- **Option 2** I predominantly mix varieties, with at least 3 different varieties and focus on healthy seed material
- **Option 3** In some cases, I choose varieties that are resistant against diseases
- **Option 4** I only choose varieties according to yield or market, or season, without checking if they are resistant to disease

The survey informs about how far the various components of IPM are already implemented by IMPWORKS farmers in outdoor vegetables.

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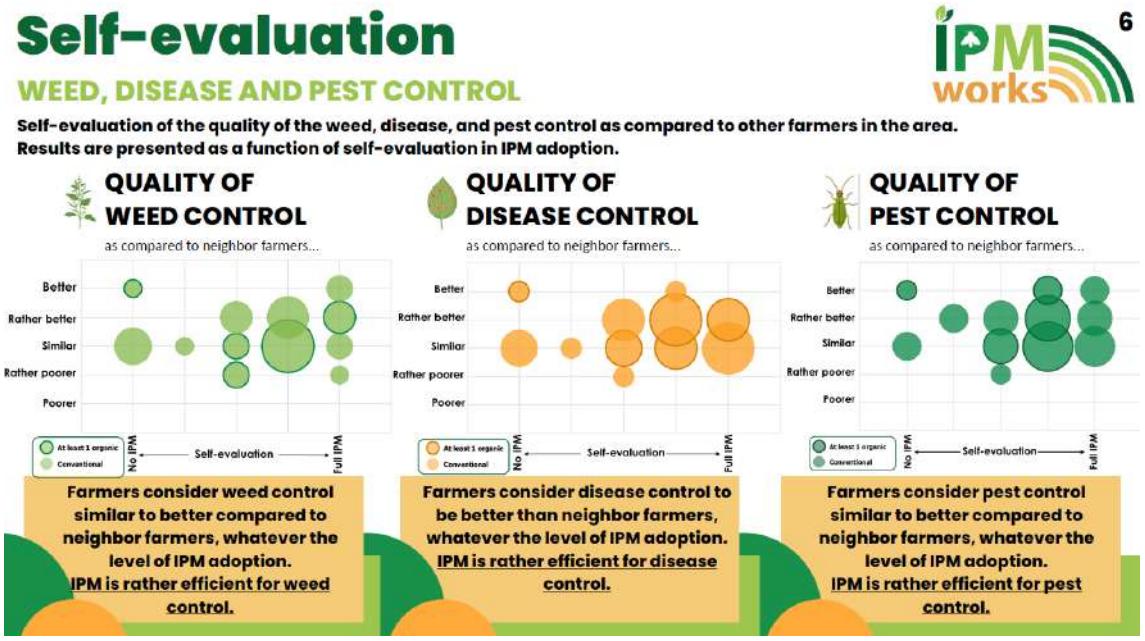

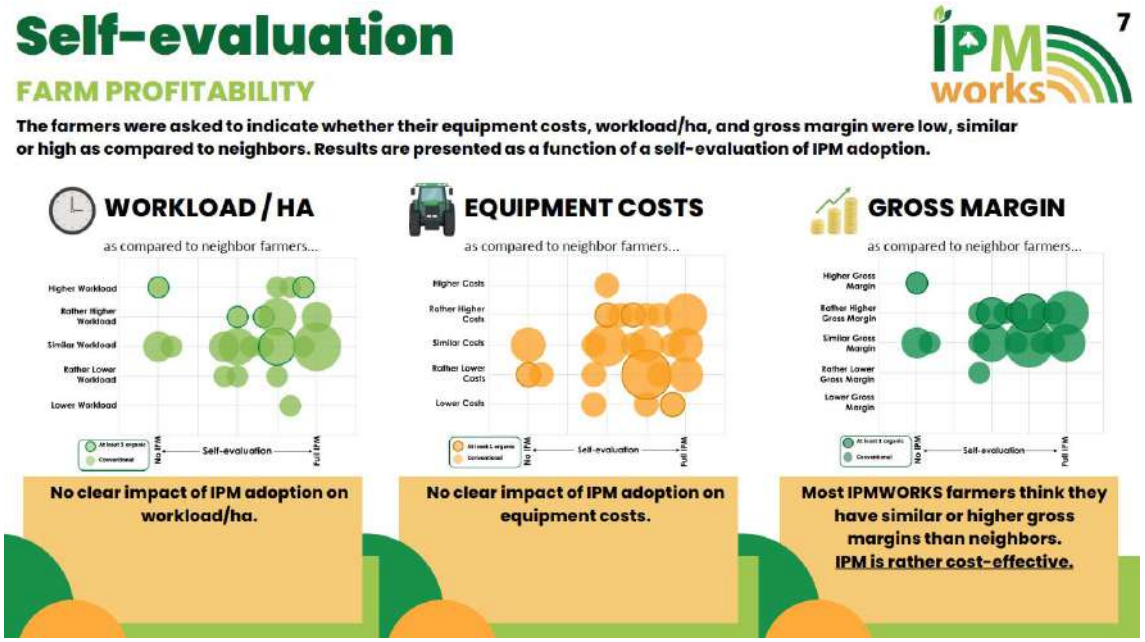

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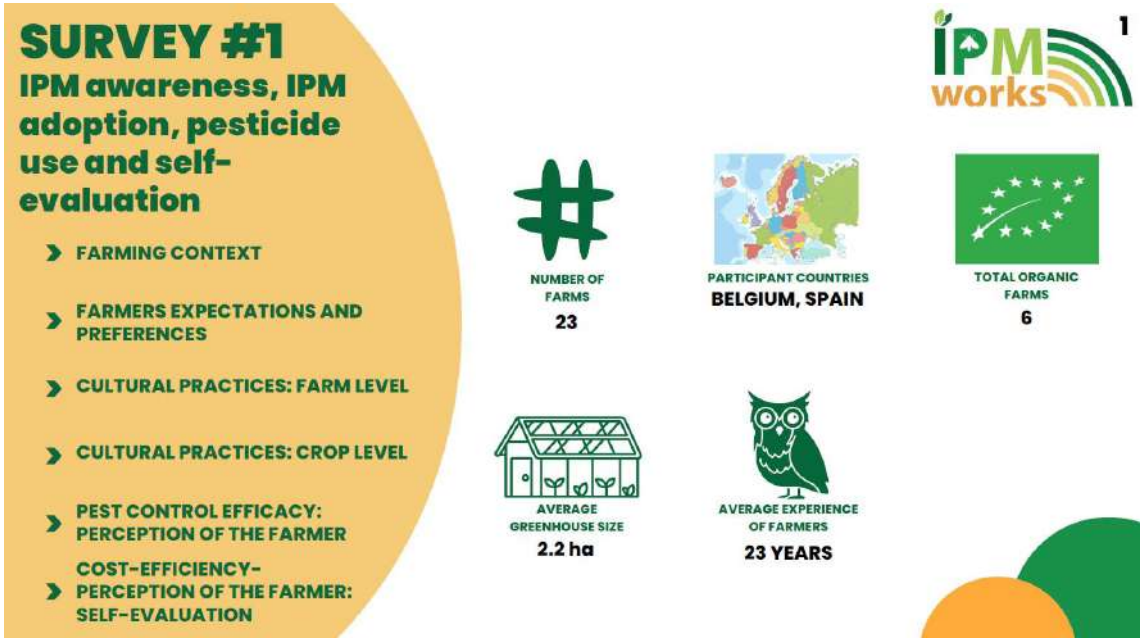
6.5. Annex 1.5 - Booklet #1 – Sector Greenhouse horticulture



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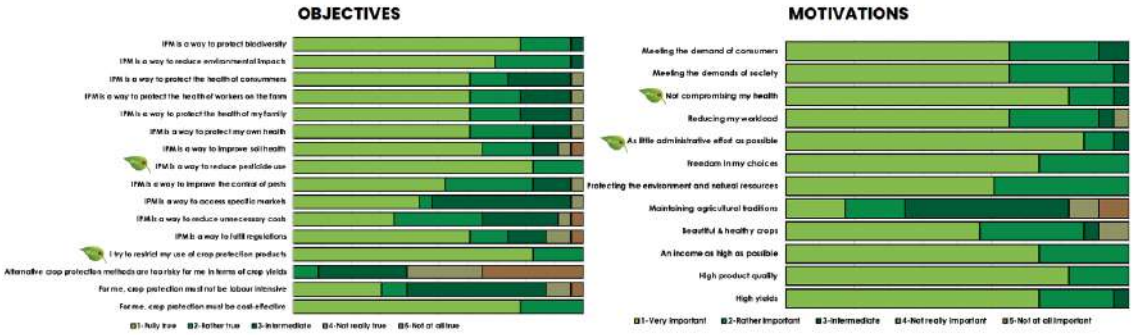
Farmers' Awareness of IPM and Motivations

2

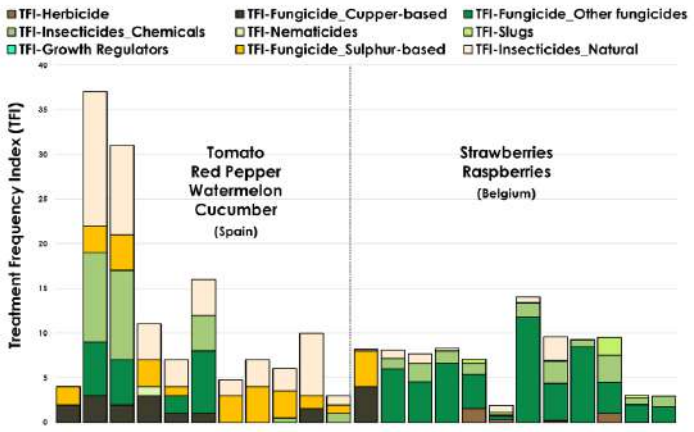
Rating statements from not "Fully true" to "Not at all true" or "Very important to "Not at all important".



"I try to restrict my use of crop protection products", "IPM is a way to reduce pesticide use", "As little administrative effort as possible" and "Not compromising my health" are considered to be the most important statements for successful IPM adoption.
"Maintaining agricultural traditions" is not something important, indicating that farmers are open to change and adopting new practices that will benefit them now and in the future.

Pesticide Use

3



Treatment Frequency Index (TFI)
TFI is used as a metric of frequency and intensity of pesticide use.

The TFI was determined based on:
- the number of treatments
- average dose (% recommended dose for target pest)
- average % of treated area (default = 100)

High-impact chemical pesticides are shown in dark colors at the bottom.
Low-impact natural pesticides are shown in light colors at the top.

TFI metric shows a large range of pesticide use across farms, that can be attributed to:
- **Nature of crops**
- **Level of IPM adoption**

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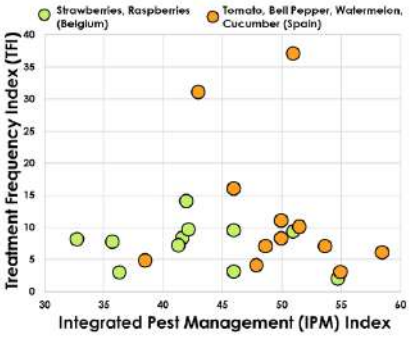
Integrated Pest Management Index

4

We tested a new IPM Index calculated from the information collected on crop and pest management.



Topics included in IPM Index

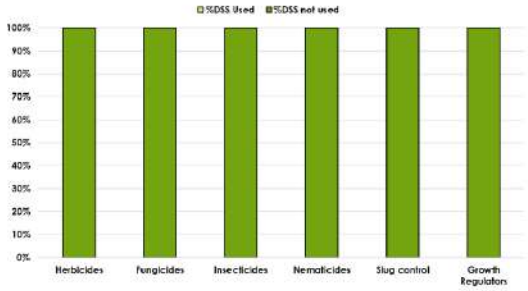
Cultural practices at the crop and farm levels were evaluated based on the last3 cropping seasons. Farmers rated these practices between 1 ("Not at all true") and 5 ("Fully true"), based on their individual perspectives.

Each practice rating was then scored between 0-4 and carried a weight of 1 in the calculation of the IPM Index, except "Biocontrol" and "Choice of Pesticides" which had a weight of 2.

The IPM index is the sum of the weighted scores and ranges from [0 - 80].

The range of IPM adoption varies across farms, and this explains part of the pesticide use.

Decision Support System

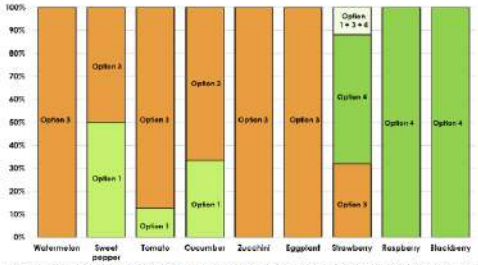


Farmers did not cite any Decision Support Systems (DSS) for the implementation of herbicides, fungicides, insecticides, nematicides, slug control, and growth regulators.

DSS does not appear as a major component of IPM strategies in these farms.

Variety Choice

5



- **Option 1** I choose predominantly varieties that are resistant against diseases and focuses on healthy seed/planting material
- **Option 2** I predominantly mix varieties, with at least 3 different varieties and focus on healthy seed material
- **Option 3** In some cases, I choose varieties that are resistant against diseases
- **Option 4** I only choose varieties according to yield or market, or season, without checking if they are resistant to diseaself you have no answer for a crop

Farmers chose cultivar varieties resistant to diseases.

The survey informs about how far the various components of IPM are already implemented by IMPWORKS farmers in greenhouse horticulture.

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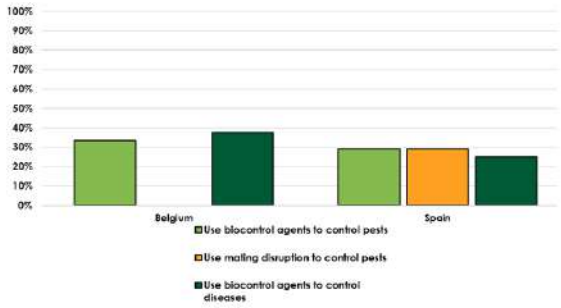
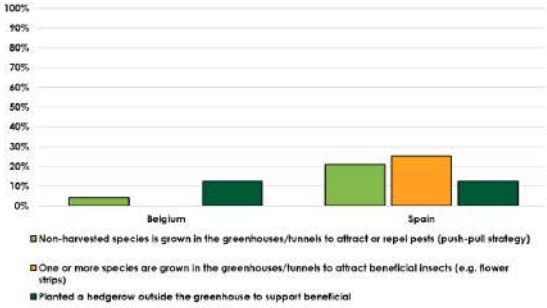
Biocontrol



Biocontrol solutions are a major component of IPM strategies in greenhouses.

Ecological infrastructure

6



Ecological approaches for attracting beneficial organisms are developing (particularly in the Spanish hub).

The survey informs about how far the various components of IPM are already implemented by IMPWORKS farmers in greenhouse horticulture.

Self-evaluation

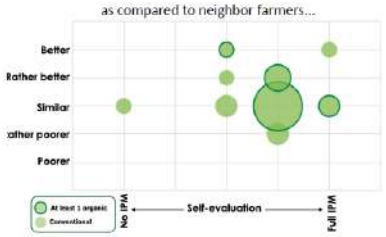
7

WEED, DISEASE AND PEST CONTROL

Self-evaluation of the quality of the weed, disease, and pest control as compared to other farmers in the area. Results are presented as a function of self-evaluation in IPM adoption.

QUALITY OF DISEASE CONTROL

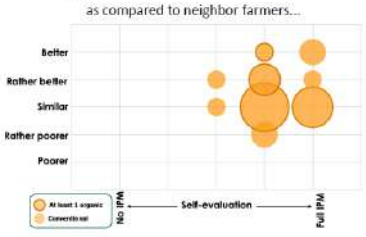
as compared to neighbor farmers...



Farmers consider disease control to be better than neighbor farmers, whatever the level of IPM adoption. IPM is rather efficient for disease control.

QUALITY OF PEST CONTROL

as compared to neighbor farmers...



Farmers consider pest control similar to better compared to neighbor farmers, whatever the level of IPM adoption. IPM is rather efficient for pest control.

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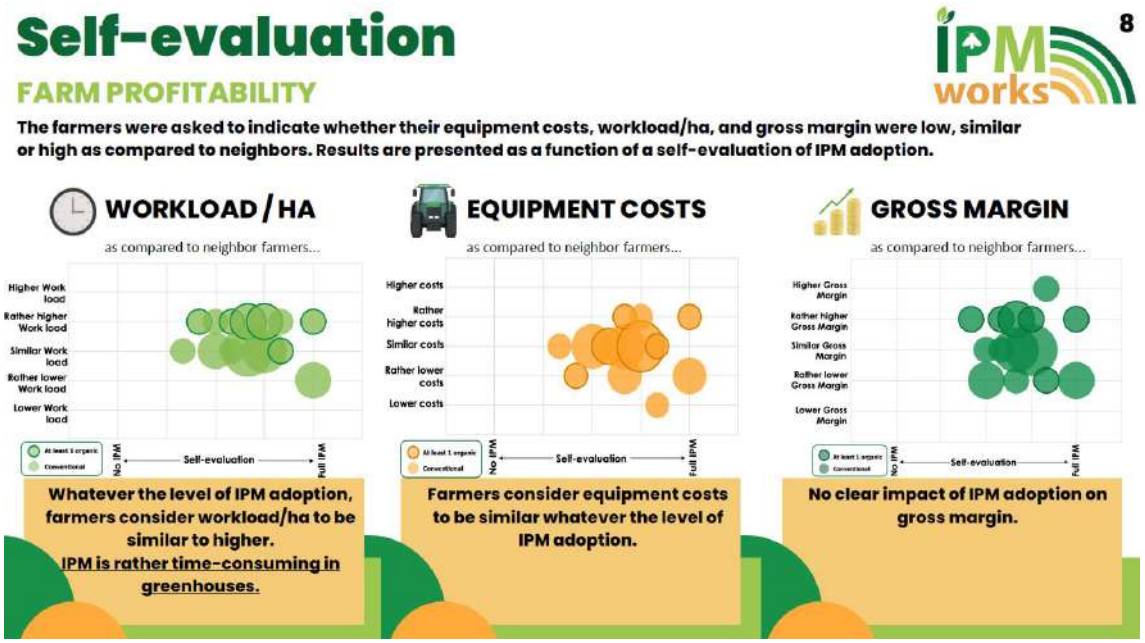

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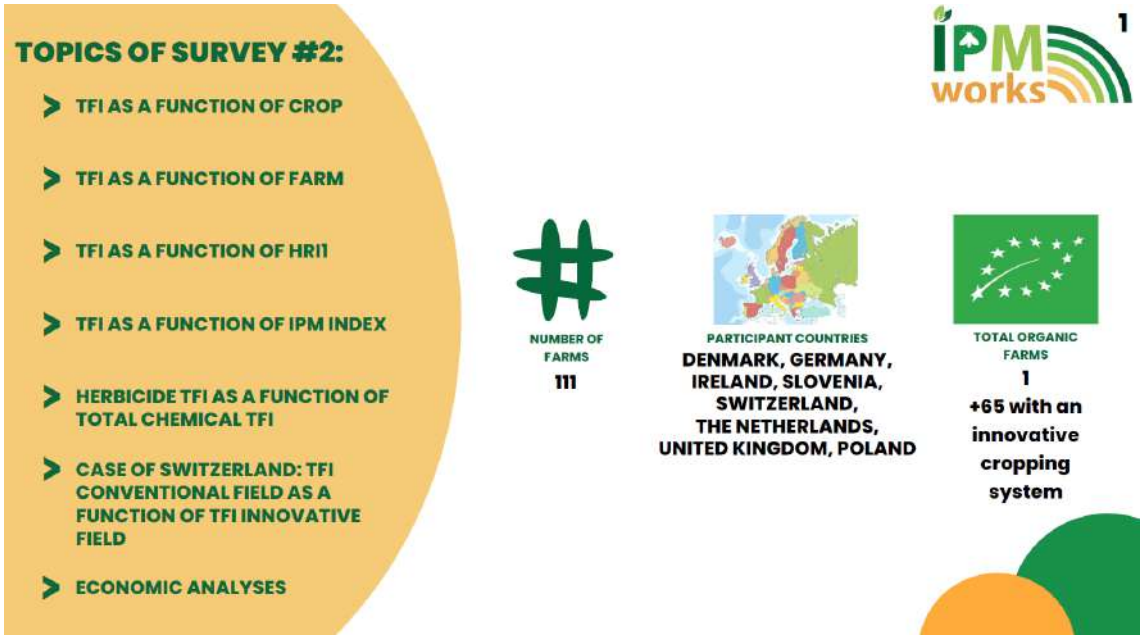
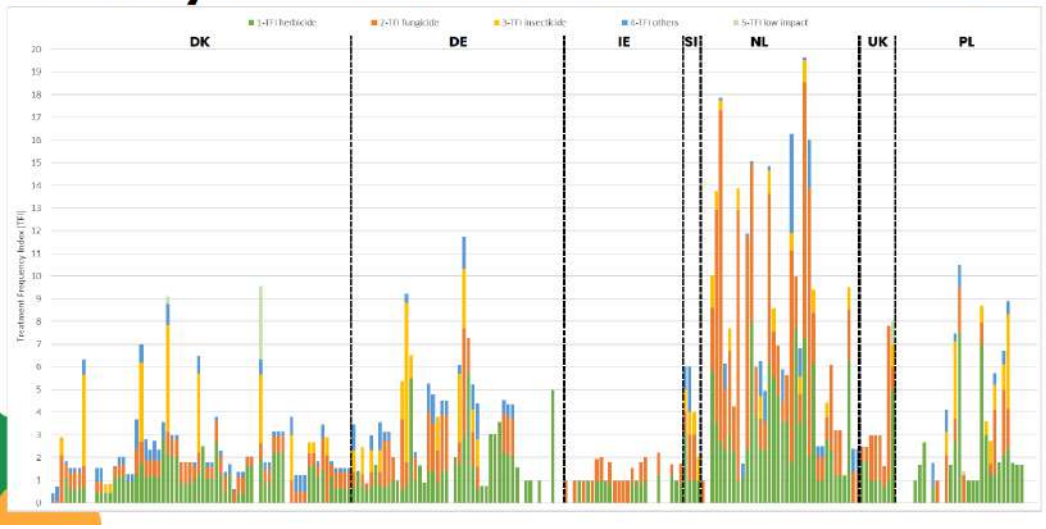
6.6. Annex 2.1 - Booklet #2 – Sector Arable Field Crops



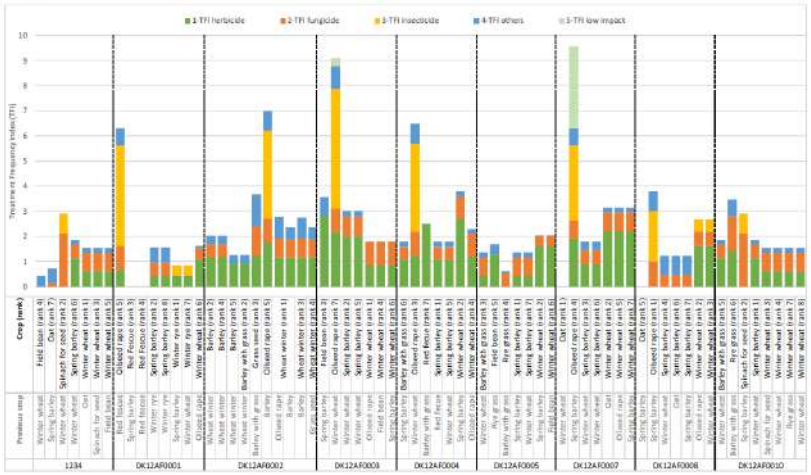
TFI as a function of crop

All country without Switzerland



TFI as a function of crop

Denmark



Main crop:
- **Wheat**
- **Barley**

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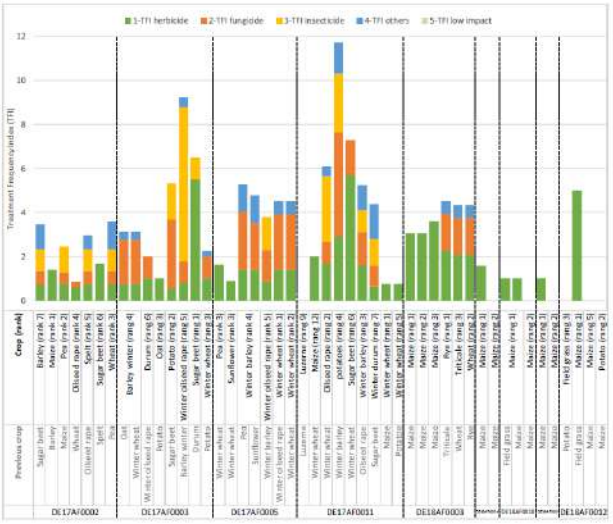
TFI as a function of crop

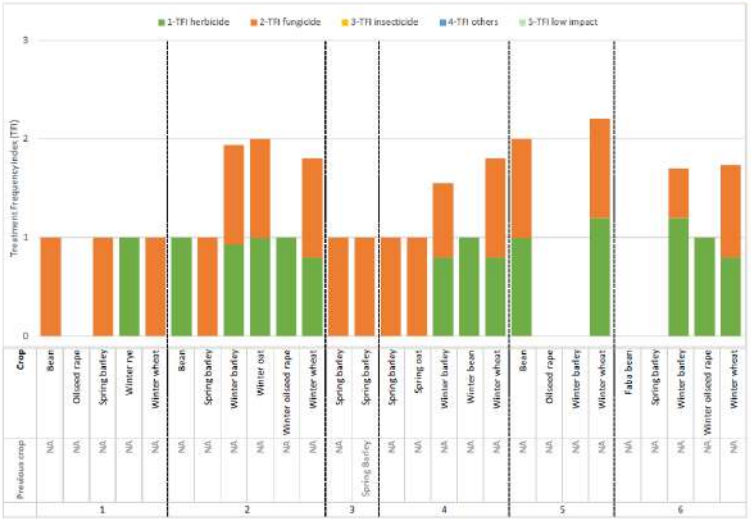
Germany



Main crop:
- **Maize**
- **Wheat**

TFI as a function of crop

Ireland



Main crop:
- **Barley**
- **Wheat**
- **Bean**

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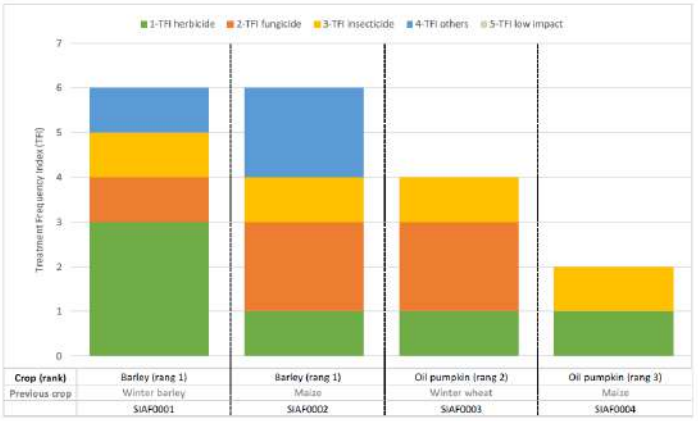
TFI as a function of crop
Slovenia

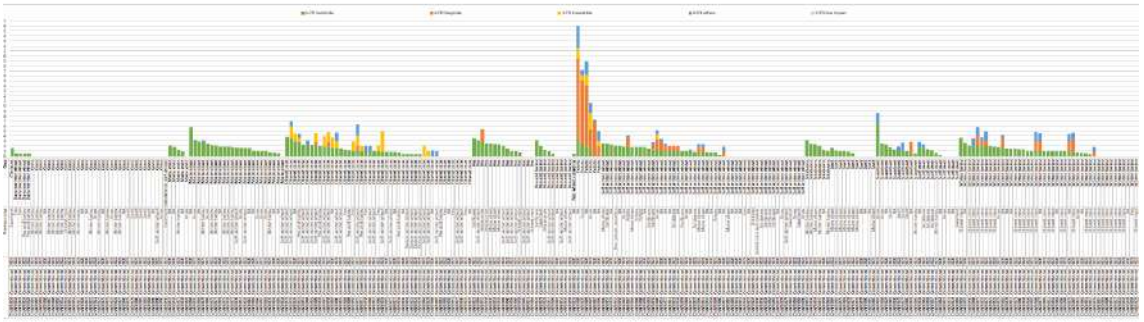
6



Main crop:
- **Barley**
- **Oil pumpkin**

TFI as a function of crop
Switzerland – conventional system

7



Main crop:
- **Rapeseed**
- **Barley**
- **Wheat**

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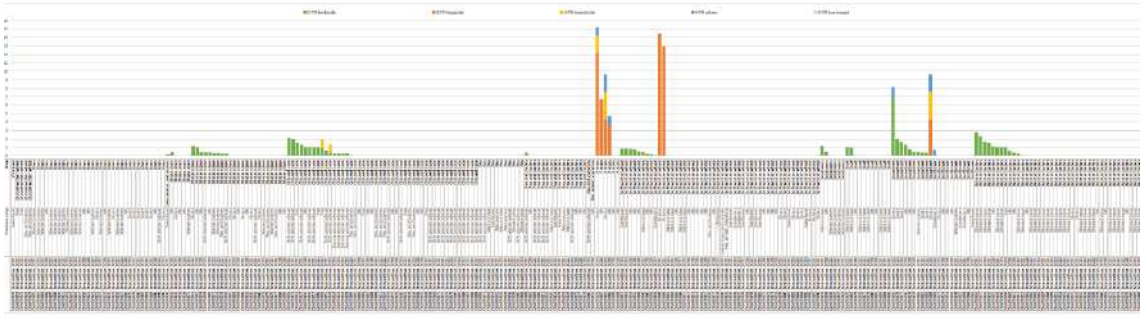
TFI as a function of crop
Switzerland – innovative system

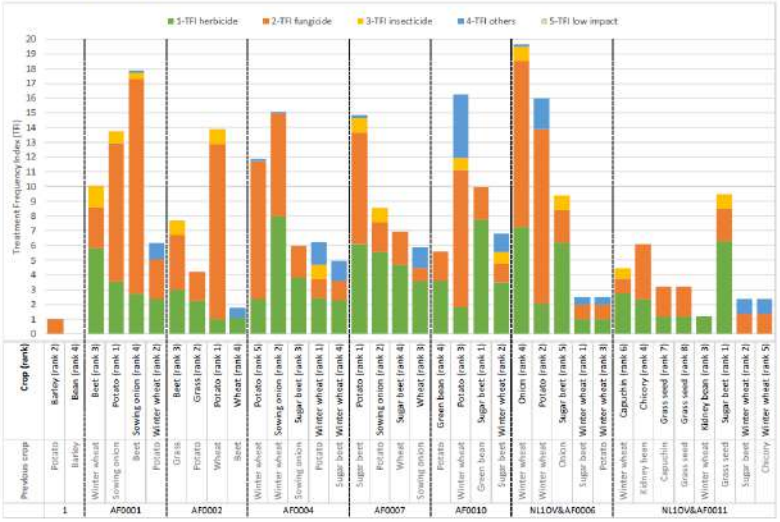
8



Main crop:
- **Rapeseed**
- **Barley**
- **Wheat**

TFI as a function of crop
The Netherlands

9



Main crop:
- **Wheat**
- **Sugar beet**

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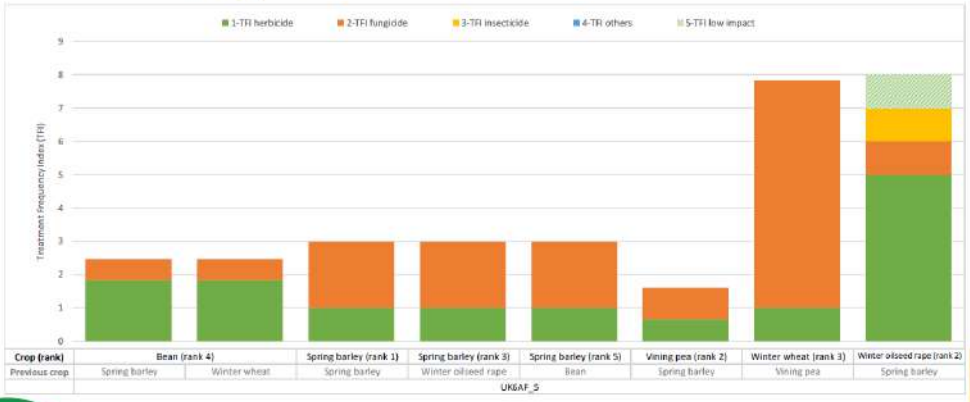
TFI as a function of crop

United Kingdom

10

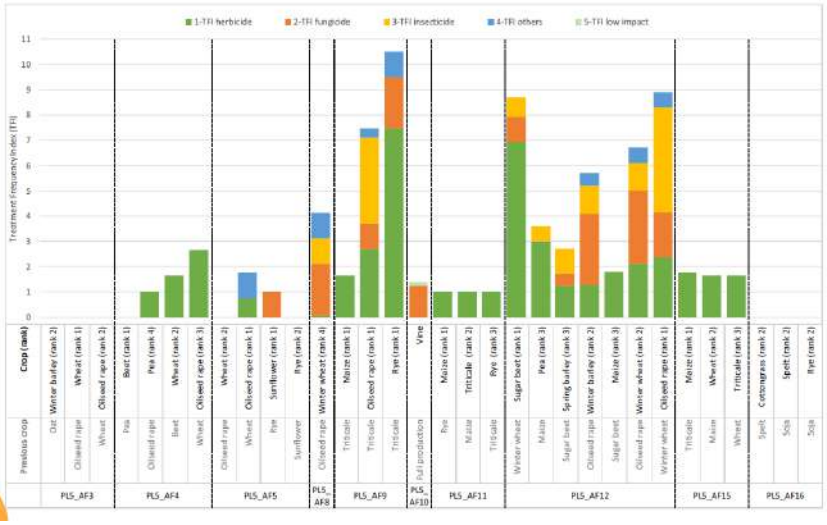


Main crop:
- **Barley**

TFI as a function of crop

Poland

11



Main crop:
- **Wheat**
- **Oilseed rape**

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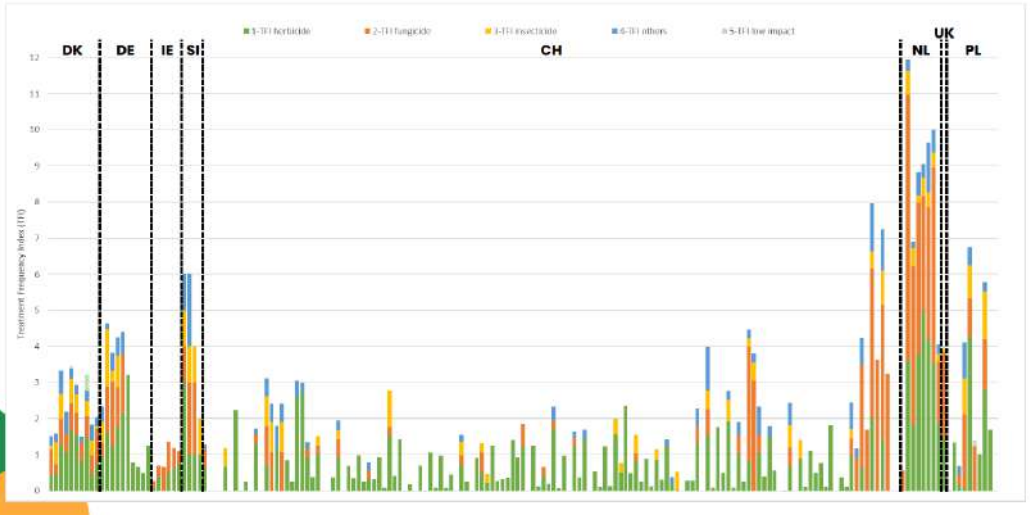
TFI as a function of farm

All country

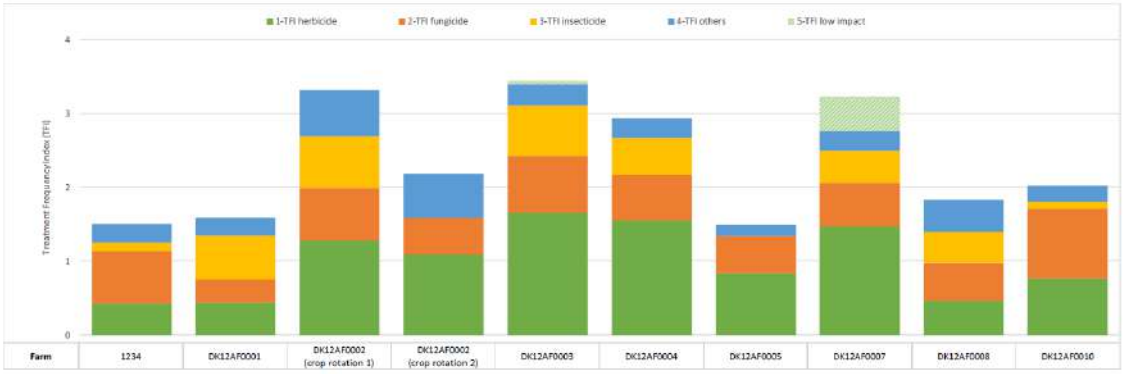
12



TFI as a function of farm

Denmark

13



Average total TFI: 2.35

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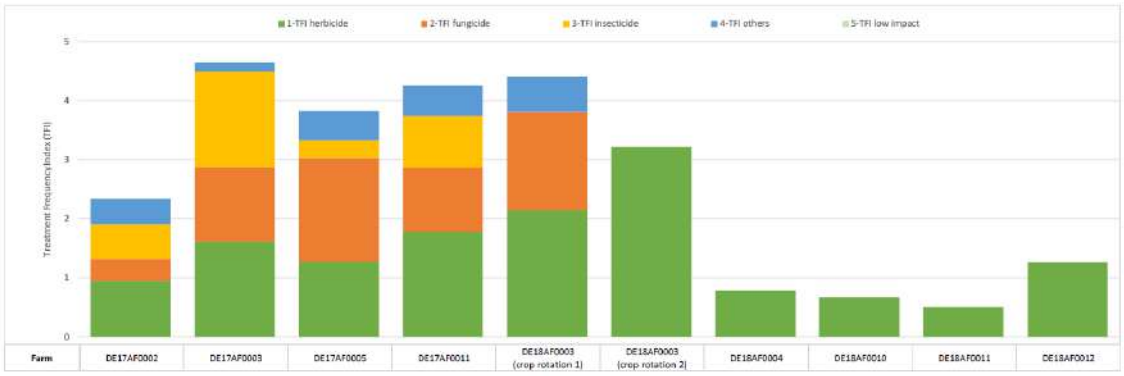
TFI as a function of farm
Germany

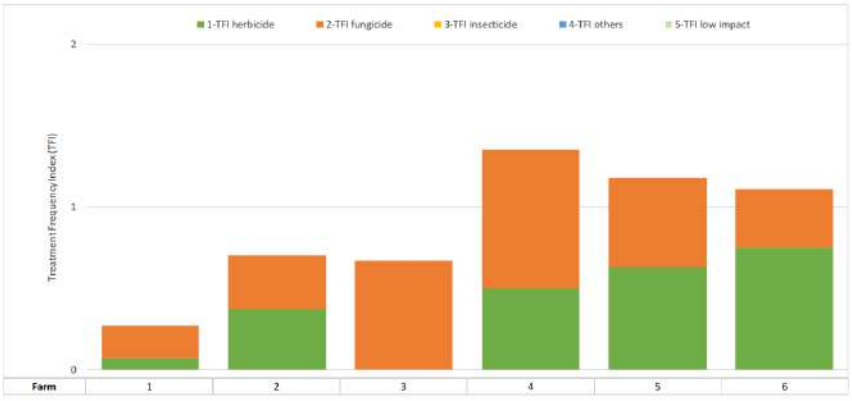
14



Average total TFI: 2.59

TFI as a function of farm
Ireland

15



Average total TFI: 0.88

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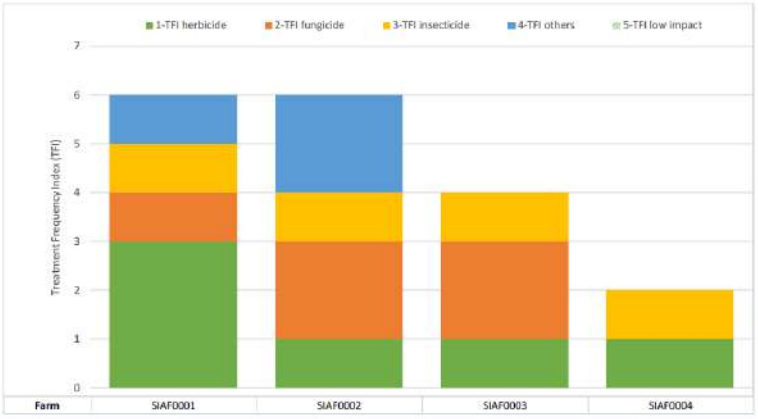
TFI as a function of farm

Slovenia

16

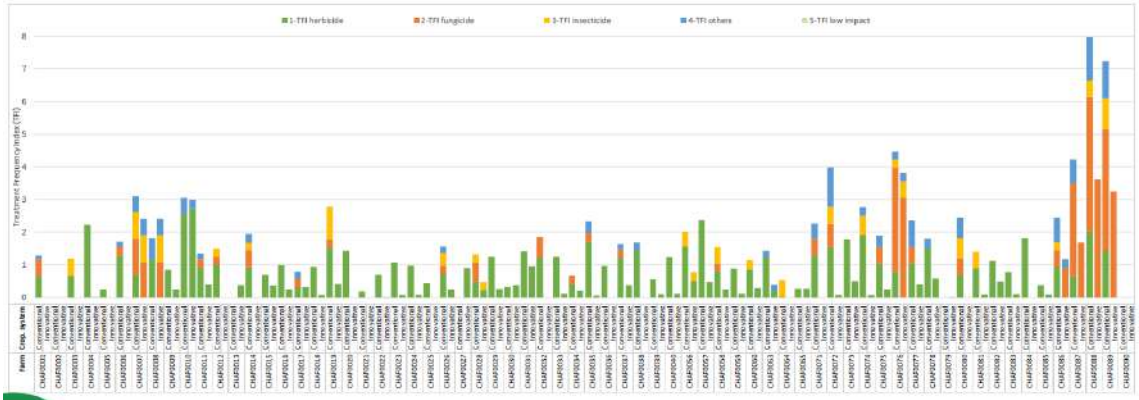


Average total TFI: 4.5

TFI as a function of farm

Switzerland

17



Average total TFI for conventional cropping system: 1.63
Average total TFI for innovative cropping system: 0.49

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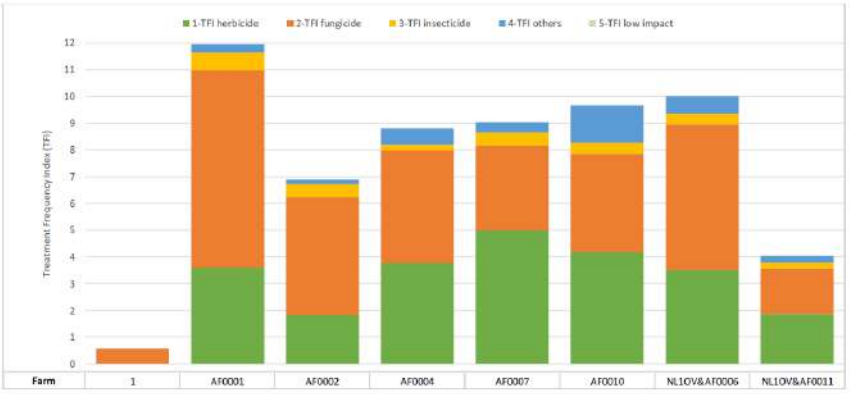
TFI as a function of farm

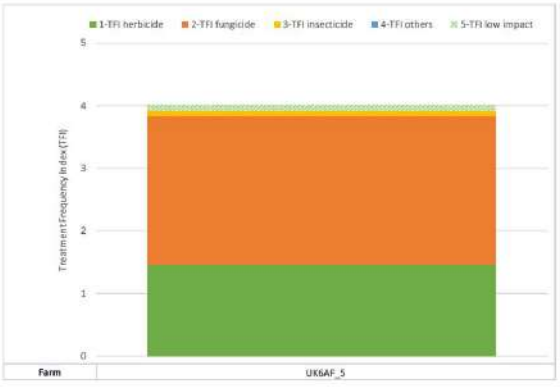
The Netherlands



Average total TFI: 7.62

TFI as a function of farm

United Kingdom



Total TFI: 4.01

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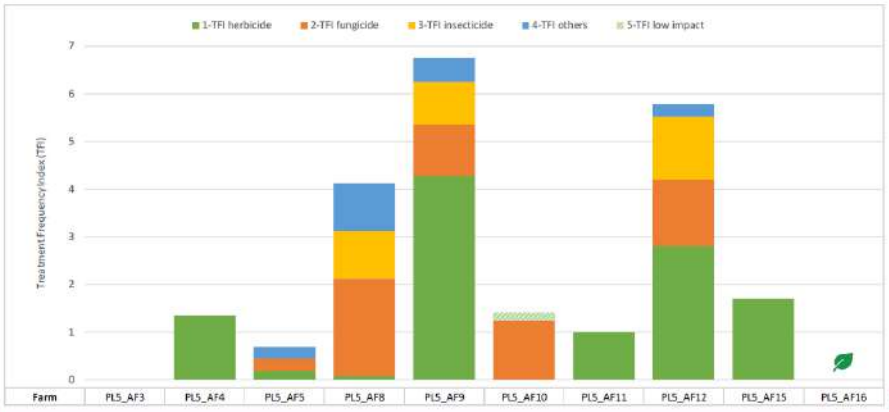
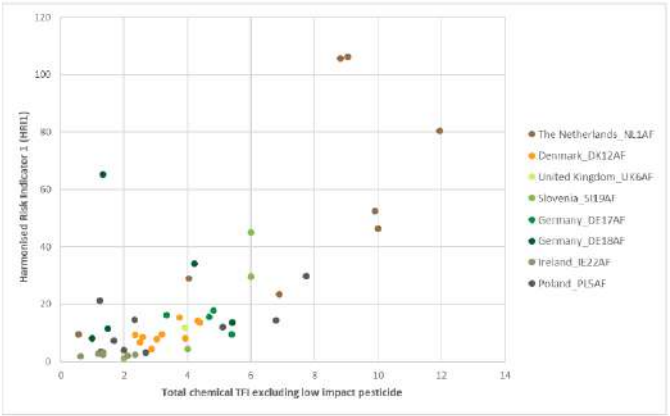
TFI as a function of farm

Poland



Total TFI for organic farm: 0
Average total TFI for conventional farm: 2.53

TFI as a function of HRI1



The Harmonised Risk Indicator 1 (HRI1) is calculated by multiplying the quantities of active substances in plant protection products by a weighting factor (4 groups: low-risk substances, approved substances, substances being considered for substitution, non-approved substances).

Positive relationship between total chemical TFI and HRI1.

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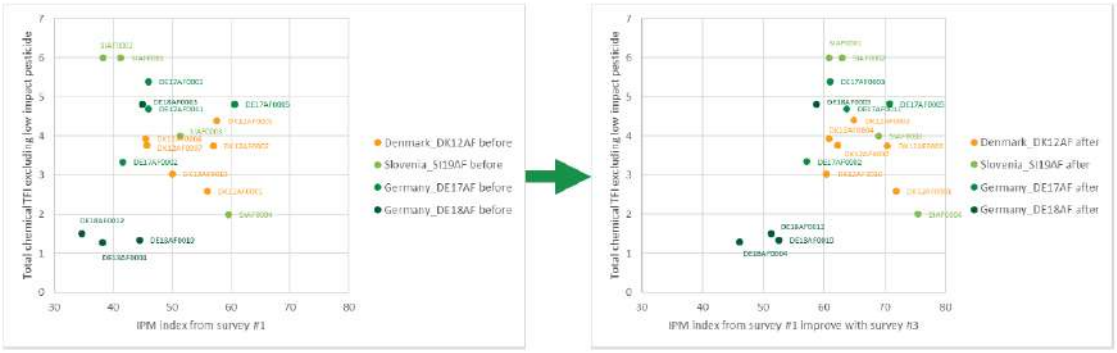
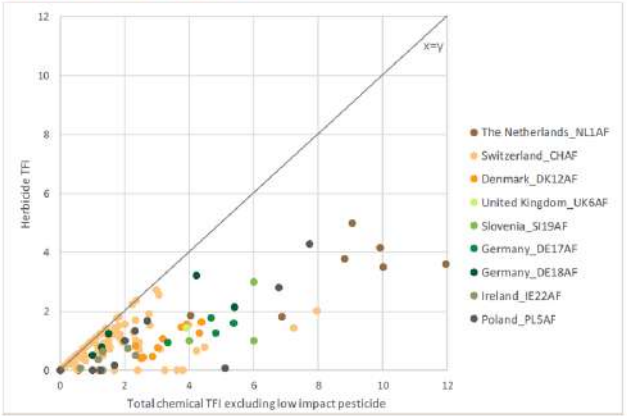
TFI as a function of IPM index



No clear relationship between total chemical TFI and IPM index (calculated in survey #1 and improve with survey #3).

Herbicide TFI as a function of total chemical TFI



Although the total quantity of chemical pesticides is decreasing, it seems more difficult to reduce the proportion of herbicides.

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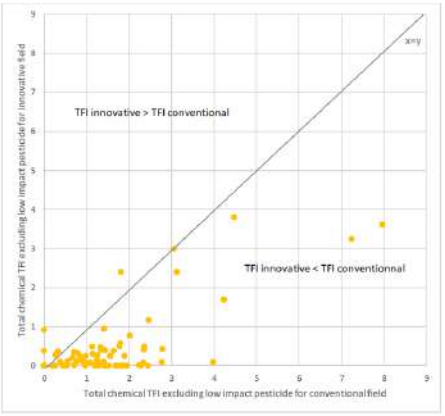
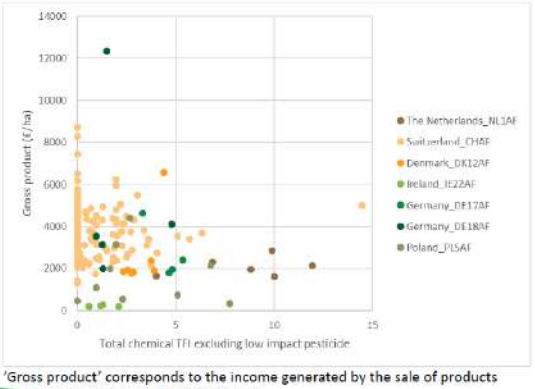
Case of Switzerland: TFI conventional field as a function of TFI innovative field



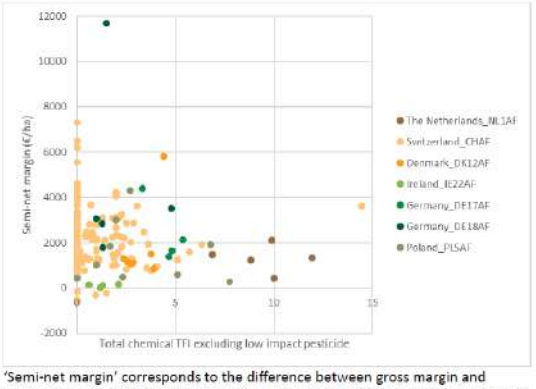
Except in rare cases, the TFI of innovative fields is lower than the TFI of conventional fields.

Economic analyses

Gross product and semi-net margin



'Gross product' corresponds to the income generated by the sale of products harvested during an intervention.



'Semi-net margin' corresponds to the difference between gross margin and mechanisation and operational costs but without the difference with labour costs.

Within a group of farms (i.e. within a given region), farms with lower TFI values do not tend to have lower productivity (gross product) and profitability (semi-net margin).

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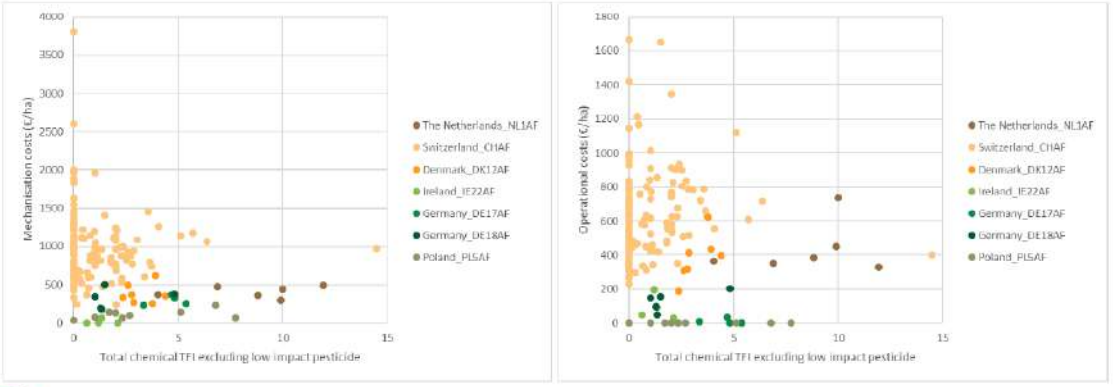
Economic analyses

Mechanisation and operational costs

26

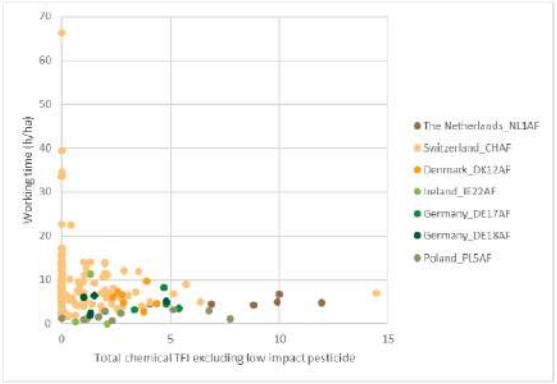


Within a group of farms (i.e. within a given region), farms with lower TFI values do not tend to have clearly higher equipment costs (mechanisation costs) but tend to have lower input costs (operational costs).

Economic analyses

Working time

27



Within a group of farms (i.e. within a given region), farms with lower TFI values do not tend to have clearly higher workloads (working time).

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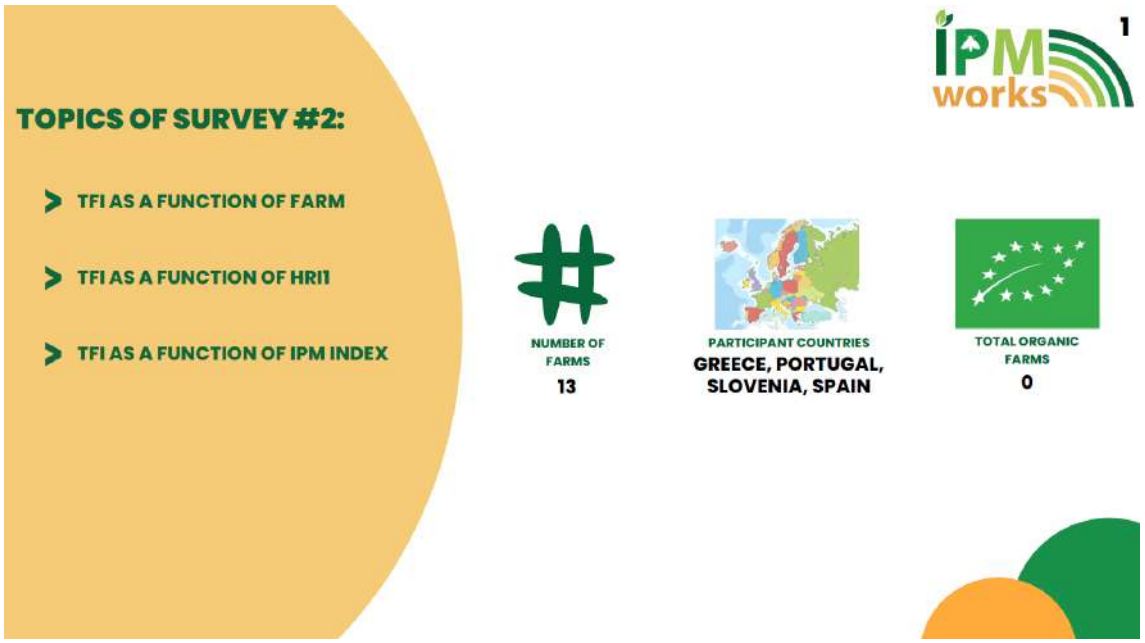
6.7. Annex 2.2 - Booklet #2 – Sector Vineyards



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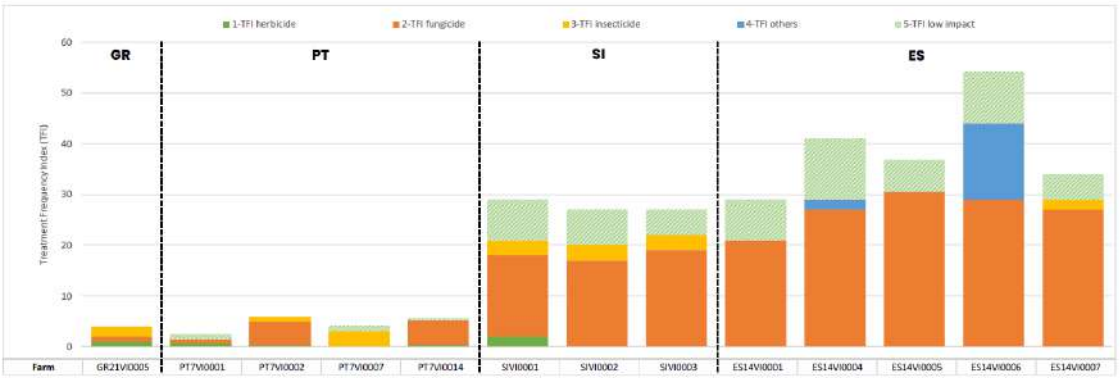
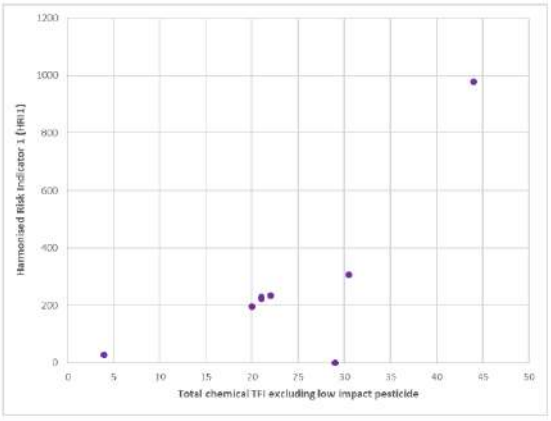
TFI as a function of farm



TFI as a function of HRI1



The Harmonised Risk Indicator 1 (HRI1) is calculated by multiplying the quantities of active substances in plant protection products by a weighting factor (4 groups: low-risk substances, approved substances, substances being considered for substitution, non-approved substances).

Tendency to a positive relationship between total chemical TFI and HRI1.

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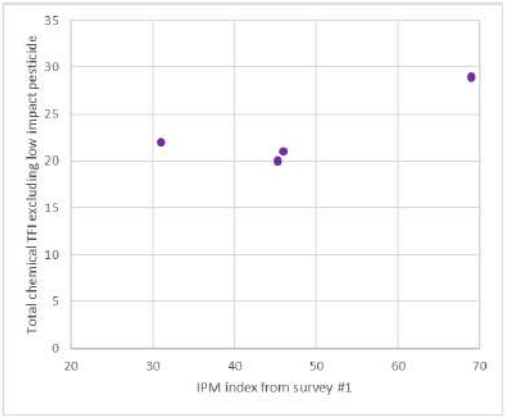
TFI as a function of IPM index



Not enough data to see a relationship between total chemical TFI and IPM index (calculated in survey #1).

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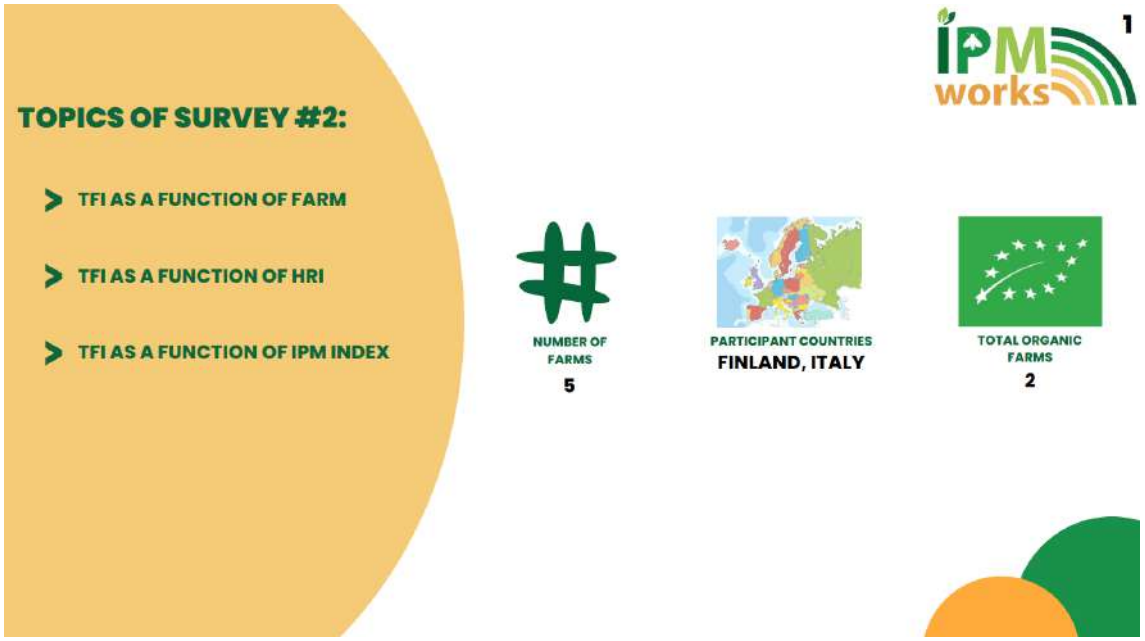
6.8. Annex 2.3 - Booklet #2 – Sector Orchards



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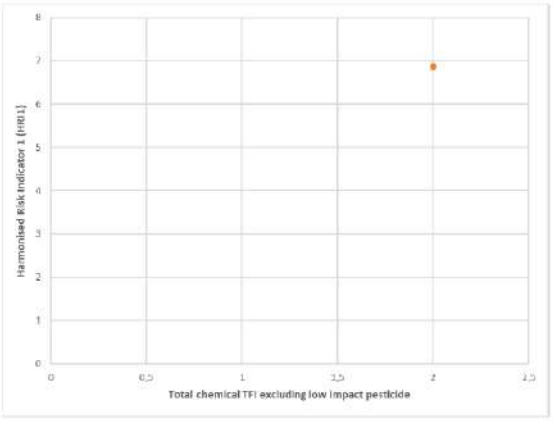
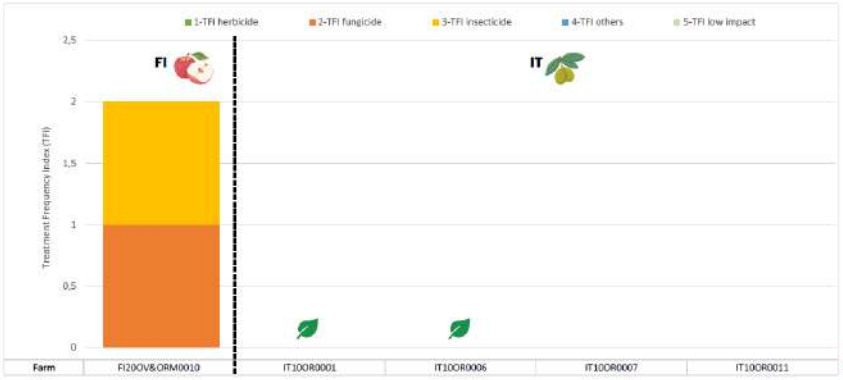
TFI as a function of HRI1



The Harmonised Risk Indicator 1 (HRI1) is calculated by multiplying the quantities of active substances in plant protection products by a weighting factor (4 groups: low-risk substances, approved substances, substances being considered for substitution, non-approved substances).

Not enough data to see a relationship between total chemical TFI and HRI1.

TFI as a function of farm



Total TFI for apple tree (Finland): 2
Total TFI for olive tree (Italy): 0

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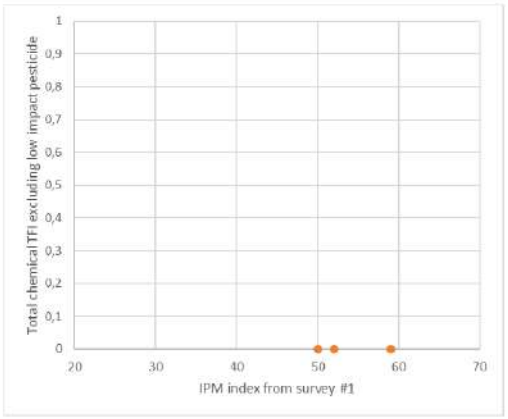
TFI as a function of IPM index



Not enough data to see a relationship between total chemical TFI and IPM index (calculated in survey #1).

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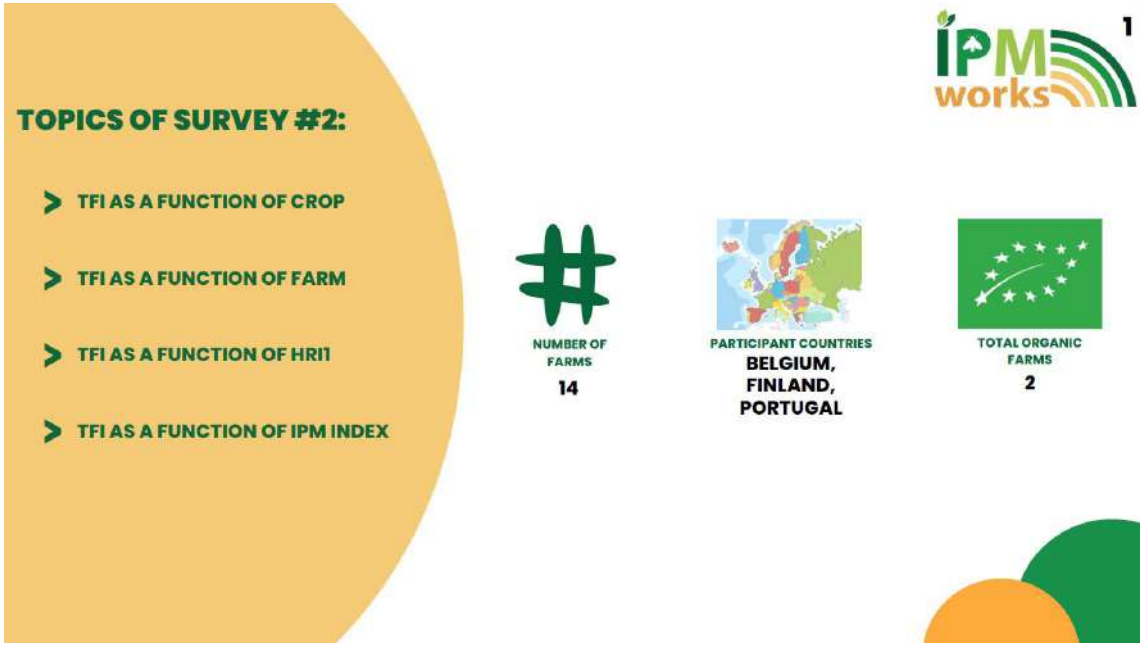
6.9. Annex 2.4 - Booklet #2 – Sector Outdoor Vegetables and Ornamentals



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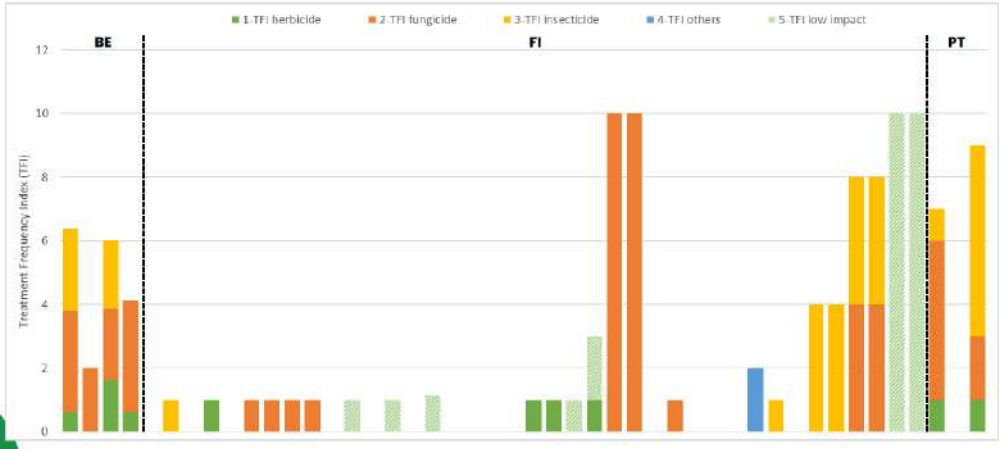
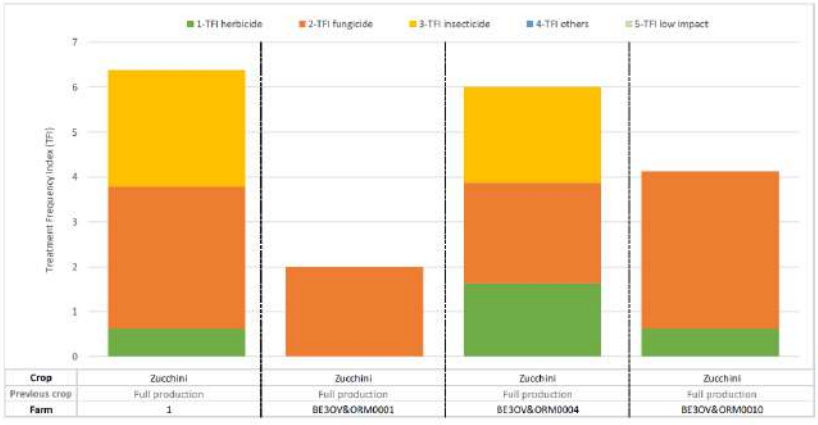
TFI as a function of crop

All country



TFI as a function of crop

Belgium



Main crop:
- **Zucchini**

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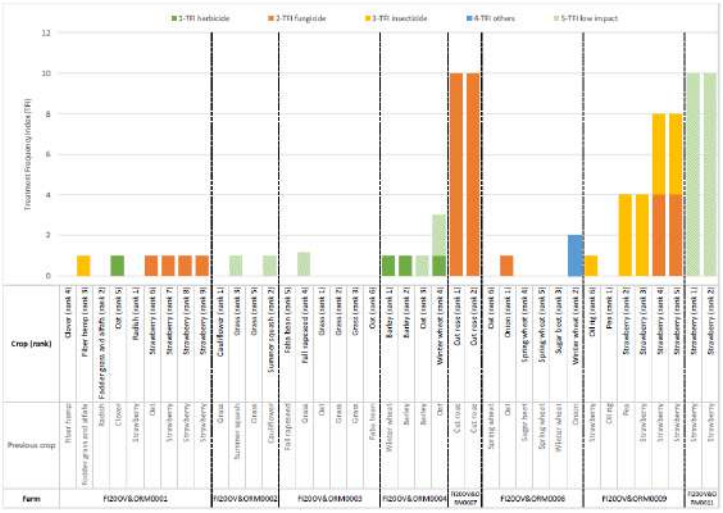
TFI as a function of crop

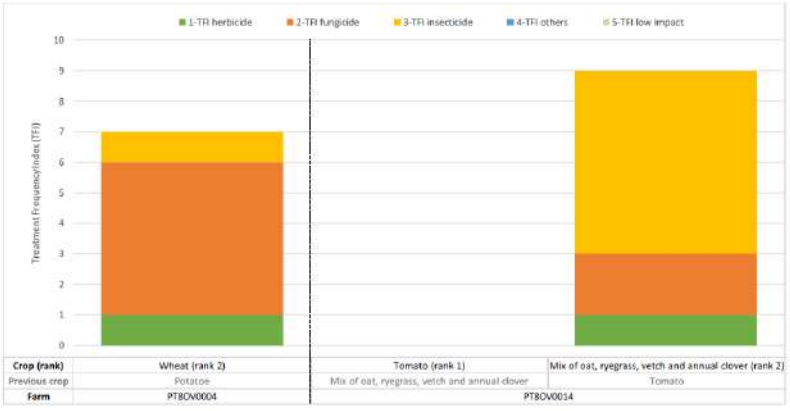
Finland



Main crop:
- **Strawberry**
- **Grass**

TFI as a function of crop

Portugal



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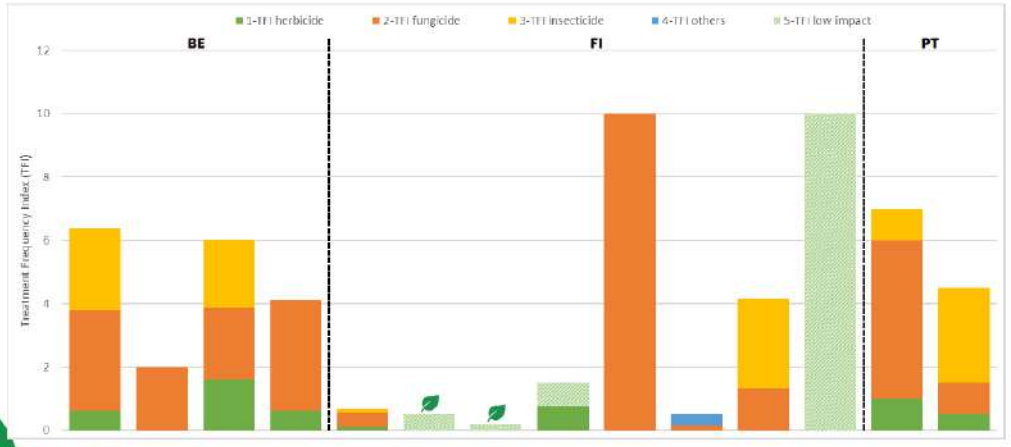
TFI as a function of farm

All country

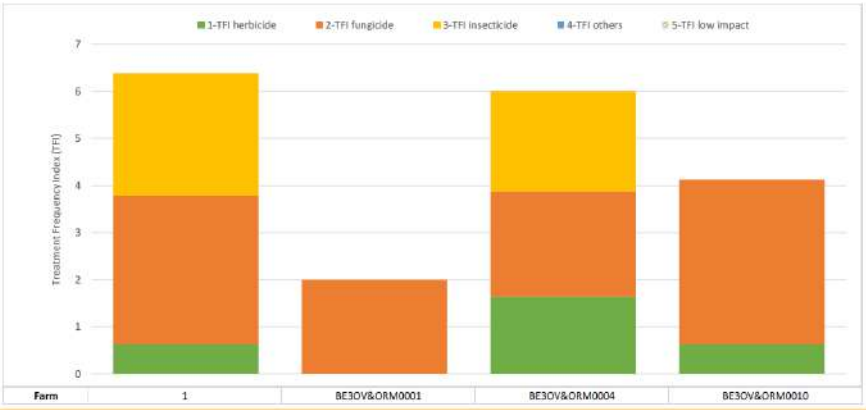
6



TFI as a function of farm

Belgium

7



Average total TFI: 4.63

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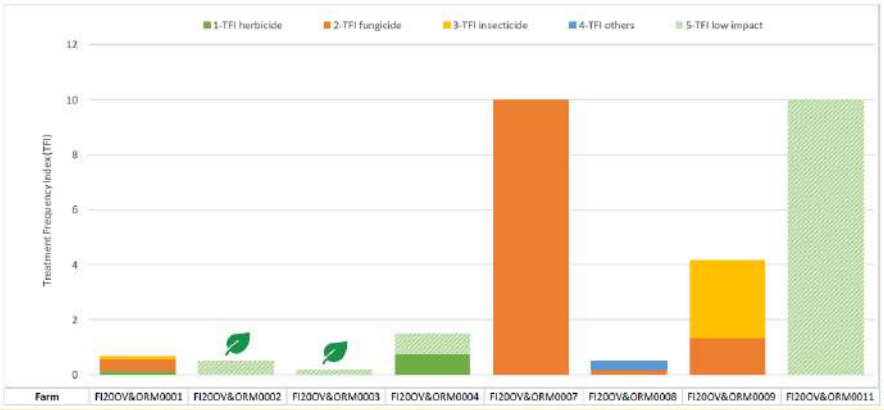
TFI as a function of farm

Finland

8

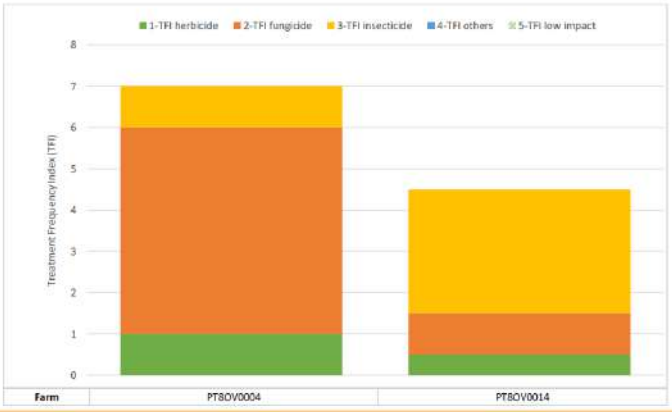


Average total TFI for organic farm: 0.34
Average total TFI for conventional farm: 4.47

TFI as a function of farm

Portugal

9



Average total TFI: 5.75

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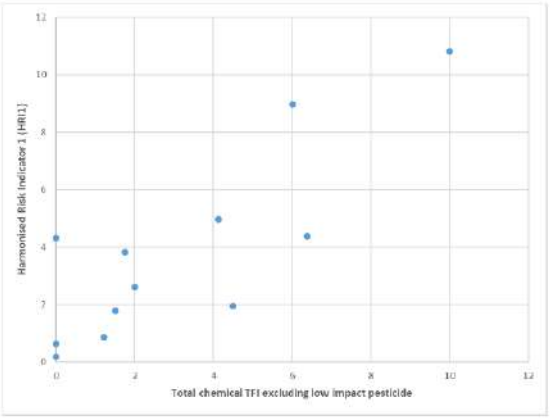
TFI as a function of HRI1

10

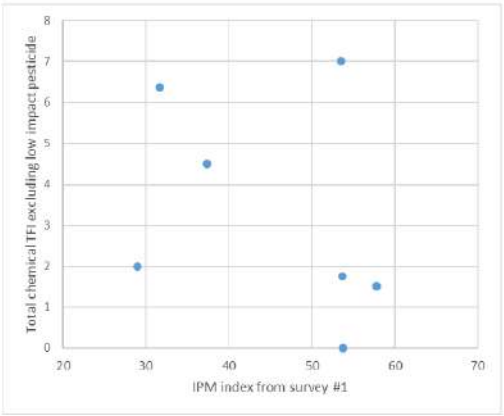


The Harmonised Risk Indicator 1 (HRI1) is calculated by multiplying the quantities of active substances in plant protection products by a weighting factor (4 groups: low-risk substances, approved substances, substances being considered for substitution, non-approved substances).

Tendency to a positive relationship between total chemical TFI and HRI1.

TFI as a function of IPM index

11



No clear relationship between total chemical TFI and IPM index (calculated in survey #1).

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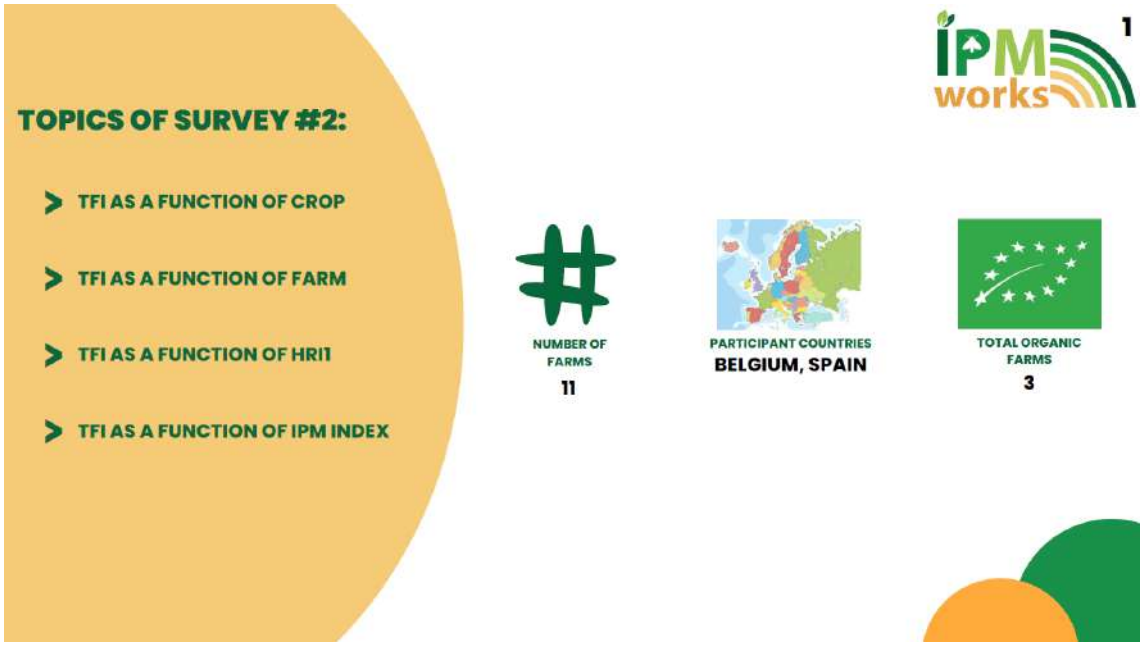
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

6.10. Annex 2.5 - Booklet #2 Sector Greenhouse horticulture



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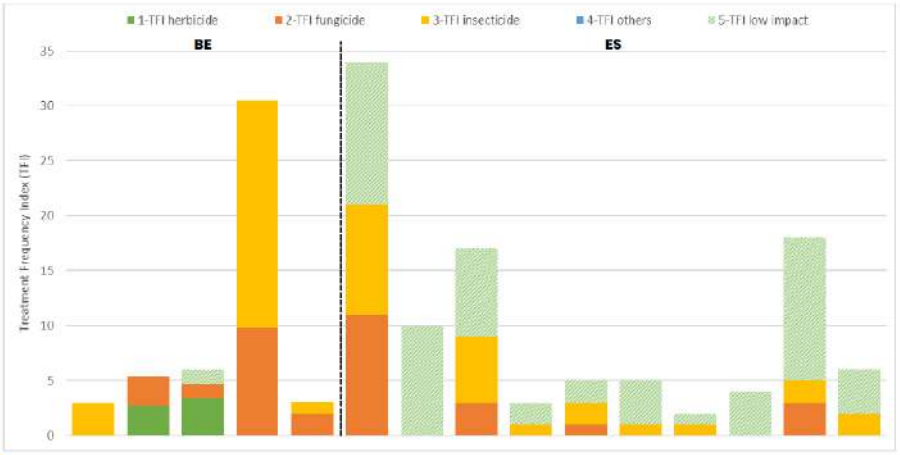
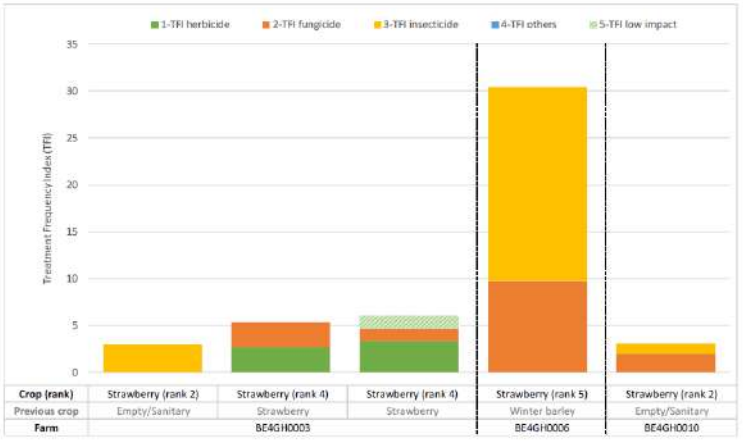
TFI as a function of crop

All country



TFI as a function of crop

Belgium



Main crop:
- **Strawberry**

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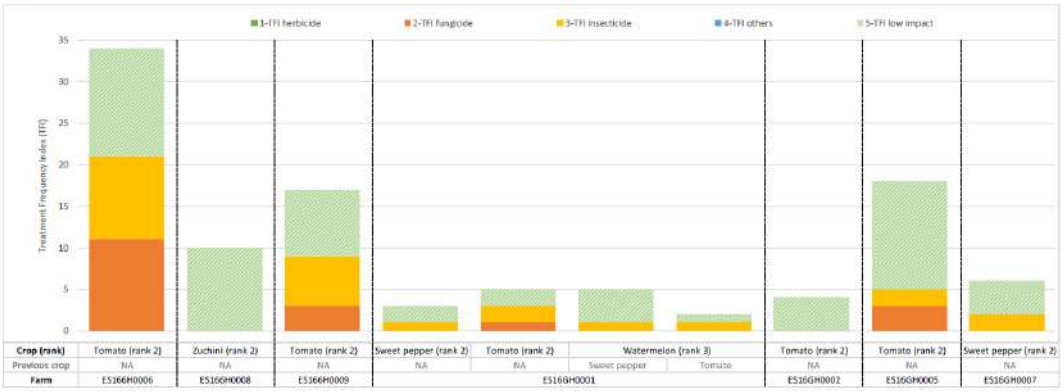
TFI as a function of crop

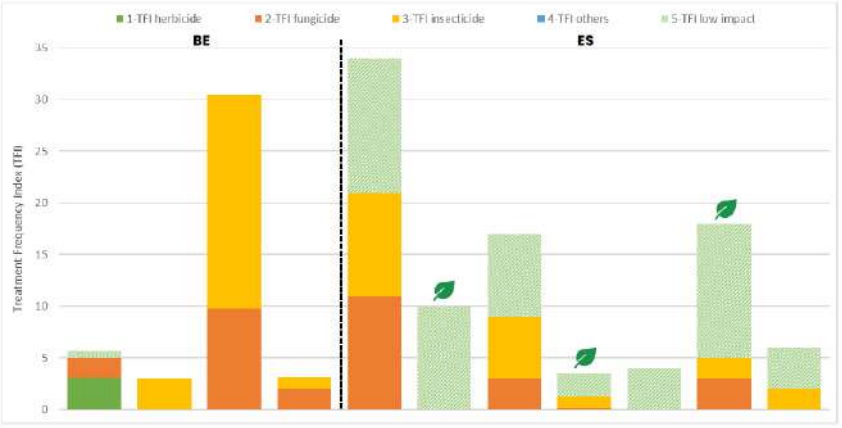
Spain



Main crop:
- **Tomato**

TFI as a function of farm

All country



: Organic farm

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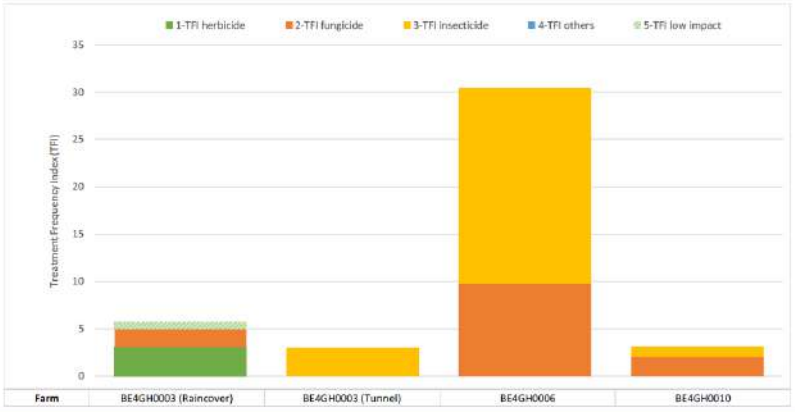
TFI as a function of farm
Belgium

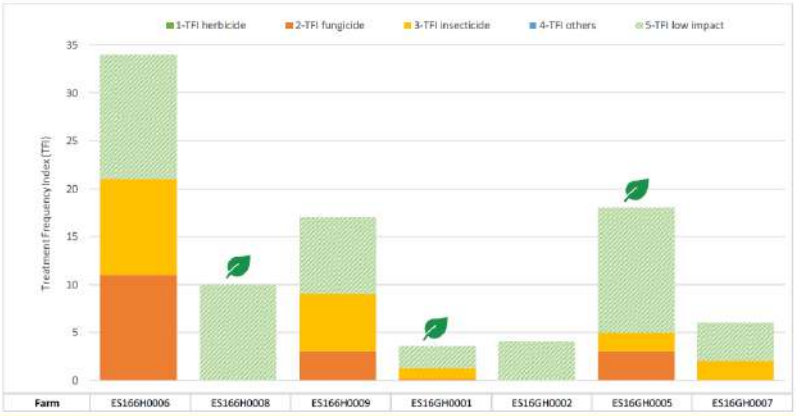
6



Average total TFI: 10.55

TFI as a function of farm
Spain

7



Average total TFI for organic farm: 10.50
Average total TFI for conventional farm: 15.25

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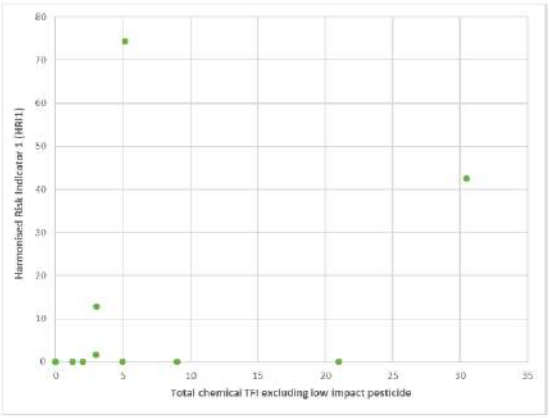
TFI as a function of HRI1

8

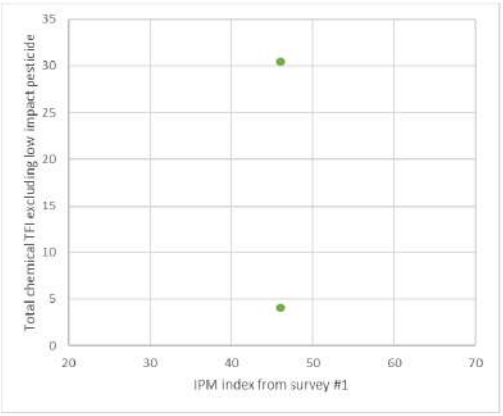


The Harmonised Risk Indicator 1 (HRI1) is calculated by multiplying the quantities of active substances in plant protection products by a weighting factor (4 groups: low-risk substances, approved substances, substances being considered for substitution, non-approved substances).

No clear relationship between total chemical TFI and HRI1.

TFI as a function of IPM index

9



Not enough data to see a relationship between total chemical TFI and IPM index (calculated in survey #1).

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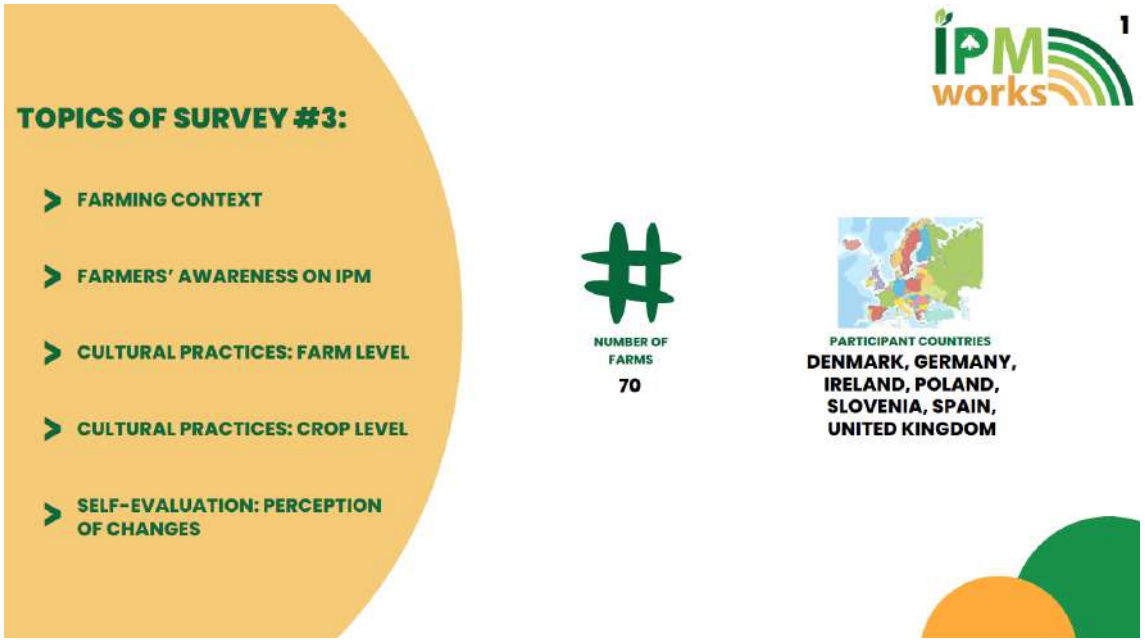
6.11. Annex 3.1 - Booklet #3 – Sector Arable Field Crops



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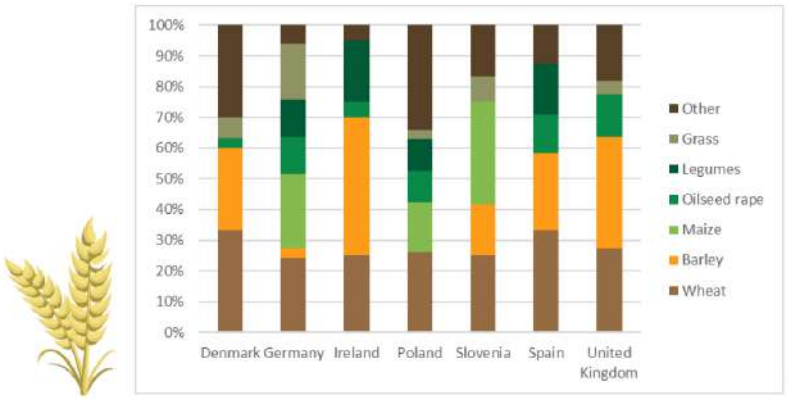
Main arable crops in participating countries



The network covers a wide range of crops.

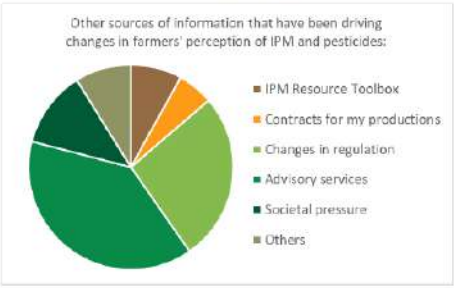
Farmers' awareness on IPM

CHANGES IN MOTIVATION AND CAUSES OF CHANGES

CHANGES IN MOTIVATION

CONTRIBUTION FROM HUB COACHES AND OTHER FARMS

CAUSES OF CHANGES IN PERCEPTION



Farmer's motivation increase to reduce pesticide use and adopt IPM.

Interest of hub coach and other farms in changing the farmers' perception of IPM and pesticide use.

Importance of changes in regulation and advisory services in changing the farmers' perception of IPM and pesticide use.

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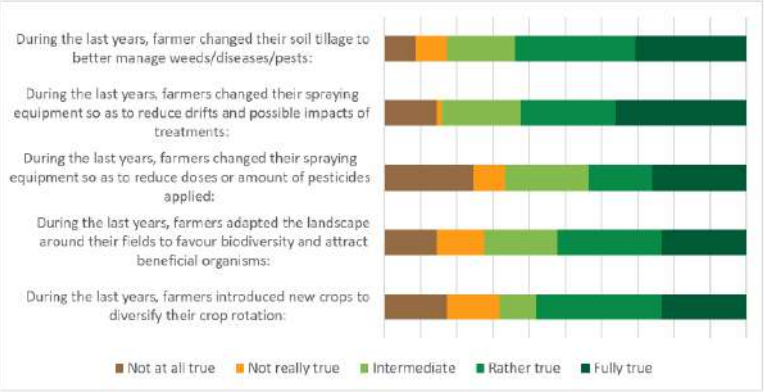
Cultural practices: farm level

CHANGES IN CULTURAL PRACTICES AT THE FARM LEVEL

4

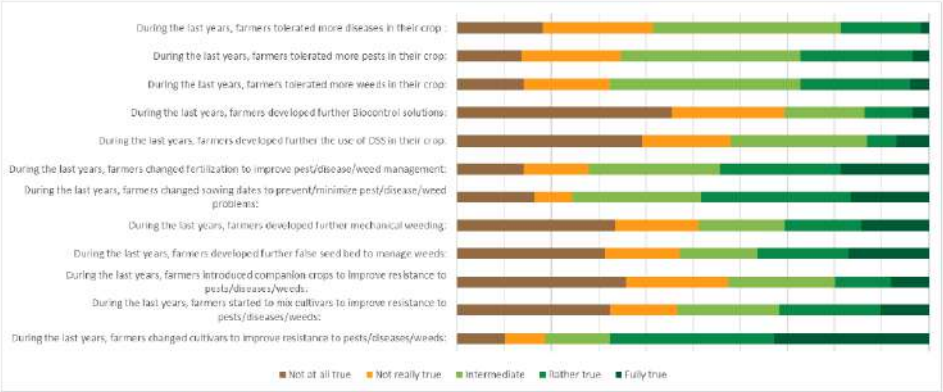


Half of farmers change their cultural practices at the farm level to adopt integrated pest management.

Cultural practices: crop level

CHANGES IN CULTURAL PRACTICES AT THE CROP LEVEL

5



More changes in fertilisation and sowing dates, and changes in cultivars.

No further use of biocontrol solution, DSS, mechanical weeding, false seed bed, introduction of companion crops or mix cultivars.

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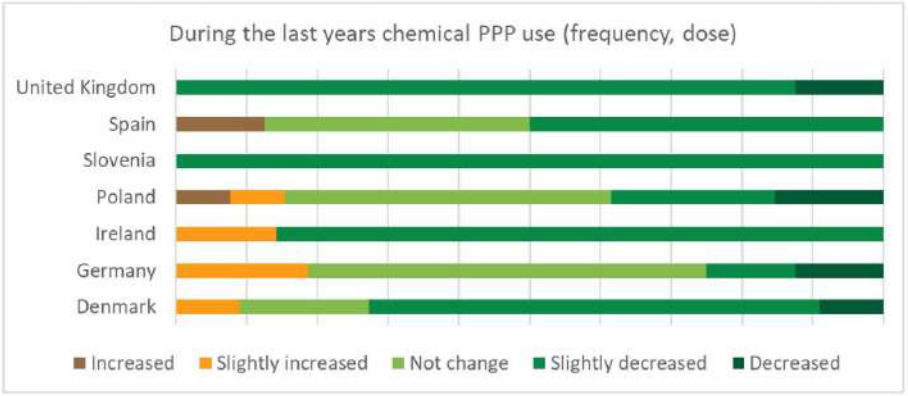
Self-evaluation

PESTICIDE USE DEPENDING ON THE COUNTRY

6



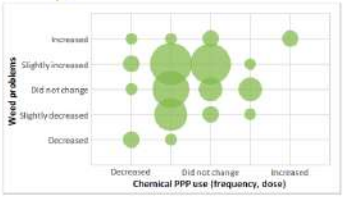
Less use of pesticides (herbicide, fungicide and insecticide) during the study, although there is some variation between countries.

Self-evaluation

WEED, DISEASE AND PEST PROBLEMS COMPARED TO THE USE OF CHEMICAL PRODUCTS

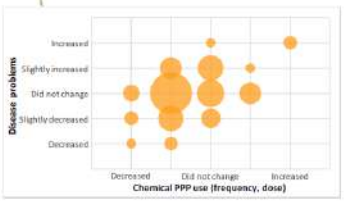
7

WEED PROBLEMS



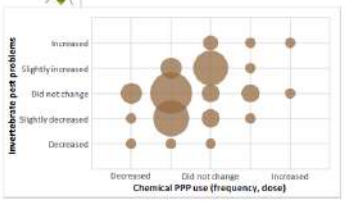
No further weed problems when pesticide use is reduced.

DISEASE PROBLEMS



No further disease problems when pesticide use is reduced.

PEST PROBLEMS



Slightly less pest problems when pesticide use is reduced.

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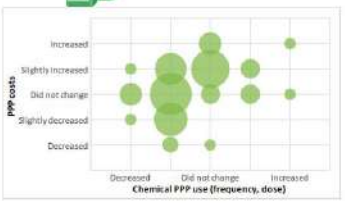
Self-evaluation

FARM COSTS COMPARED TO THE USE OF CHEMICAL PRODUCTS

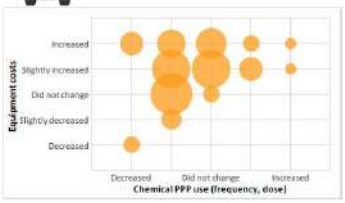
8

PPP COSTS



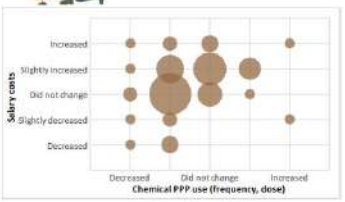
Slightly less PPP costs when pesticide use is reduced.

EQUIPMENT COSTS



Tendency for equipment costs to rise, whatever the level of pesticide use.

SALARY COSTS



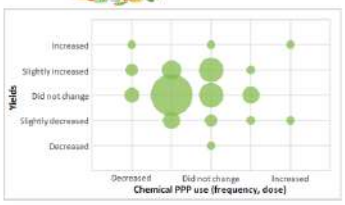
No change in salary costs when pesticide use is reduced.

Self-evaluation

YIELDS, WORKLOAD AND PROFITABILITY COMPARED TO THE USE OF CHEMICAL PRODUCTS

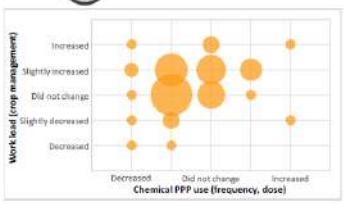
9

YIELDS



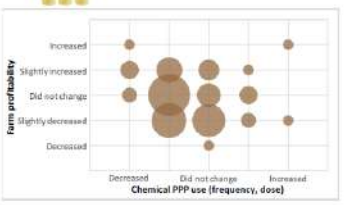
No change in yields when pesticide use is reduced.

WORKLOAD



No change in work load when pesticide use is reduced.

PROFITABILITY



No change in profitability when pesticide use is reduced.

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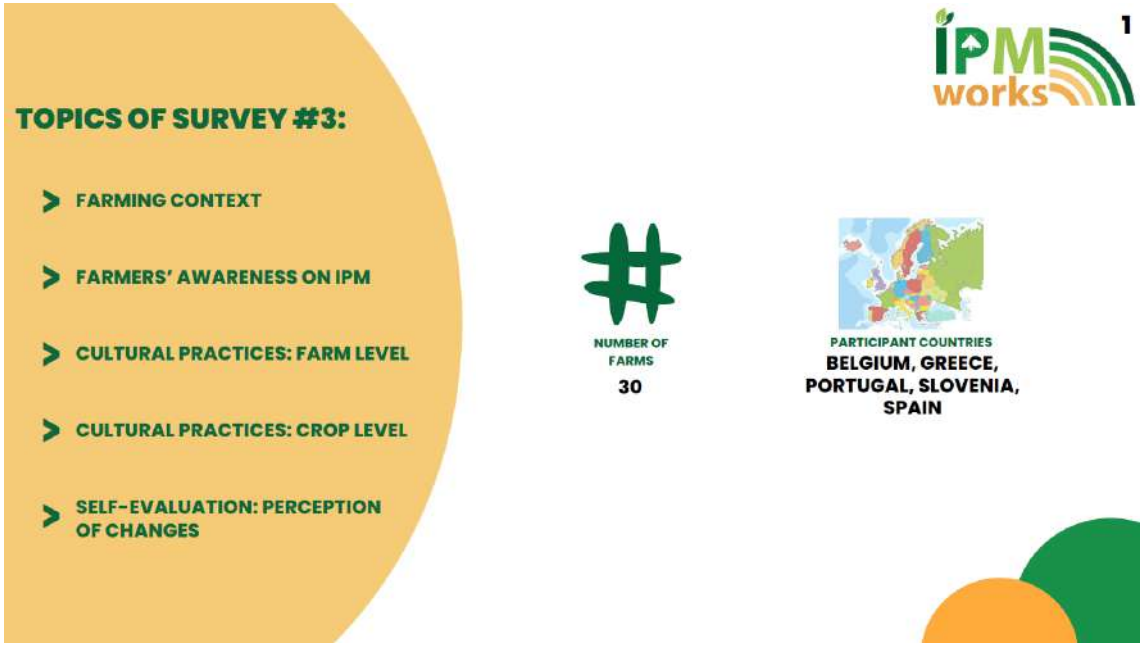
6.12. Annex 3.2 - Booklet #3 – Sector Vineyards



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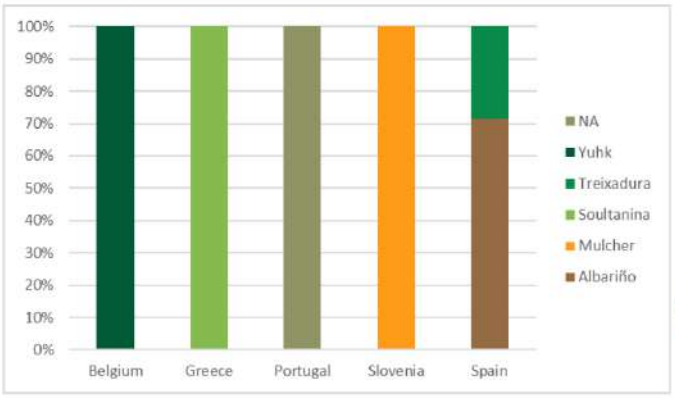
Main cultivars in participating countries

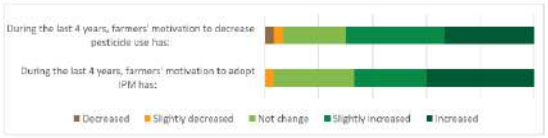


Each country is specialised in a particular cultivar.

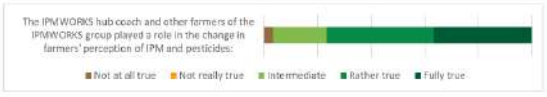
Farmers' awareness on IPM

CHANGES IN MOTIVATION AND CAUSES OF CHANGES

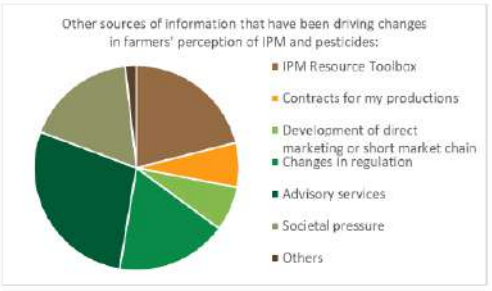
CHANGES IN MOTIVATION



CONTRIBUTION FROM HUB COACHES AND OTHER FARMS



CAUSES OF CHANGES IN PERCEPTION



Farmer's motivation increase to reduce pesticide use and adopt IPM.

Interest of hub coach and other farms in changing the farmers' perception of IPM and pesticide use.

Importance of IPM resource toolbox, changes in regulation, advisory services and societal pressure in changing the farmers' perception of IPM and pesticide use.

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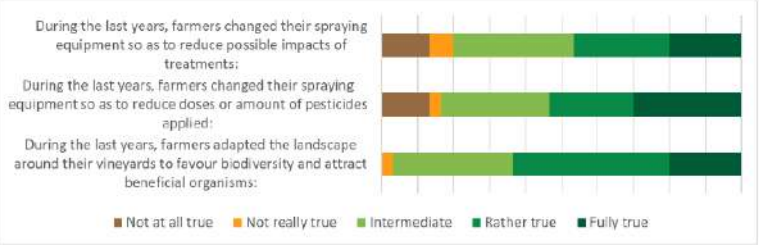
Cultural practices: farm level

CHANGES IN CULTURAL PRACTICES AT THE FARM LEVEL

4

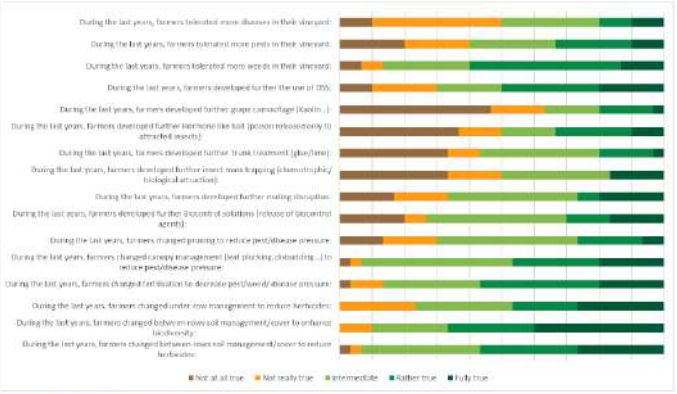


Half of farmers adapted the landscape around their vineyards to favour biodiversity and change their spraying equipment.

Cultural practices: crop level

CHANGES IN CULTURAL PRACTICES AT THE CROP LEVEL

5



More tolerance to weeds.
Half of farmers use more DSS and change fertilisation and canopy, under-row and between-row management.

No further tolerance to diseases and pests.
No further grape camouflage, hormone like bait, trunk treatment and insect mass trapping.

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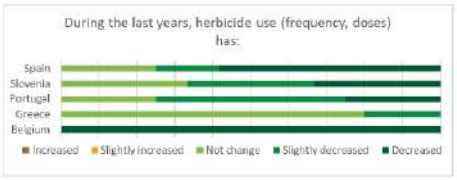
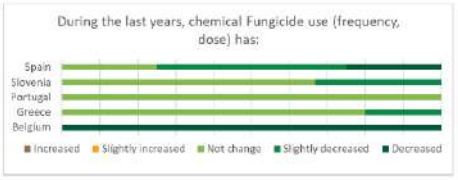
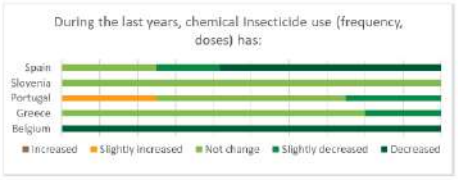
Self-evaluation

PESTICIDE USE DEPENDING ON THE COUNTRY

6







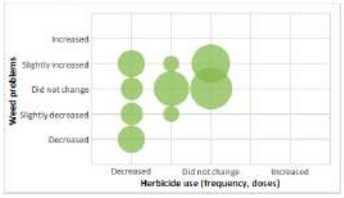
Tendency of less use of pesticides (herbicide, fungicide and insecticide) during the study, although there is some variation between the type of pesticide and countries.

Self-evaluation

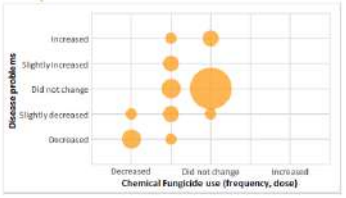
WEED, DISEASE AND PEST PROBLEMS COMPARED TO THE USE OF CHEMICAL PRODUCTS

7

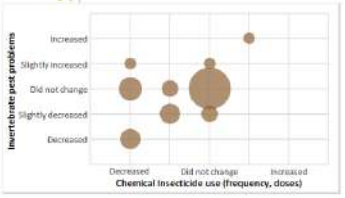
WEED PROBLEMS



DISEASE PROBLEMS



PEST PROBLEMS



Slightly less weed problems when herbicide use is reduced.

Slightly less disease problems when fungicide use is reduced.

Slightly less pest problems when insecticide use is reduced.

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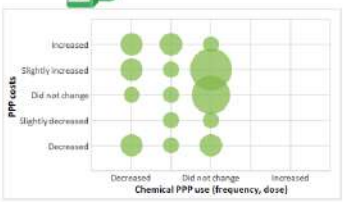
Self-evaluation

FARM COSTS COMPARED TO THE USE OF CHEMICAL PRODUCTS

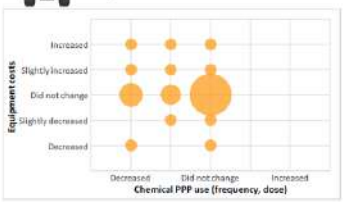
8

PPP COSTS



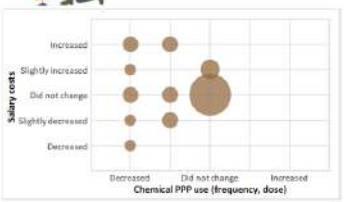
No change in PPP costs when pesticide use is reduced.

EQUIPMENT COSTS



Non change in equipment costs when pesticide use is reduced.

SALARY COSTS



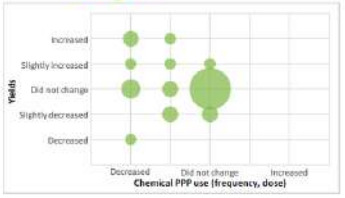
No change in salary costs when pesticide use is reduced.

Self-evaluation

YIELDS, WORKLOAD AND PROFITABILITY COMPARED TO THE USE OF CHEMICAL PRODUCTS

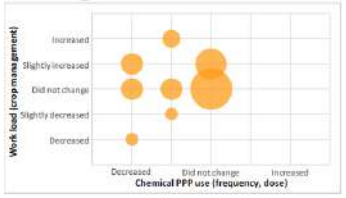
9

YIELDS



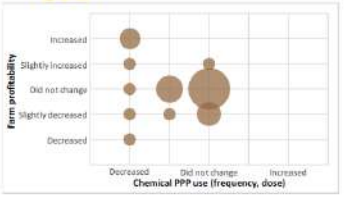
No change in yield when pesticide use is reduced.

WORKLOAD



No change in work load when pesticide use is reduced.

PROFITABILITY



No change in profitability when pesticide use is reduced.

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6.13. Annex 3.3 - Booklet #3 – Sector Orchards

IPM works 1

TOPICS OF SURVEY #3:

- FARMING CONTEXT
- FARMERS' AWARENESS ON IPM
- CULTURAL PRACTICES: FARM LEVEL
- CULTURAL PRACTICES: CROP LEVEL
- SELF-EVALUATION: PERCEPTION OF CHANGES

NUMBER OF FARMS
13

PARTICIPANT COUNTRIES
ITALY, SLOVENIA

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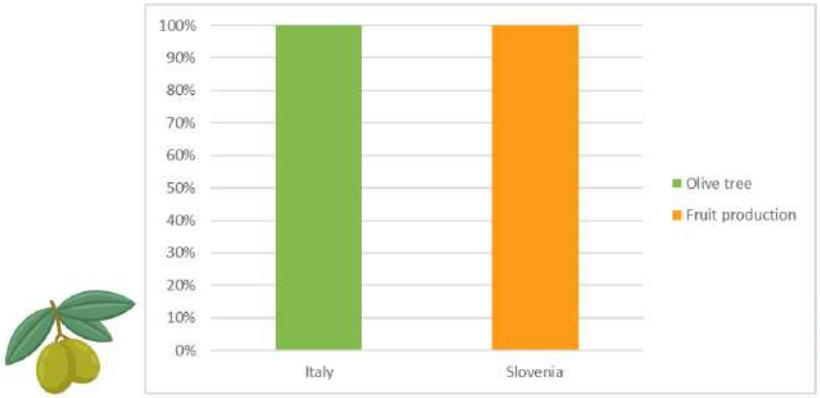
Main tree species in participating countries

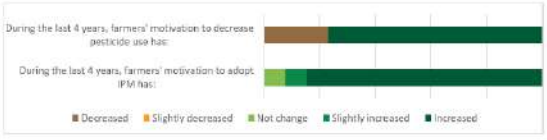


Each country is specialised in a particular tree species. Fruit production mainly includes apples.

Farmers' awareness on IPM

CHANGES IN MOTIVATION AND CAUSES OF CHANGES

CHANGES IN MOTIVATION



CONTRIBUTION FROM HUB COACHES AND OTHER FARMS

CAUSES OF CHANGES IN PERCEPTION

Farmer's motivation increase to reduce pesticide use and adopt IPM.

Interest of hub coach and other farms in changing the farmers' perception of IPM and pesticide use.

Importance of other sources (personal research on internet, meetings with other farmers) in changing the farmers' perception of IPM and pesticide use.

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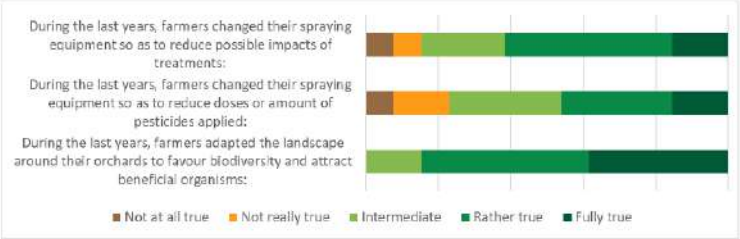
Cultural practices: farm level

CHANGES IN CULTURAL PRACTICES AT THE FARM LEVEL

4



Farmers adapted the landscape around their greenhouse to favour biodiversity.

Half of the farmers change their spraying equipment.

Cultural practices: crop level

CHANGES IN CULTURAL PRACTICES AT THE CROP LEVEL

5

More tolerance to diseases, pests and weeds.
More use of alternative practices to reduce pesticides (fruit camouflage, pruning, soil management, nets).
No further use of trunk treatment, mating confusion, mating disruption and biocontrol solutions.
No increase of cultivar diversity.

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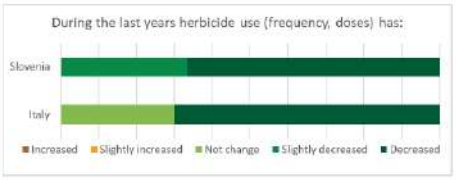
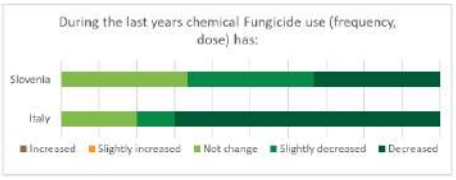
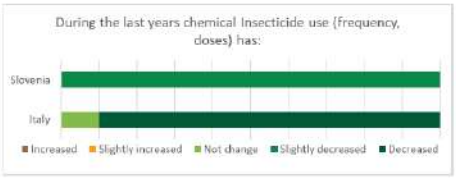
Self-evaluation

PESTICIDE USE DEPENDING ON THE COUNTRY

6







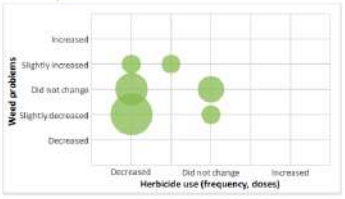
Less use of pesticides (herbicide, fungicide and insecticide) during the study in every country.

Self-evaluation

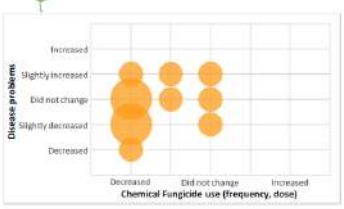
WEED, DISEASE AND PEST PROBLEMS COMPARED TO THE USE OF CHEMICAL PRODUCTS

7

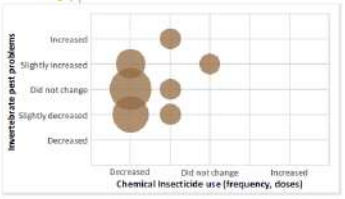
WEED PROBLEMS



DISEASE PROBLEMS



PEST PROBLEMS



Slightly less weed problems when herbicide use is reduced.

Slightly less disease problems when fungicide use is reduced.

No change in pest problems when insecticide use is reduced.

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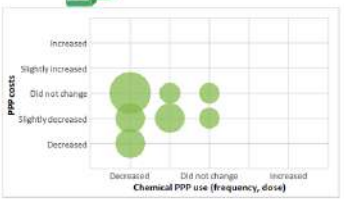
Self-evaluation

FARM COSTS COMPARED TO THE USE OF CHEMICAL PRODUCTS

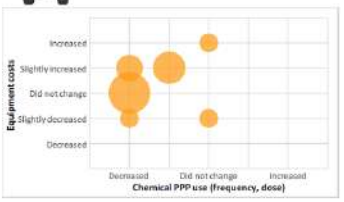
8

PPP COSTS



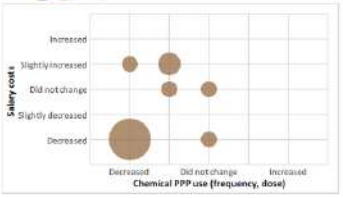
Slightly less PPP costs when pesticide use is reduced.

EQUIPMENT COSTS



No change in equipment costs when pesticide use is reduced.

SALARY COSTS



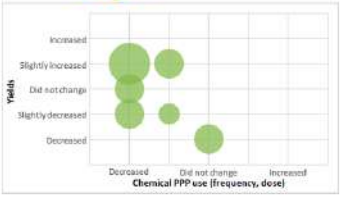
Less salary costs when pesticide use is reduced.

Self-evaluation

YIELDS, WORKLOAD AND PROFITABILITY COMPARED TO THE USE OF CHEMICAL PRODUCTS

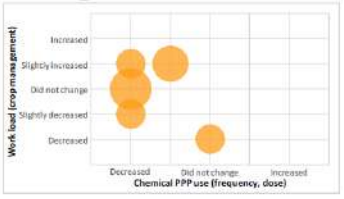
9

YIELDS



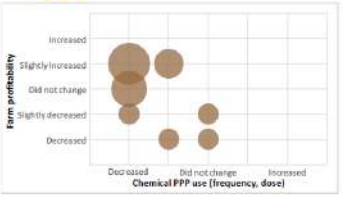
Slightly more yield when pesticide use is reduced.

WORKLOAD



Slightly more work load when pesticide use is reduced.

PROFITABILITY



Slightly more profitability when pesticide use is reduced.

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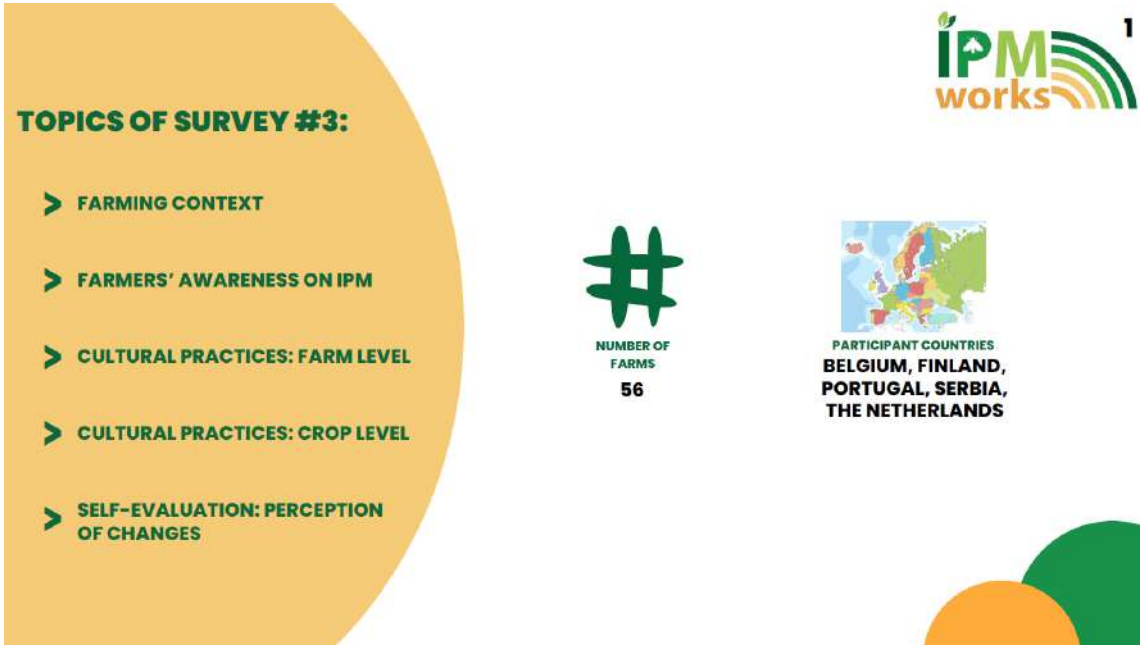
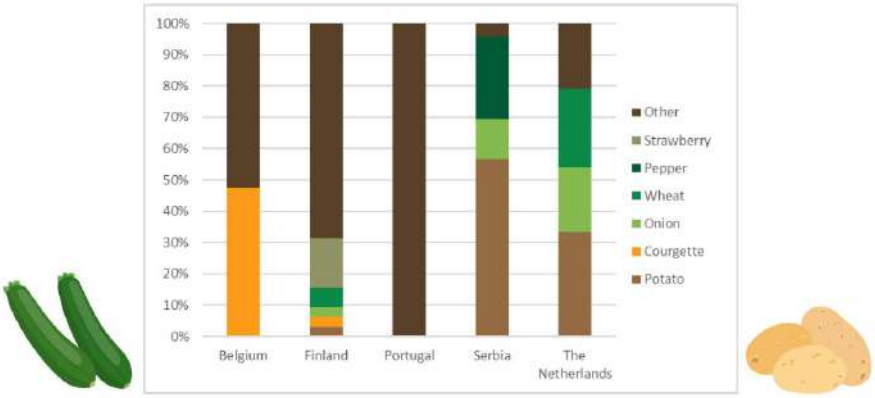
6.14. Annex 3.4 - Booklet #3 – Sector Outdoor Vegetables and Ornamentals



Main crops in participating countries



The network covers a wide range of crops, but some countries are more diversified than others.

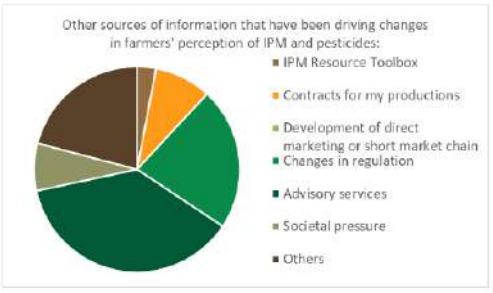
Farmers' awareness on IPM

CHANGES IN MOTIVATION AND CAUSES OF CHANGES

CHANGES IN MOTIVATION

CONTRIBUTION FROM HUB COACHES AND OTHER FARMS

CAUSES OF CHANGES IN PERCEPTION



Farmer's motivation increase to reduce pesticide use and adopt IPM.

Interest of hub coach and other farms in changing the farmers' perception of IPM and pesticide use.

Importance of changes in regulation, advisory services and others sources (own convictions, scientific publications) in changing the farmers' perception of IPM and pesticide use.

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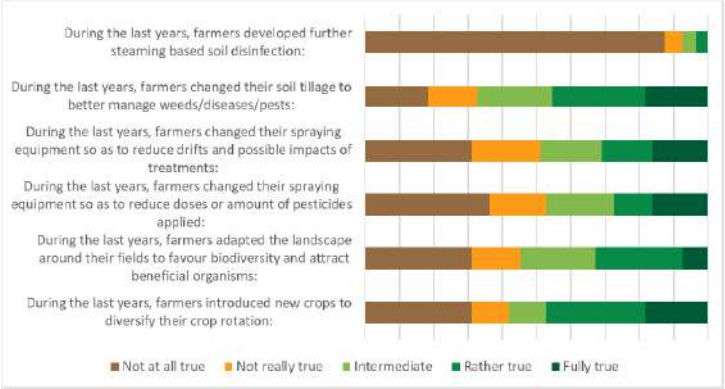
Cultural practices: farm level

CHANGES IN CULTURAL PRACTICES AT THE FARM LEVEL

4



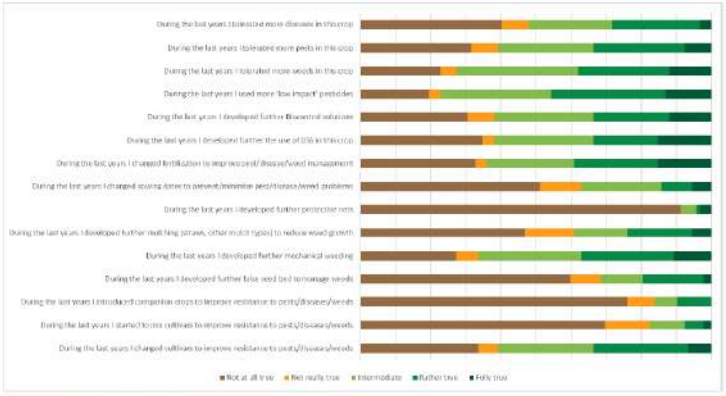
Half of the farmers changed their soil tillage and introduced new crops to diversify their rotation.

No further change in cultural practices at the farm level.

Cultural practices: crop level

CHANGES IN CULTURAL PRACTICES AT THE CROP LEVEL

5



Half of farmers use further low impact pesticides.

No further change of sowing date, use of protective nets, mulching and false seed bed.
No introduction of companion crop and mix cultivar.

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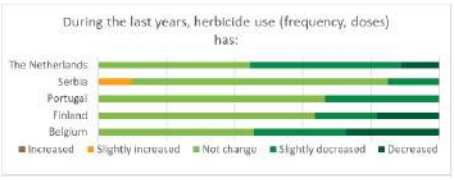
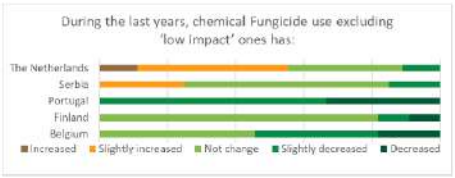
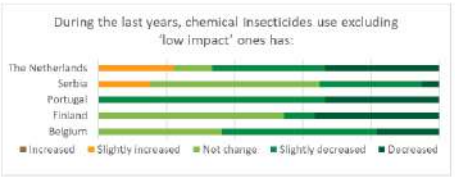
Self-evaluation

PESTICIDE USE DEPENDING ON THE COUNTRY

6







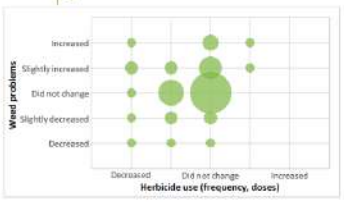
Tendency of less use of pesticides (herbicide, fungicide and insecticide) during the study, although there is some variation between the type of pesticide and countries.

Self-evaluation

WEED, DISEASE AND PEST PROBLEMS COMPARED TO THE USE OF CHEMICAL PRODUCTS

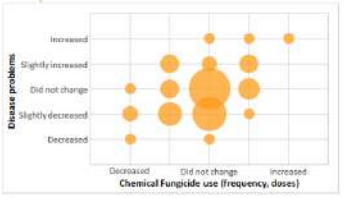
7

WEED PROBLEMS



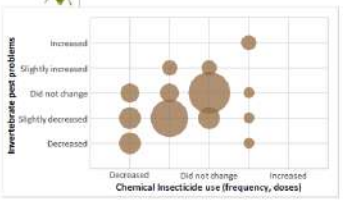
No further weed problems when herbicide use is reduced.

DISEASE PROBLEMS



Slightly less disease problems when fungicide use is reduced.

PEST PROBLEMS



Slightly less pest problems when insecticide use is reduced.

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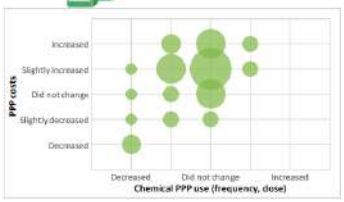
Self-evaluation

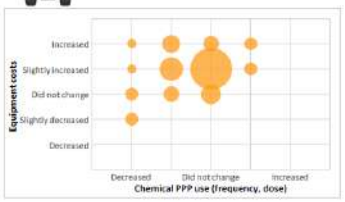
FARM COSTS COMPARED TO THE USE OF CHEMICAL PRODUCTS

8

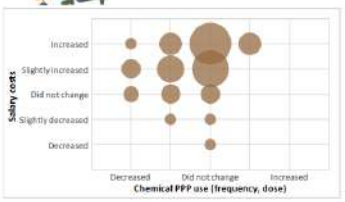
PPP COSTS



EQUIPMENT COSTS



SALARY COSTS



Slightly less PPP costs when pesticide use is reduced.

Tendency for equipment costs to rise, whatever the level of pesticide use.

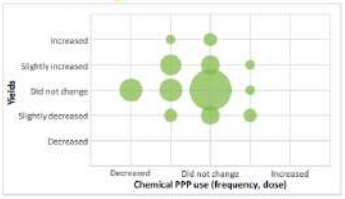
Tendency for salary costs to rise, whatever the level of pesticide use.

Self-evaluation

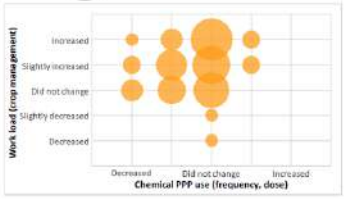
YIELDS, WORKLOAD AND PROFITABILITY COMPARED TO THE USE OF CHEMICAL PRODUCTS

9

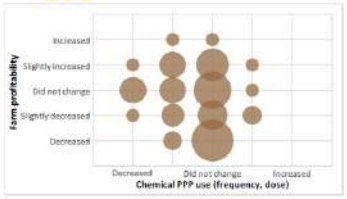
YIELDS



WORKLOAD



PROFITABILITY



No change in yield when pesticide use is reduced.

Tendency for workload to rise, whatever the level of pesticide use.

No change in profitability when pesticide use is reduced.

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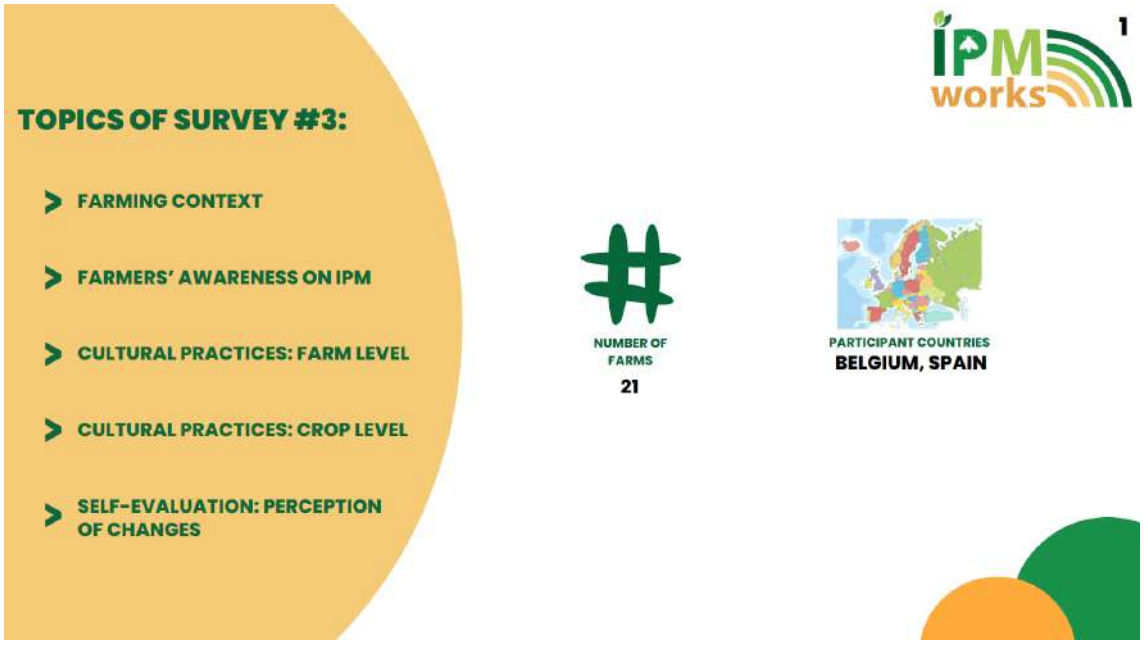
6.15. Annex 3.5 - Booklet #3 Sector Greenhouse horticulture



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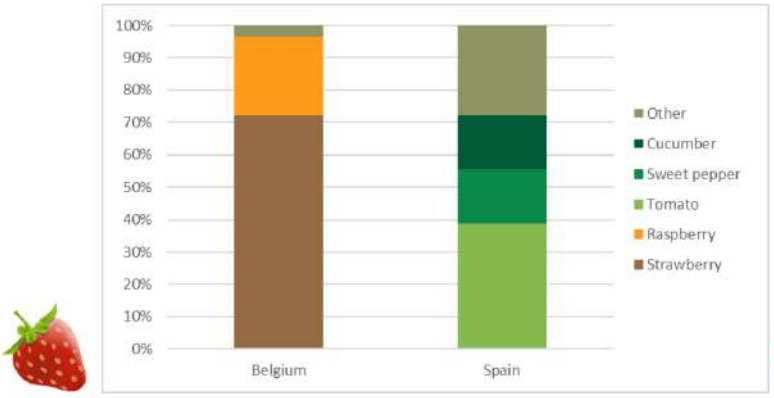
Main crops in participating countries

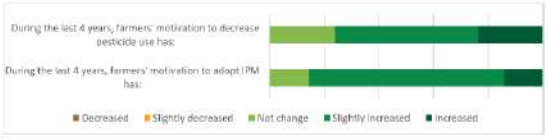


The network covers a wide range of crops, but Spain is more diversified than Belgium.

Farmers' awareness on IPM

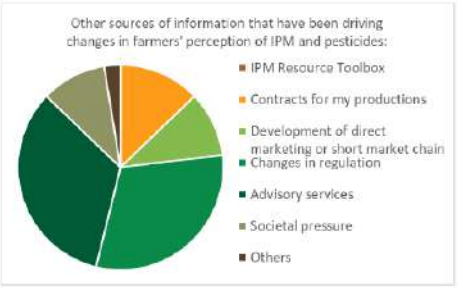
CHANGES IN MOTIVATION AND CAUSES OF CHANGES

CHANGES IN MOTIVATION



CONTRIBUTION FROM HUB COACHES AND OTHER FARMS

CAUSES OF CHANGES IN PERCEPTION



Farmer's motivation increase to reduce pesticide use and adopt IPM.

Interest of hub coach and other farms in changing the farmers' perception of IPM and pesticide use.

Importance of changes in regulation and advisory services in changing the farmers' perception of IPM and pesticide use.

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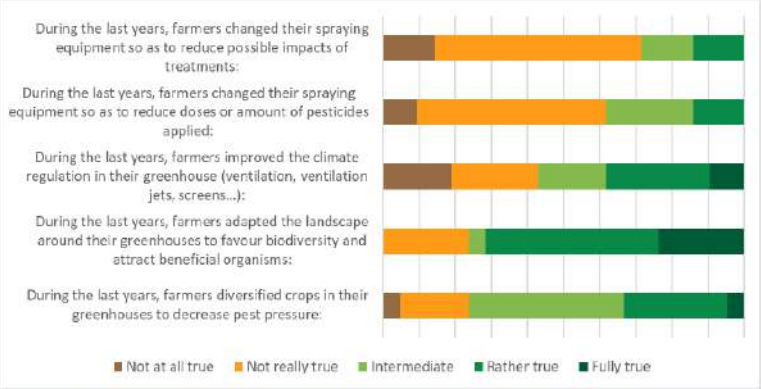
Cultural practices: farm level

CHANGES IN CULTURAL PRACTICES AT THE FARM LEVEL

4



Farmers adapted the landscape around their greenhouse to favour biodiversity.

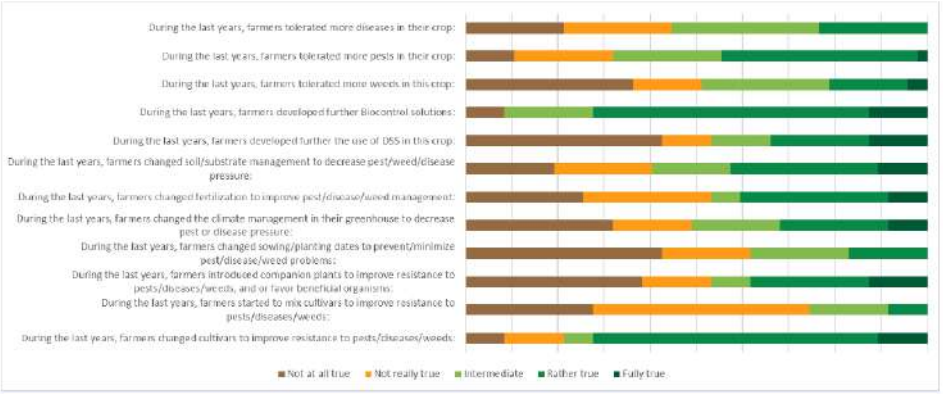
Half of farmers diversified crops and improved the climate regulation in their greenhouse.

No further changes of spraying equipment.

Cultural practices: crop level

CHANGES IN CULTURAL PRACTICES AT THE CROP LEVEL

5



More biocontrol solutions and changing cultivars to improve resistance.

No introduction of mix cultivars.

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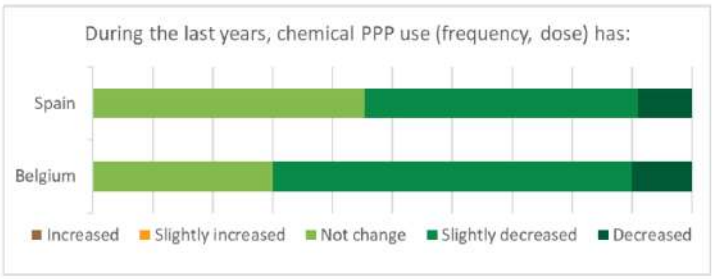
Self-evaluation

PESTICIDE USE DEPENDING ON THE COUNTRY

6



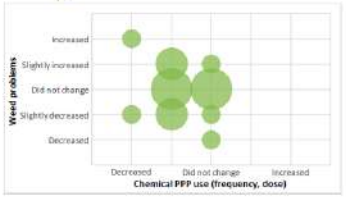
Less use of pesticides (herbicide, fungicide and insecticide) during the study in every country.

Self-evaluation

WEED, DISEASE AND PEST PROBLEMS COMPARED TO THE USE OF CHEMICAL PRODUCTS

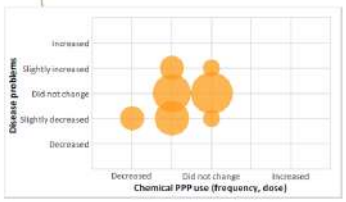
7

WEED PROBLEMS



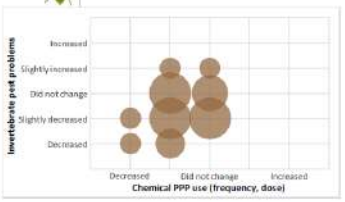
No further weed problems when pesticide use is reduced.

DISEASE PROBLEMS



Slightly less disease problems when pesticide use is reduced.

PEST PROBLEMS



Slightly less pest problems when pesticide use is reduced.

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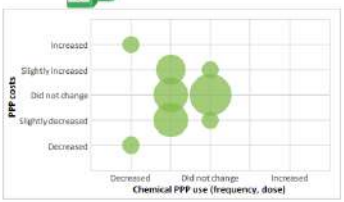
Self-evaluation

8

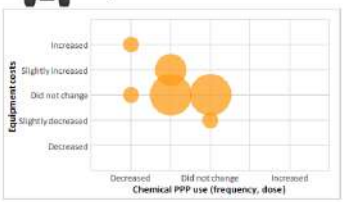
FARM COSTS COMPARED TO THE USE OF CHEMICAL PRODUCTS

PPP COSTS



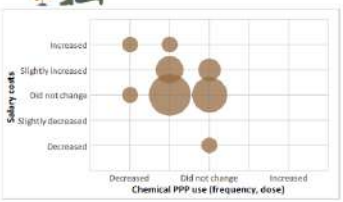
No change in PPP costs when pesticide use is reduced.

EQUIPMENT COSTS



Slightly more equipment costs when pesticide use is reduced.

SALARY COSTS



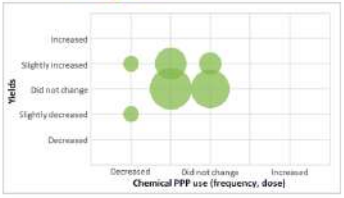
Slightly more salary costs when pesticide use is reduced.

Self-evaluation

9

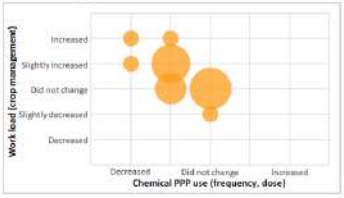
YIELDS, WORKLOAD AND PROFITABILITY COMPARED TO THE USE OF CHEMICAL PRODUCTS

YIELDS



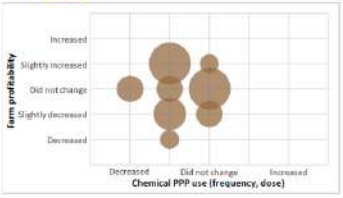
No change in yields when pesticide use is reduced.

WORKLOAD



Slightly more work load when pesticide use is reduced.

PROFITABILITY



No change in profitability when pesticide use is reduced.

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