An Information System
to describe and evaluate the IPM strategies deployed across the network

Deliverable D5.2

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

Coordination and Support Action (CSA)

01 October 2020 – 30 September 2024 (48 months)

Deliverable D5.2
An Information System to describe and evaluate the IPM strategies deployed across the network

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Author List: Nicolas Munier-Jolain (INRAE), Mélinda Turpin (INRAE)

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☐	**CO**	Confidential, only for members of the consortium (including the Commission Services)

Abstract

This report presents the work done by INRAE to adapt the AGROSYST information system to the context of the IPMWORKS project. AGROSYST is a web-based software providing functionalities to describe the technical details of IPM-based cropping systems, and to compute indicators of pesticide use and economic performance. AGROSYST was primarily developed by INRAE for the requirement of the French DEPHY network, which is affiliated to IPMWORKS.

The adaptation of the software included :

- the geographical expansion of localization data (to be able to describe farms in all 16 European countries of project partners),

- the simplification of the software,

- the re-design of the user interface,

- the update of the Plant Protection Products database to include products used in the different countries,

- the translation to all languages spoken in the IPMWORKS Farm Demo network.

AGROSYST is now ready for use. It will be used by IPMWORKS Hub Coaches all along year 2023 for Survey#2, to collect data describing the details of cropping systems and crop management in IPMWORKS farms. These data are needed to compute indicators of pesticide use, pesticide impact, and cost efficiency along a gradient of IPM adoption across farms.

Contents

1. IPMWORKS: Summary

IPM*WORKS*: Summary

Integrated Pest Management (IPM) is based on a diversity of pest management measures (prevention, non-chemical control, best practices for optimizing pesticide efficiency, etc.). These are combined at the farm level to enable reduced reliance on pesticides, and therefore a decrease in the exposure of the environment and people to pesticides. Pioneer farmers throughout Europe are testing such IPM strategies and are succeeding in achieving good outcomes with low pesticide inputs. However the majority of European farmers still rely heavily on pesticides, with major environmental and societal impacts, because most of them have not adopted a comprehensive, farm-level and holistic IPM strategy so far.

The objective of IPM*WORKS* is to promote the adoption of IPM strategies, based on an EU-wide demonstration network of farmers, who both progress further in the adoption of IPM – through peer-to-peer learning, and joint efforts – and demonstrate to other farmers that holistic IPM "works"; i.e. allows a low reliance on pesticides with better pest control, reduced costs and enhanced profitability. IPM*WORKS* coordinates existing networks promoting IPM and launched new hubs of farms in regions or sectors where IPM pioneers were not yet engaged in a relevant network. Advisors coordinating hubs have a major role in facilitating knowledge sharing, coaching farmers to find their own IPM solutions, and organizing local demonstration activities. IPMWORKS stimulates access to the 'IPM Decisions' platform and provides information on the IPM methods. It does collect data for comparing IPM strategies, and share results and dissemination material through channels widely used by farmers, broadcasting IPM success stories. It will organize training, and produce training material, targeting both farmers outside the network and advisory services, in order to prepare for the future dissemination of the peer-to-peer learning approach and the general adoption of IPM throughout the EU.

The demonstration of cost-efficiency of IPM is to be based on data describing the details of cropping systems and pest management in farms involved in the network.

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Project co-ordination	Dr Nicolas Munier-Jolain, INRAE, Dijon
Tel	+33 (0)3 80 69 30 35
Email	nicolas.munier-jolain@inrae.fr

2. Introduction

After the first step of creating the hubs of demo farms during the 12 first months of the project (from October 2020 to October 2021, i.e. during the most dramatic period of the COVID pandemic, which was not the best conditions for the recruitment of motivated farmers), a first survey (Survey#1) was performed by hub coaches. Survey#1 collected information about IPM awareness, motivations, and self-evaluation of IPM strategies of IPM*WORKS* farmers. Survey#1 was mostly qualitative, and allowed hub coaches to better know the farmers and their strategy to manage crops and pests. Survey#1 also included questions allowing a rough estimation of pesticide use in each farm, using a Treatment Frequency Index computed from the number of treatments, the average dose relative to recommended dose, and the average proportion of area treated. Because of difficulties of hub coaches to perform this survey#1 on time, the timing for finalising it was finally postponed until the end of 2022.

A second survey (Survey#2) was planned for the third year of the project, with the aim of collecting detailed technical information on cropping systems, crop and pest management. Such detailed data is needed to assess indicators of pesticide use and impact in IPM*WORKS* farms, and indicators of cost-efficiency of IPM strategies (profitability for farmers, work load, etc.), and therefore demonstrate with quantitative results that holistic IPM strategies indeed reduce drastically pesticide use without impairing economic profitability for farmers.

Such a technical detailed survey requires a specific methodology for data collection, to produce a reliable and consistent database. The DEPHY network in France is using an information system for data collection with the same objectives, called AGROSYST, developed by INRAE. The IPM*WORKS* DoA therefore includes a task for adapting this information system, so that it can be used for collecting data for Survey#2. This task started from the beginning of the project. It was performed by INRAE (and the sub-contracting IT developer 'Code Lutin'), with the supervision of participants of WP5 and of the project Steering Committee.

3. Adaptation of AGROSYST for IPMWORKS needs

Choices for simplification

The French version of AGROSYST is a very complex system with many functionalities that were not relevant in the context of IPM*WORKS* (detailed motivations of farmers, already collected

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with Survey#1; qualitative description of IPM strategies, also collected through Survey#1; Post-harvest self-assessment of previous growing season, etc). These functionalities could have been relevant in the context of IPM*WORKS*, but would also have required higher human resources than available for data collection. It was therefore decided to hide these functionalities in the IPM*WORKS* version of the system, to make the use of the interface much easier and intuitive.

The French version of AGROSYST includes two different options for describing the technical details of cropping systems and crop management:

- Option 1: all sequences of crop management are described for all fields managed according to a given strategy, and yield are also collected for each field. Indicators of pesticide use, pesticide impact and cost-efficiency for a given strategy in a given farm are therefore computed as the average of all fields.

- Option 2: this option is more synthetic. Each cropping system is described by a crop rotation (of course, not in perennial crops such as vineyards and orchards), and then crop management is described for each crop of the crop rotation, as a synthesis of possibly several fields with the same crop in a given year. Indicators of pesticide use, pesticide impact and cost-efficiency for a given strategy in a given farm are therefore computed as the weighted average of the different crops of the rotation (weights being the proportion of each crop in the rotation).

The two options produce a database that is difficult to manage and use. It was therefore decided to select only one option for IPM*WORKS*, to create a simple and consistent database. Because crop rotation is an important component of IPM strategies (in field crops), and because Survey#2 was planned only once during the lifetime of the project, Option 2 was chosen. Crop rotation is indeed not really known from Option 1 over one single year.

New concepts for the use at the European level

The structure of the database of the IPM*WORKS* version of AGROSYST is the same as the French one, but it was necessary to add a few fields for the use of the system at the European level:

- A field 'country' was added to the description of the farm;

- A list of European municipalities was included (with an access filtered by the country);

- The list of registered/used Plant Protection Products (PPPs) was updated for each country.

AGROSYST automatically computes an indicator of pesticide use, the Treatment Frequency Index, which requires a reference dose for each PPP x crop combination. As the objective is to compare pesticide use across a range of IPM strategies in the European network, it was decided to use the same reference dose for all farms of IPM*WORKS*, whatever the country, and whatever difference in registered dose among countries. Each product in each country was then associated to a corresponding product used in France, with the same active substances and the same concentrations.

The issue of language

The information system is to be used and fed by Hub Coaches. All Hub Coaches are not familiar with English for technical vocabulary. Therefore, the interface and all drop-down menus had to be translated from French to all 12 other languages currently spoken in the IPM*WORKS* network.

4. Practical developments

Subcontracting with IT developers

INRAE is subcontracting the IT development of the French version of AGROSYST. The selection of the subcontracting IT company is done according to French rules for the selection of subcontractors in public institutions, and has to be renewed every 5 years. Subcontracting had to be renewed at the beginning of 2021, a few months after the start of IPM*WORKS*. The specifications for the competitive tendering therefore included two separate parts, one for the continuation of the development of the French version, the other for the adaptation of the system for IPMWORKS.

The outcome of the competitive tendering was the selection of the IT company 'Code Lutin'.

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Adaptations made

The IPM*WORKS* version of AGROSYST shares the database with the French version, but the user interface is different. The list of adaptation made is as following :

- Adding of a field 'Country' in several tables.

- Adding of a functionality for the selection of the language, and translation of all the text of the user interface and all drop-down menus.

- Hiding of many functionalities and fields considered as not necessary/useful for the IPM*WORKS* version.

- Revision and simplification of the interface for a more intuitive user experience.

- Adding of lists of registered PPPs for each country (whenever the list was available and provided by the local IPM*WORKS* partner). The list of PPPs is filtered by country.

- Change the description of soils, as the French version of AGROSYST is using a French list of soil types that was not adapted to the EU level.

The IPM*WORKS* version of AGROSYST was ready for use by the end of December 2022, i.e. with three months of delay as compared to the DoA, but just on time for the launching of Survey#2,

after the deadline for finalizing Survey#1. The AGROSYST system is hosted by an INRAE server, and is accessible (with proper credentials) at: https://agrosyst.fr/ipmworks/ipmworks/.
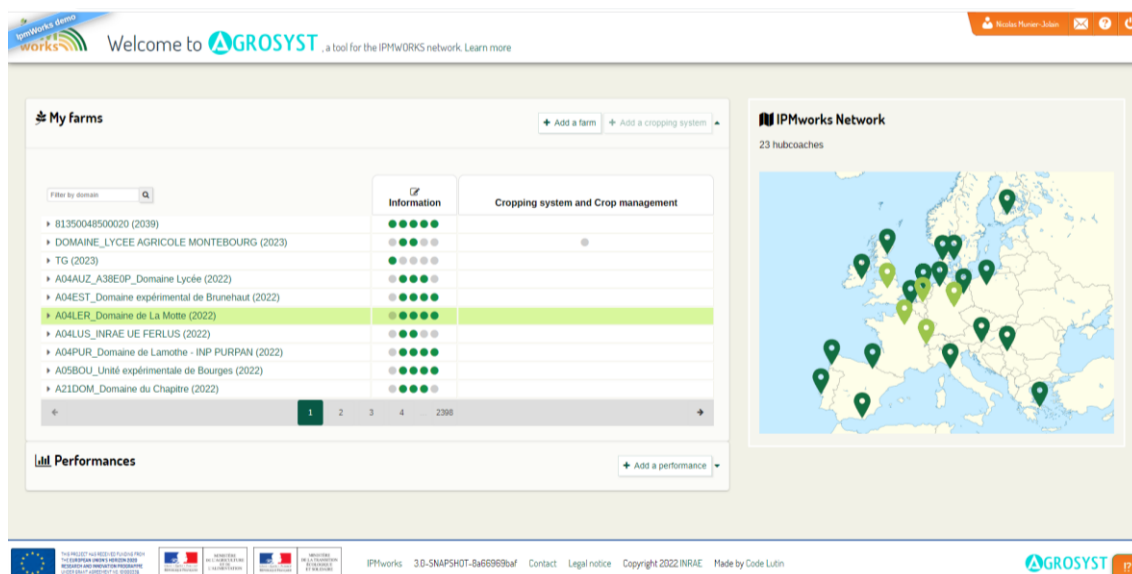
Figure 1: Home page of the IPMWORKS version of the AGROSYST system

5. Training and launching of Survey#2

The AGROSYST interface (almost finalized at this time) has been presented to Hub Coaches during the project Annual Meeting in Switzerland in October 2022, and the launching of Survey#2 was then reminded to all partners. Survey#2 was also reminded through the project internal newsletter.

INRAE produced two guideline documents, disseminated to Hub Coaches (see Annexes):

- A guideline for the use of the AGROSYST system (in its simplified IPM**WORKS** version), disseminated in February 2023.

- A guideline for the collection of data for survey#2, indicating the list of mandatory information to collect and the degree of precision required for each type of information (disseminated in April 2023). A template for paper recording in the farm (prior to electronic entering in AGROSYST) is also provided to facilitate the farmer's interview.

IPM**WORKS** Hub Coaches were invited to join a training webinar for the implementation of Survey#2 and the use of AGROSYST. 5 sessions of this training webinar were organized by INRAE

(on February 22, March 3, March 15, March 24, April 5, 2023). These sessions included a live demonstration of the software, and time dedicated to live test by hub coaches on the Demo version of the AGROSYST. Half of the IPM**WORKS** Hub Coaches attended one of the session.

Due to both delay in the finalization of Survey#1 by some hub coaches, and to the delay in the finalization of the IPMWORKS version of AGROSYST, the deadline for finalising Survey#2 was extended to December 31, 2023. This leaves 10 months to Hub Coaches to organize this data collection, and will leave 9 months before the end of the project for data analysis and production of results and dissemination material.

6. Conclusions

As planned by the project DoA, but with a delay of 4 months, the methodology and the IT tool are both ready for the implementation of Survey#2, dedicated to collection of detailed data on cropping systems, crop management and IPM strategies. The whole consortium is well aware of the significance of this survey for the demonstration that "IPM indeed works" (i.e. reduce pesticide use and impact, and is cost-effective), based on quantitative and reliable data.

The IT tool AGROSYST is now to be used by Hub Coaches to collect relevant data. For many Hub Coaches, this survey will provide a further knowledge of the details of IPM strategies of farmers, and some clues for understanding differences in pesticide use among farms. The key limiting factors for the implementation of the survey could be the limited time available for them to perform surveys and input data in the AGROSYST system.

7. List of annexes

- **Annex 1:** AGROSYST User guide
- **Annex 2:** Guidelines for Survey#2

Annexe 1 – AGROSYST User guide

AGROSYST — A short guide to using Agrosyst Survey#2

Survey #2

The objective of survey#2 is to produce quantitative data on IPMWORKS' IPM-based strategies, on pesticide use and impact, and cost-efficiency. To compute indicators, we need a comprehensive detailed description of technical crop management.

Outputs of Survey#2 should feed:
- Farmers' discussion within hubs, based on benchmarking
- The IPMWORKS project communication
- Specific communication towards Policy makers, who have high expectations for IPMWORKS. We have to convince them that IPMWORKS is useful and should be maintained and expanded. We need quantitative results for this.
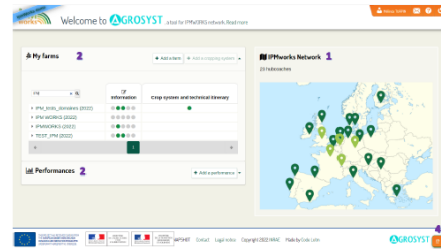
Hub coaches are in charge of collecting data for Survey#2.
The deadline for completing the survey is December 31, 2023

Agrosyst is an information system to be used for collecting data required for IPMWORKS' survey #2. The interface will help you to describe farming practices (and a rough description of the farming context) and will compute technical indicators (TFIs, input costs, margins, etc.).

AGROSYST describes cropping systems. You are asked to choose and describe at least one cropping system (a rotation), for each farm in your Hub (the most representative, or the nicest IPM strategy). Describe one cropping season (year), either 2022 or 2023 (or eventually a synthesis of both years if you wish).

As a reminder: a crop year is the interval between the last harvest of year n-1 and the last harvest of year n.

*1*

AGROSYST — Home page

1. The map shows all the IPMWORKS hubs, and the pre-existing national farm networks affiliated to IPMWORKS. Click on the green pins, and see the names, email addresses and sectors of the hub coaches.

2. The home page allows you to find your way around, view your farms, cropping systems and crop management details, and create your performance files.

3. In the orange box at the top right, by clicking on your name, you can change your password and change the language of the interface (remember to save and refresh your page after each change). There is no connection between country and language, so you can use any language.

4. You can contact us by using the link [ ] at the bottom right of the page, specifying the concern (adding species/varieties, plant protection products, reporting bugs, questions about the operation of Agrosyst...).

You can always come back to the home page by clicking on the [ ] house at the top left.
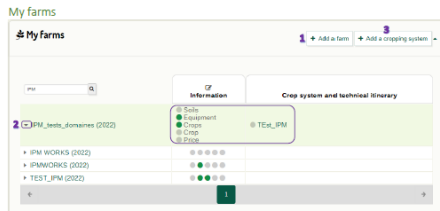
Mandatory data are marked with an asterisk (*). They have to be filled in to be able to save the page.

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AGROSYST — Filter
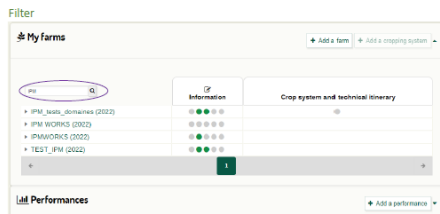
If you have many farms, you can enter the name of one farm in the search bar to filter the farm list.

My farms

1. Click on "Add a farm" to create a new farm.

2. Click on *the name of your farm* to go directly to the **Information** page.

☐ Click on the arrow in front of *the name* or directly on the grey/green dots to unfold the details. This way you can see your progress: the dot turns green when all the compulsory information of the tab is filled in.

3. To add a cropping system, pull down the details of the desired farm and click on "Add a cropping system".

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AGROSYST — Farm Information

This page is composed of 8/9 tabs. In this form, you will describe the farm, the crops, the equipment and the products used.

- **Context:**
Enter the growing season year (cycle from the previous harvest to the current harvest, the year is the year of harvest), the name of the farm, the type of farm, your name, the country and the municipality. For more precision you can enter the exact GPS coordinates of the farm (not mandatory).

- **Characteristic:**
Indicate at least the orientation of the farm, especially if livestock is present on the farm. By indicating the presence of livestock, a new tab "Livestock" appears (for a rough description of livestock: type of livestock, number of animals). The other information (not mandatory) allows to understand the farmer's approach and the management of the farm, some of which are included in the calculation of indicators (indicated by π).

- **Livestock:**
Present only if you have previously indicated the presence of livestock on the farm. Click on "Add", at least indicate the type of animals (dairy, beef, pigs...) then create your herds by clicking on "Add". Again, specify the type of animals (dairy cows, heifers, bulls...) and their feed. Remember to click on "OK" and save.

- **Soils:**
Click on "Add a field". A pop-up window appears where 4 categories are to be filled in: general information (name, municipality, surface area...), soil (texture, depth, stoniness...), equipment (irrigation system, drainage, protection...) and neighbouring elements (trees, fallow land, meadows, orchards...). You can fill in several soils if necessary.
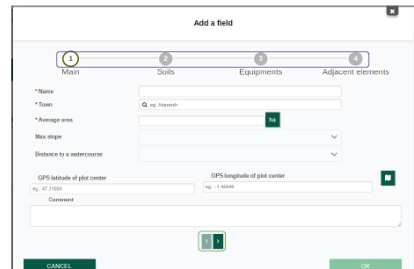
To move from one page to another you can click on the arrows or on the number of the desired page directly.

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AGROSYST

- **Equipment:**

Click on "Add equipment" and fill in all the equipment used in the cropping system you will describe.

You can download the full Agrosyst list of equipment via ⬇. Once your equipment is complete, you have to create combinations of tools used for crop management (traction + tools, e.g., tractor + harrow). Click on "Add a combination of tools", select the tools and select corresponding actions (tillage, sowing, harvest…). Defaults tool operating speed are suggested from the AGROSYST database, but you can update it if you have the information. These combinations will thereafter be suggested for crop management sequences. You can also describe manual interventions 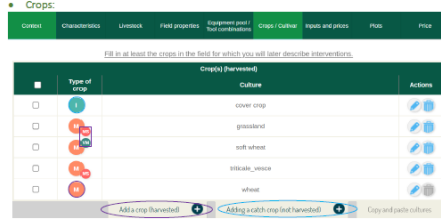(whether or not they are performed by a service provider). You can copy/paste 🗐 the equipment from one farm to one another.
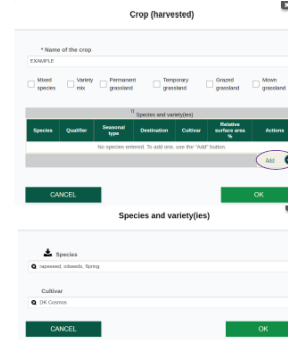
Tool combinations are required in crop management as this information is used to calculate indicators related to fuel consumption or work load.

However, if you don't have all the precise details of equipment, a rough description of it by selecting approximate equipment (e.g. a five bodies mouldboard plough whereas the real equipment was a six bodies plough) is enough for computing standardised indicators.

- **Crops:**

	Context	Characteristics	Livestock	Field properties	Equipment pool / Tool combinations	Crops / Cultivar	Inputs and prices	Plots	Price

Fill in at least the crops in the field for which you will later describe interventions.

☐	Type of crop	Crop(s) (harvested) Culture	Actions
☐		cover crop	✏ 🗑
☐		grassland	✏ 🗑
☐		soft wheat	✏ 🗑
☐		triticale_vesce	✏ 🗑
☐		wheat	✏ 🗑

Add a crop (harvested) ➕ | Adding a catch crop (not harvested) ➕ | Copy and paste cultures

Add a crop (or a catch crop, i.e. not harvested)

☐ The dots indicate whether the crop is a mixture of species and/or varieties (tick-boxes when creating a crop)

AGROSYST

Crop (harvested)

* Name of the crop

EXAMPLE

☐ Mixed species ☐ Variety mix ☐ Permanent grassland ☐ Temporary grassland ☐ Grazed grassland ☐ Mown grassland

Species and variety(ies)

Species	Qualifier	Seasonal type	Destination	Cultivar	Relative surface area %	Actions

No species entered. To add one, use the "Add" button

Add ➕

CANCEL | OK

Species and variety(ies)

⬇ Species
🔍 rapeseed, oilseeds, Spring

Cultivar
🔍 DK Exorcos

CANCEL | OK

Indicate the crop name, eventually tick one tick-box if appropriate (e.g., mix of varieties) and click on "Add" to select the crop species in the drop-down list (you can start typing the species to facilitate the selection)

Eventually add the cultivar(s)

The list of species can be downloaded ⬇
Remember to click on "OK".

Distribution of cultivated species (%)	Species	Qualifier	Seasonal type	Cultivated area (ha)	Distribution of cultivated species (%)
	English ryegrass	-	-	5	4.76
	Brome grass sitchensis	-	-	5	4.76
	HYBRID CLOVER	-	-	5	4.76
	SOFT WHEAT	-	Winter	30	28.57
	triticale	-	-	15	14.29
	common vetch	-	Spring	15	14.29
	HARD WHEAT	-	Spring	30	28.57

You can indicate the area of each species. Please note that these are the species and not the crops! The diagram gives an overview of the proportions of each species on the farm.

- **Inputs and prices:**

All inputs have to be listed here. Click on "Add an input" in the relevant input category, then fill in the input description. If you have the information of input price, you can save it in the price section (not mandatory). The inputs can then be used in the crop management. For example, for a treatment with a plant protection product, a drop-down list will suggest the products from the section **Inputs and Prices/Registered products (Chemical and non-chemical PPP)**.
There is a link between the country where the farm is registered and the list of available products. Only products from the relevant country are shown.

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Specific case of seed coating: It is important to enter seed lots in the corresponding tab of the **Input and prices** section. First, select the crop, then the species/varieties and finally the unit of seeding dose. The second tab allows you to specify whether seeds are certified, chemically treated and/or biologically inoculated. These seed lots will be available for your subsequent sowing actions (see the crop management part).
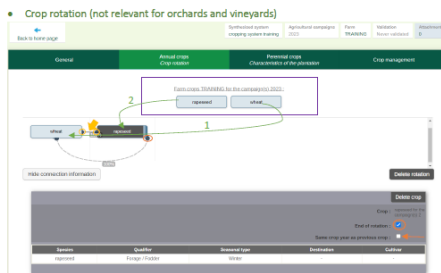
You can copy and paste 🗐 your inputs to another farm.

- **Plots:**
You can indicate the number of parcels/fields on the farm and their situation in relation to the holding and to each other.

- **Crop prices:**
You can enter the selling price of harvested products, for each crop. This tab can only be filled in once harvesting have been included in the crop management (see the section about it).

Cropping Systems and Crop Management

This page is composed of 4 tabs. In this form, you will describe the crop rotation (or the main features of vineyards/orchards), as well as the details of the crop management operations.

- **General:**
Fill in the name chosen for the cropping system, specify the year (or years, if you chose to describe a synthesis of 2 years; then the format should be: 2022, 2023), the sector and the type of management (organic or conventional). Be careful to fill in the IPMWORKS number associated with this farm. If you do not know farm IPMWORKS numbers, please contact Stanka (stanka.klemencic@kmetijski-zavod.si).

- **Crop rotation (not relevant for orchards and vineyards)**

← Back to home page	Synthesised system cropping system training	Agricultural campaigns 2023	Farm TRAINING	Validation Never validated	Attachments 0

General	Annual crops Crop rotation	Perennial crops Characteristics of the plantation	Crop management

Farm crops: TRAINING for the campaign(s) 2023:

☐ On the upper part, you will find all the crops entered on your farm. If the crop does not appear, you must create it on your farm.

AGROSYST

To set crop rotation:
- All crops listed in the farm are displayed on the top of the screen. Click and drag the first crop into the crop rotation space provided (blue area that appears on the left). Repeat this operation to position each crop in the rotation.
- Then link the crops together by positioning the arrow at the right end of the box (a blue dot appears), click, hold and drag the line to the left end of the desired crop.
- By clicking on this link, you can enter a catch crop in the box below (the catch crop has to be listed beforehand in the section Crop / Cultivars of the farm).
- Finally, complete the rotation. Click on the last crop(s) and tick the "End of cycle" box in the box below the rotation. Don't forget to link the last crop(s) to the first one to close the rotation.
- By default, two succeeding crops are for two years. If you have several succeeding crops within a given year, click on the second crop, and click on the tick-box 'Same crop year as previous crop'. Two succeeding crops in the same years are displayed in darker blue.
  If you have a crop grown over several years, drag and drop several time the same crop (by default, 1 crop = 1 year). You will thereafter have to describe the crop management for each year (but don't worry, the copy/paste functionality will help a lot!)

Please remember to save the crop rotation.

/!\ Rotations can be complicated to describe, especially for the Greenhouse and Outdoors vegetables sectors. If you don't know what is the previous crop, you can create an empty crop (fictitious previous) without any species, and declare it as the previous crop.
Example:

- **Perennial crops (relevant for orchards and vineyards only):**
If all of cultivars of a given species are managed the same way, you can declare in your farm just one crop (e.g., Olive tree) with all the varieties in it (if there are several). Describe the orchards/vineyards in this tab Perennial cops/characteristics of the plantation.
If there are differences in crop management across varieties, then you should have 1 crop for each variety at the farm level (e.g., Crop 1 = Vine-Chardonnay and Crop 2 = Vine-Pinot Noir). In the tab Perennial cops/characteristics of the plantation, declare the share of each variety in the cropping system and describe the orchards/vineyards for each variety.

• Crop management:

For each crop in your rotation, you must enter each intervention, i.e., each pass over the crop, whether mechanised or manual, from the harvest of the previous crop to the harvest of this crop; several actions can be carried out during a given pass (e.g. soil tillage and sowing in the same pass).

When adding an intervention, a box appears, choose the type of intervention you want and select the appropriate tool combination (if no tool combination is suggested for this type of intervention, you must create it in your equipment pool).

You can specify whether the intervention concerns the catch crop by ticking the relevant box.

You can also modulate the frequency of this intervention, both spatially if the intervention was not performed on all plots for this crop, or on the whole plot area, and temporally if you have carried out this intervention several times over a given period (e.g. several passes of the same mechanical weeding tool).

Example: I treated my field with an herbicide but only 1 row out of 2 and I did it 3 times at the beginning of the year.

You must then specify which species/varieties are concerned by the intervention. By default, all species/varieties are ticked.

You then fill-in the details of each action (there may be several). It is in this box that you note the type of sowing carried out, the yield and the destination of your harvest...

Finally, the last box concerns the inputs. This is where you select seed coating (for a sowing action) or the products used (for a PPP treatment or a fertiliser application). If the desired input does not appear in your drop-down list, it is because it was not entered in the *Inputs and prices* tab when you filled in the *Farm information* section.

If one intervention is in pink/red, as above, it means that some information is missing at the action and/or input level.

You can copy and paste one or more interventions on another crop in the same farm. You then only have to modify the yields and inputs to adapt them to this new crop.

The tick-box on the top-left is for selecting all interventions.

Performances

You can run a computation of technical and economic indicators, that are then stored in the system as a .xls file. To search and view a stored performance file, click on "Performances" on the home page of AGROSYST. You can then search for your performance file by the name you gave it, the name of the farm or the name of the cropping system.

To create a new performance file, click on "Add a performance". Give it a name, select the indicators you want to calculate, specify the farm(s) and the associated cropping system(s). Finally, click on save. The "Download" button will turn green once calculations are done, and you can click on it to download your performance file in xls format.

Tips and Tricks

• Savings:
Remember to save regularly, at each tab.

• Copy and paste:
You can save yourself a lot of typing by using copy/paste. You will find this functionality for farm equipment (copy/paste on another farm), for farm inputs (copy/paste on another farm) and for crop management (copy/paste within the same farm).

• Tabs/Windows:
It is recommended to open several tabs or windows on your browser: one tab with the farm details and one tab with the rotation and the crop management.
Right click on the page tab and duplicate your page.
Or, if you realise that you are missing inputs or tool combinations when describing crop management, you can right-click on the farm name and open the page in a new tab to update the farm description.

• Symbols:
To assist users in their input, symbols are present throughout Agrosyst.

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*: the asterisk in front of a field indicates that the entry is mandatory. The page cannot be saved if these fields are not filled in.

π: the pi indicates that the field is involved in the indicator calculation.

? : The question mark gives additional information about the field to help with the filling in.

List of mandatory (and important) data to save

- **Farm information:**
  Farm name, type (commercial farm), contact person, country, city/municipality
  Important (but not mandatory): Farm type / Main production(s)
  Important in case of livestock (but not mandatory): type and number of animals

- **Soil (except in greenhouses)**   Tab 'Field properties'
  Soil type, texture, depth, stoniness...

- **Equipment:**
  List of equipment used in the cropping system, and combination of tools for each type of operation.
  Don't need to be super-precise for the equipment properties

- **Crops/species/cultivars:**
  List of crops grown in the described cropping system, including species (and better if you can also inform on cultivars), including cover crops

- **Crop rotation** (or characteristics of the plantation for vineyards and orchards)

- **Crop management for each crop** (each term of the crop rotation):
  Comprehensive sequence of interventions, form harvest of the previous crop to harvest of the considered crop, including tools combinations, dates, spatial and temporal frequency, inputs, doses, yields.

List of secondary information (not mandatory, not so important)
- Age, motivation of farmer
- GPS location
- Labour forces, human resources
- Prices (inputs and harvested products)
- Plots

Annexe 2 – Guidelines for Survey#2

AGROSYST / IPM works

Guide for farmers' interview

Survey #2

The objective of survey#2 is to produce quantitative data on IPMWORKS' IPM-based strategies, about pesticide use and impact, and cost-efficiency. To compute indicators, we need a comprehensive detailed description of technical crop management.

Outputs of Survey#2 should feed:
- Farmers' discussion within hubs, based on benchmarking
- The IPMWORKS project communication
- Specific communication towards Policy makers, who have high expectations for IPMWORKS. We have to convince them that IPMWORKS is useful and should be maintained and expanded. We need quantitative results for this.

Hub coaches are in charge of collecting data for Survey#2.
The deadline for completing the survey is December 31, 2023

AGROSYST is an information system to be used for collecting data required for IPMWORKS' survey #2. The interface will help you to describe farming practices (and a rough description of the farming context) and will compute technical indicators (TFIs, input costs, margins, etc.).

AGROSYST describes cropping systems. You are asked to choose and describe at least <u>one</u> cropping system (a rotation), for each farm in your Hub (the most representative, or the nicest IPM strategy). Describe one cropping season (year), either 2022 or 2023 (or eventually a synthesis of both years if you wish).

As a reminder: a crop year is the interval between the last harvest of year n-1 and the last harvest of year n.

Minimal data needs for AGROSYST completion are listed below, to help you ask the good questions to farmers:

THE FARM

IPMWORKS farm number   *ex : ES15AF0012*
What type of farm? *Commercial farm, Experimental farm, School farm*
           In IPMWORKS, should be always 'Commercial farm'!
Type of management? *Conventional, organic*

Description of the livestock, when relevant: *type & numbers of animals*

Soil descriptions (main soil of the farm): texture, depth, stoniness
Non-mandatory data: maximum slope, distance to a watercourse, hydromorphy, limestone, organic matter....

Equipment pool
For this section, a rough description of equipment is enough (approximate power of tractors, approximate width of tools...). However, a description as precise as possible of PPP spraying equipment might be relevant.

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AGROSYST / IPM works

<u>4 categories</u>
Tractor   *e.g.: Tractor, 120 hp*
Self-propelled   *e.g.: Combine harvester, 6 m cutting width*
Tools   *e.g.: 3 m rotary harrow; 15 m3 slurry spreader*
Irrigation   *e.g.: Pivot-ramp, 190m boom*
Tool combinations: make a note of the tool combinations used for each type of intervention.

Is the tool shared or not with other farmers? Are some interventions done by a subcontractor? (In case of subcontracting, the equipment used still should be known)

CROP MANAGEMENT

The rotation / nature of crops
Crops
Species? Varieties? Eventually intercropping (mixtures of species, mixtures of cultivars)?
Cover crops (species)
The rotation
Describe the rotation *when relevant/possible, of course not in orchards or vineyards*
If the rotation is too complex, at least take note of the proportion of each crop in the system

Crop management for each term of the rotation
Ask and describe all interventions, from the harvest of the previous crop *(e.g. including interventions related to cover crops: sowing, crushing...)*.

Tillage
Date?
What type ? *ploughing, hoeing, harrowing, subsoiling, etc. + mechanical weeding*
Depth in cm
Number of paths?
Tools/Combination of tools *including tractor*

Sowing
Date?
Which type *(classic, precision, direct, planting...)*
Type of seed *(certified, farm-saved, both...)*
Seed coating *(chemical, biological inoculation)*
Quantity sown? *Kg/ha or seeds/ha*
Sowing depth in cm
Tools/Combination of tools *including tractor*

Mineral fertilisation
Date(s)?
Type of fertiliser? *Urea, potassium fertilizer, sulphur ...*
Composition *N, P, K...*
Form? *liquid, granulated...*
Application rate (with unit)
Tools/Combination of tools *including tractor*

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AGROSYST / IPM works

Organic fertilisation
Date(s)?
Type of product? *Solid/liquid manure...*
Composition *N, P, K...*
Application rate (with unit)
Tools/Combination of tools *including tractor*

Irrigation
Date(s)?
Average amount of water supplied (in mm)
If ferti-irrigation, amount of N applied (kg/ha)

PPP treatments
Date(s)?
Proportion of area treated (%)?   */!\ this proportion might be below 100% if (i) not all the fields of a given crop are treated (spatial frequency) (ii) part only of each field is treated (spatial frequency, e.g. treatment against slugs on field margins only, or patch spraying on perennial weeds), (iii) all the fields are treated, but the treatments are located on rows only, or between rows only (band spraying), or (iv) a combination of several preceeding options. Take note of these !!*
Type of product *herbicide, fungicide, insecticide, etc.*
Trade name
Application rate (with unit)
Tools/Combination of tools *including tractor*   Average spray volume per hectare

Biocontrol and non-registered products
Date(s)?
Proportion of area treated (%)?
Type of product *macro-organisms, chemical mediators, others...*
Name?
Application rate (with unit)
Tools/Combination of tools *including tractor*

Harvest
Date?
Type *grain, roots, silage, baling, grazing...*
Yields?   */!\ the unit in AGROSYST is deciton/ha !*
If it is a mixture of species/varieties you can specify the yield of each species/variety, if you can access the information.
Tools/Combination of tools *Combine harvester, ...*

Maintenance/ Vineyard and orchard pruning:
Date?
What type *pre-pruning, leaf removal, trellising, etc.*
Tools/Combination of tools

Other interventions:
Date?
type ? *transplanting, covering, protection, grafting, potting, etc.*

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AGROSYST / IPM works

Type of small equipment used and its characteristics (*tarpaulin, traps, pots...*)
Tools/Combination of tools *including tractor*

List of secondary information (not mandatory, not so important)

- Age, motivation of farmer
- GPS location
- Labour forces, human resources
- Prices (inputs and harvested products)
- Plots

Next pages: Template for taking notes of relevant data for survey#2

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AGROSYST

Farm description

Farm ID			Conventional / Organic
Livestock			
Type of animals		Number	

Soil(s)	Soil 1	Soil 2	Soil 3
texture			
depth			
stoniness			
organic matter			
limestone			
slope			
hydromorphy			
Comments			

Equipment

Tractor(s) *[power]*

Self-propelled *[type, width]*

Tools *[type, width]*

Irrigation *[type, size]*

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AGROSYST

Tool combinations:

Type of intervention	*what type?*	> Tractors, Tools
• Soil tillage 1		>
• Soil tillage 2		>
• Soil tillage 3		>
• Sowing 1		>
• Sowing 2		>
• Fertiliser 1		>
• Fertiliser 2		>
		Average spray volume L/ha
• PPP spraying		>
• Mechanical weeding		>
• Irrigation		>
• Harvest 1		>
• Harvest 2		>

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AGROSYST

Crops

	Species(s)	Cultivar(s)	Mixture of species	Mixture of cultivars
Crop 1			☐	☐
Crop 2			☐	☐
Crop 3			☐	☐
Crop 4			☐	☐
Crop 5			☐	☐
Crop 6			☐	☐
Crop 7			☐	☐

Crop rotation

Comments

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AGROSYST

Fertilisers

Mineral
Name   type   [N] %   [P2O5]%   [K2O]%   [other elements]%

Organic
Name   type   [N]   [P2O5]   [K2O]   *don't forget the unit !*

Other relevant information

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AGROSYST

Crop management crop 1			Species :
Type of intervention	date	Dose	Combination of tools
Soil tillage			
Cover crop			
Sowing			
Fertilisation			
PPPs			
Harvest			
Yield (with unit!)			

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AGROSYST

IPM works

Crop management crop 2			Species :
Type of intervention	date	Dose	Combination of tools
Soil tillage			
Cover crop			
Sowing			
Fertilisation			
PPPs			
Harvest			
Yield (with unit!)			

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AGROSYST

IPM works

Crop management crop 3			Species :
Type of intervention	date	Dose	Combination of tools
Soil tillage			
Cover crop			
Sowing			
Fertilisation			
PPPs			
Harvest			
Yield (with unit!)			

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AGROSYST

IPM works

Crop management crop 4			Species :
Type of intervention	date	Dose	Combination of tools
Soil tillage			
Cover crop			
Sowing			
Fertilisation			
PPPs			
Harvest			
Yield (with unit!)			

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AGROSYST

IPM works

Other relevant information