IPM Decisions

Deliverable 6.16 List with contributions to SUD

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List of Authors

Company	Author(s)	Contribution
Delphy	Harm Brinks	Author
ADAS	Mark Ramsden	Author

List of Reviewers

Company	Reviewer	Contribution
ADAS	Mark Ramsden	Review and formatting

Contents

Horizon 2020

1 Public Summary

The European Commission (EC) Sustainable Use Directive (SUD) (2009/128/EC) represents the overall European policy towards crop protection and provides a framework for reducing the risks and impacts of pesticides on the environment and human health. National and international policy organisations in Europe were identified as an important stakeholder group during the IPM Decisions project. This deliverable provides an overview of the activities conducted for policy organisations, and of activities with participation of national and international policy actors.

2 IPM Decisions contributions to the SUD

The IPM Decisions project has increased the impact of decision support systems (DSS) for IPM, through the launch of an open access online IPM Decision Platform (https://www.platform.ipmdecisions.net/) and associated resources. Supporting activities have helped quantify the benefits of IPM DSS consultation and identified the barriers and incentives to uptake. Resources have been created to foster DSS innovation, enabling DSS comparison, adaptation, creation, and integration between platforms. Longevity of the platform has been secured by making the source code open access and lowering the entry threshold for researchers and developers to make their systems accessible to farmers, advisors and other stakeholders. Several studies have demonstrated that significant reductions in pesticide application can be achieved through increased consultation of IPM DSS. Increased uptake of DSS can contribute to meeting European Union (EU) targets to reduce the use and risk of chemical pesticides by 50% by 2030. Scaling up the use of DSS would require widespread adoption and implementation by farmers and their advisors throughout Europe.

The SUD aims to achieve a sustainable use of pesticides in the EU by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of IPM and alternative approaches or techniques to pesticides (e.g. such as non-chemical alternatives). The SUD forms part of the EU legal framework covering pesticides and their use. By promoting the use of IPM and of alternative approaches and techniques, the SUD supports the achievement of the targets set out in the EU's Farm to Fork Strategy for reducing the risks and use of pesticides. IPM Decisions was planned and delivered in consultation with national authorities, represented as project participants, responsible for implementation of the SUD. As well as supporting the development of the Holistic IPM concept in collaboration with the IPMWORKS project, the IPM Decisions project has produced resources in direct support of SUD Articles 4, 5, 14, and 15, and of the General Principles of IPM as summarised in ANNEX III (Figure 1).

DSS covers a diverse range of decision tools including pest monitoring and treatment thresholds, forecasting pest density and damage, and systems for comparing treatment options. DSS, which help target pesticide treatments according to need, address IPM principles for avoiding the need for intervention (principles 2 and 3) and targeting

Horizon 2020

interventions to avoid unnecessary or excessive applications (principles 6 and 8). DSS which guide the use of non-chemical control measures or aid choice of chemical control, address principles 1, 4, 5 and 7. Synergies between these principles have been established, demonstrating, for example, that targeting treatments according to need (principle 6) is a key anti-resistance strategy (principle 7), and that non-chemical IPM, such as the use of disease resistant crop varieties (principle 1), increases the economic benefits to farmers from the use of DSS.

Policy actors were an important target group for IPM Decisions. The Danish Environmental Agency (DEA) and UK Health and Safety Executive (HSE) were partners within IPM Decisions consortium. The foreseen role of DEA and HSE was to provide insight on the role of decision support systems (DSS) in regulation, and to inform regulatory colleagues in other EU member states about the platform. This included updates as part of regular meetings of the EU working group of experts on Sustainable Use of Pesticides within the Directorate-General for Health and Food Safety (DG SANTE), responsible for EU policy on food safety and health and for monitoring the implementation of related laws. Discussion regarding a proposed Sustainable Use Regulation (SUR) in 2023 meant the EU Commission stopped organising meetings for member states regulatory authorities to discuss the SUD, including IPM activities. Country specific engagement with national policy actors was maintained by partners throughout the project. A summary of events to which policy actors were invited are listed in Table 1. These activities are included in Deliverable 6.8, secondary country list with demonstration activities, in which all platform promotion activities are listed.

ANNEX III

General principles of integrated pest management

1. The prevention and/or suppression of harmful organisms should be achieved or supported among other options especially by:

   — crop rotation,

   — use of adequate cultivation techniques (e.g. stale seedbed technique, sowing dates and densities, under-sowing, conservation tillage, pruning and direct sowing),

   — use, where appropriate, of resistant/tolerant cultivars and standard/certified seed and planting material,

   — use of balanced fertilisation, liming and irrigation/drainage practices,

   — preventing the spreading of harmful organisms by hygiene measures (e.g. by regular cleansing of machinery and equipment),

   — protection and enhancement of important beneficial organisms, e.g. by adequate plant protection measures or the utilisation of ecological infrastructures inside and outside production sites.

2. Harmful organisms must be monitored by adequate methods and tools, where available. Such adequate tools should include observations in the field as well as scientifically sound warning, forecasting and early diagnosis systems, where feasible, as well as the use of advice from professionally qualified advisors.

3. Based on the results of the monitoring the professional user has to decide whether and when to apply plant protection measures. Robust and scientifically sound threshold values are essential components for decision making. For harmful organisms threshold levels defined for the region, specific areas, crops and particular climatic conditions must be taken into account before treatments, where feasible.

4. Sustainable biological, physical and other non-chemical methods must be preferred to chemical methods if they provide satisfactory pest control.

5. The pesticides applied shall be as specific as possible for the target and shall have the least side effects on human health, non-target organisms and the environment.

6. The professional user should keep the use of pesticides and other forms of intervention to levels that are necessary, e.g. by reduced doses, reduced application frequency or partial applications, considering that the level of risk in vegetation is acceptable and they do not increase the risk for development of resistance in populations of harmful organisms.

7. Where the risk of resistance against a plant protection measure is known and where the level of harmful organisms requires repeated application of pesticides to the crops, available anti-resistance strategies should be applied to maintain the effectiveness of the products. This may include the use of multiple pesticides with different modes of action.

8. Based on the records on the use of pesticides and on the monitoring of harmful organisms the professional user should check the success of the applied plant protection measures.

Figure 1: Annex III of the SUD; General principles of Integrated Pest Management

2.1 Designing the IPM Decisions platform to support the SUD

The eight general principles of IPM provided a framework for the core design of the IPM Decisions platform, ensuring that consultation of the platform was compatible with principles 2, 3, 6, and 8. To that end, users of the IPM Decisions platform are able to:

- Access and consult a range of warning, forecasting, and early diagnosis systems through the IPM Decisions platform.
- Gain increasing access to a growing number of systems over time as the IPM Decisions platform is designed to enable integration of systems from multiple sources.
- Adapt DSS integrated into the platform to make small adjustments to regional conditions or deconstruct and re-integrate DSS through the IPM Decisions DSS factory where larger regional adaptation is required.
- Enter observation data from monitoring efforts to assess against established risk thresholds as the platform integrates action thresholds as well as warning, forecast and diagnostic systems.
- Forecast risk of given pest/crop combinations based on weather, observations and other relevant factors through consultation with multiple DSS. DSS may also include observations on crop variety or growth stage dates, to guide the user on where crops are or are not at risk.
- Review and interrogate season data, and compare with other sites, models and in some cases against the previous season. This offers users the opportunity to compare forecast risk against actual observations.

2.2 Impact on the main actions of the SUD

The main actions of the SUD are outlined on the EC website[1], and relate to:

i. Training of users, advisors and distributors.
ii. Inspection of pesticide application equipment.
iii. The prohibition of aerial spraying.
iv. The protection of the aquatic environment and drinking water.
v. Limitation of pesticide use in sensitive areas.
vi. Information and awareness raising about pesticide risks.
vii. Systems for gathering information on pesticide acute poisoning incidents, as well as chronic poisoning developments, where available.

The main actions of the SUD have been selected to minimise the immediate risks associated with pesticide use to human and environmental health. IPM Decisions has targeted activities on avoidance of unnecessary applications and ensuring targeted application of pesticides where necessary. As such, contributions to the main actions identified above are mainly related to supporting improved training of users, advisors and distributors on the role of IPM DSS. Indirectly, IPM Decisions contributes to all of the main actions by supporting the avoidance of application of unnecessary pesticide applications, and in so doing minimising the frequency and scale of pesticide use.

[1] https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/main-actions_en: Accessed on 10/10/2024

As part of collaboration with IPMWORKS, IPM Decisions provided input into recommendations to the proposed SUR. While the SUR was ultimately withdrawn, the recommendations remain valid for improving implementation of holistic IPM in Europe. Details of the recommendations can be found on the IPMWORKS Toolbox:

IPMWORKS - Policy recommendation for the Sustainable Use of Pesticides Regulation (SUR)

2.3 Supporting National Action Plans across Europe

The consultation of IPM DSS or similar are explicitly or implicitly promoted in many current the National Action Plans, however support for and availability of DSS for crop-pest interactions is very different between Member States. In many countries there are no or few IPM DSS for the major pests that drive the majority of pesticide use. DSS are often inadequately validated, eroding the trust of users; this is a major barrier to the reduction of pesticide use. To address this, the development, provision and promotion of IPM DSS should be coordinated between Member States, while adaptation, validation and demonstration of DSS should take place at a national scale, as well as training in the use and interpretation of DSS outputs. DSS used as evidence of effective decision making should meet the same criteria of 'independence' as advisors, in line with requirements for independent advisory services.

Support for application of DSS as part of National Action Plans was addressed by individual project partners as part of engagement activities throughout the project, detailed in D6.12 and D6.14. Coordination of DSS uptake between Member States was addressed by IPM Decisions through the development of a platform capable of integrating national platforms; facilitating the rapid sharing of resources and models across borders.

3 Policy recommendations from IPM Decisions

In addition to the specific events to which policy actors were invited during the project (Table 2), IPM Decisions presents three policy recommendations to the EC to support access to and consultation of IPM DSS in Europe, in line with wider efforts to increase application of digital services and in support of the SUD and Green Deal objectives. First, greater support is needed for coordinated research and development of novel IPM DSS, to work against consistent standards for development, validation, and evaluation of benefits. Second, technological and socioeconomic barriers need to be addressed, providing farmers and advisors with reliable access to, and training on the use of IPM DSS. Finally, a coordinated approach for the demonstration of IPM DSS is needed, to maintain continuity of engagement and trust between farmers, advisors, and researchers.

3.1 POLICY RECOMMENDATION 1
Support research and development of novel IPM DSS

Development of IPM DSS involves large amounts of data and analysis, as well as integration into a suitable platform to make it accessible. A more coordinated approach to DSS innovation across Europe, with clear guidelines on the requirements and standards for DSS provision in agriculture, would both improve trust in DSS performance and drive innovation.

Horizon 2020

- **Coordinated DSS development:** Development of novel DSS is disjointed across Europe, leading to high levels of diversity in approach and delivery, including in the design of graphical user interface. Greater integration of IPM DSS development and applications should be included in educational curriculums, especially in agricultural courses at university and agricultural schools.
- **Account for risk aversion:** The perceived level of risk represented by a given pest-crop interaction can be influenced by a range of factors, both directly and indirectly linked to the likelihood of a damaging infestation. The extent of pre-decision risk aversion will influence interpretation of DSS outputs. Further research and support is needed to engage decision makers, so that decision making processes incorporate the effect of individual and/or group risk aversion in pest management decisions.
- **IPM DSS Validation:** Novel DSS models, or models that have been translated and/or adapted to novel regions, need to be independently validated against clear standards. DSS providers should be bound to provide evidence of the extent to which DSS outputs are valid at a given location, and any assumptions or limitations that should be considered when interpretating DSS outputs.
- **Quantify the benefits of DSS:** Development of novel DSS often focuses on the generation and testing of the algorithms required to make risk predictions. Research is required to further evaluate the economic and environmental value of DSS, as well as identifying critical pest/crop combinations where high value returns can be achieved.

3.2 POLICY RECOMMENDATION 2
Address technological and socioeconomic barriers to farmers and advisors IPM DSS consultation

A number of technological and socioeconomic barriers to the uptake of IPM DSS have been identified for both farmers and advisors. The relative importance of these barriers varies across Europe, as detailed in two open access publications[2,3].

- **Digital infrastructure:** Many farmers and advisors do not have consistent access to information and communications technology (ICT) infrastructures required to reliably engage with online systems, notably access to internet connection across farming landscapes. Support for improved digital infrastructure, especially for improving rural broadband, would improve uptake of online DSS services.
- **ICT and DSS training:** Many farmers and advisors perceive their ICT skills as in need of improvement to better engage with online systems. Support for wider training in the access to, consultation and interpretation of IPM DSS would improve uptake of online DSS services.

[2] Akaka JJ, García-Gallego A, Georgantzis N *et al.* Decision Support Systems adoption in pesticide management [version 2; peer review: 1 approved, 1 approved with reservations]. Open Res Europe 2024, **4**:142 (https://doi.org/10.12688/openreseurope.17577.2)

[3] Marinko, J., Ivanovska, A., Marzidovšek, M., Ramsden, M., & Debeljak, M. (2023). Incentives and barriers to adoption of decision support systems in integrated pest management among farmers and farm advisors in Europe. *International Journal of Pest Management*, 1–18. https://doi.org/10.1080/09670874.2023.2244912

- **Targeted DSS development:** Encouraging/subsidising the development of DSS in regions and for crops where there are few or no existing systems (e.g. olives, vines, hops in Southern and Central Europe).
- **Subsidising DSS subscriptions:** Open access to DSS system at an introductory level should be subsidised to ensure widespread use. Support for access to more advanced, bespoke systems would also improve uptake, but this would be further enhanced where users have had previous experience with open systems.

3.3 POLICY RECOMMENDATION 3
Support wider demonstration of IPM DSS in practice to farmers and advisors

In all parts of Europe, farmers and advisors change practices based on access to reliable information on a novel approach. For IPM DSS, a lack of trust in the outputs from risk forecast models was identified as a key barrier to uptake. Engagement with these groups highlighted that general marketing may be counterproductive to building trust. While consultation of DSS from other regions may be considered as part of decision-making processes, it is unlikely to lead to sustained changes in practice without regional validation and demonstration.

- **IPM DSS Demonstrations:** In order to build trust in the use of IPM DSS, independent demonstration of the application and impact of DSS are required at a regional scale, including summaries of the short- and long-term impact on production, and profitability of the crop.

4 Conclusion

Throughout the IPM Decisions project, outputs relevant to the SUD to both the EC, and policy actors at national levels, were communicated by the project team. In the last year of the project, IPM Decisions organised or participated in several impactful events to which policy actors were invited, concluding with the joint hosting of the IPM Conference with IPMWORKS in Brussels in May 2024, attended by over 130 delegates from across Europe. Around 30 people working for the EC or national policy authorities joined the conference.

IPM DSS support the avoidance and targeted use of pesticides, and in so doing contribute to the implementation of the SUD. Further effort is required to coordinate access to, and consultation of, IPM DSS between and within Member States, as well as to support development and adaptation of relevant, valid systems at suitable regional scales. The resources created as part of the IPM Decisions project support these activities, by enabling the rapid integration and sharing of resources between national developers.

Table 1: Summary events to which policy actors were invited during the IPM Decisions project. Activities were intended to promote engagement with policy actors involved in the implementation of the SUD and Pesticide National Action Plans in Europe.

Date	Country	Short description	Main message communicated
24 March 2020	Pan-European	A short presentation introducing the IPM Decisions project was given by DEPA to EU SUD authorities.	Introduce the scope and ambition of the IPM Decisions project.
See Table 2	Pan-European	As part of project activities, IPM Decisions ran three rounds of multi-actor workshops in each of the 12 participating countries. The purpose of these workshops was to get feedback from stakeholders during the development of the platform, and to facilitate the IPM Decisions Network for the communicating updates on the platform post launch. National policy actors were invited to relevant national workshops. Specific dates and locations of these workshops are provided in Table 2.	Workshop 1: Introduce the project, provide forum for stakeholder input into platform design. Workshop 2: Introduce the project, provide recent progress updates, present beta version of platform and elicit feedback. Workshop 3: Demonstrate the platform, and how its design reflects multi-actor input from previous workshops.
11 May 2022	Pan-European	Farm Demo Conference in Brussels was organized together with sister project IPMWORKS, and Nefertiti. Policy actors/organizations were an important target group for this event.	Introduce the scope and ambition of the IPM Decisions project to policy makers and other stakeholders.
10 May 2023	United Kingdom	DEFRA were updated on the IPM Decisions project, including a demonstration of the platform and discussion on next steps for promotion in the UK. Context was provided through a farm visit and field tour with LEAF farmer, to showcase projects and relevant outputs.	Introduce the scope and ambition of the IPM Decisions project to policy makers and demonstrate the Platform and associated resources. The role of IPM DSS in reducing pesticide applications, and role in NAPs was highlighted.
22 September 2023	Pan-European	Platform demonstration and policy discussion with representatives of DG AGRI, DG SANTE and DG ENV, Brussels	In September 2023, the platform was also demonstrated to representatives of DG AGRI, DG SANTE and DG ENV, along with supporting evidence of the benefits of DSS use in reducing the use and risk of pesticides in Europe.

27 September 2023	Netherlands	Dutch EIP network meeting for plant health. This meeting was organized by 'Regiebureau POP', the Dutch Common Agricultural Policy (CAP) coordination unit.	The IPM Decisions platform was demonstrated to policy makers and discussed.
15 October 2023	Pan-European	Policy recommendations for the SUR; open letter written with IPMWORKS, Policy recommendations for the SUR.	IPM Decisions contributed several recommendations on the inclusion of IPM DSS in European directives and regulations.
15 March 2024	Netherlands	Demonstration of IPM Decisions platform in the meeting of the IPMWORKS National Policy Network meeting.	Along with the demonstration of IPM Decisions platform to policy makers, the potential role of DSS within National Action Plans was highlighted.
7 May 2024	United Kingdom	Updated the Department for Environment Food and Rural Affairs (Defra) on IPM Decisions, and description of routes for longevity of platform support beyond the project funding period.	Demonstrated the IPM Decisions platform to policy makers, and made the case for benefits of national funding to ensure national benefits.
14 May 2024	Pan-European	IPM Conference in Brussels, organised together with sister project IPMWORKS. Policy actors/organisations were an important target group for this event.	Overall benefits of IPM Decisions outputs were presented, in the context of the need for holistic IPM strategies. In a dedicated workshop, IPM Decisions Platform was demonstrated, and its potential contribution to National Action Plans was highlighted.

Table 2: Dates and locations of the IPM Decisions multi-actor workshops 2020-2023, to which national policy actors were invited

Country	Dates	Organizing partner	Links
Netherland	29 Jan 2020; 5 Dec 2020; 10 Jan 2022	Delphy	NL Workshop 2020 NL Workshop 2021
France	12 Nov 2019; 30 Nov 2019; 23 Mar 2021; 15 Jan 2022	APCA/ INRAE	
United Kingdom	11 Feb 2020; 18 Feb 2020; 15 Jan 2021; 18 Jan 2022	AHDB	UK Workshop 2020 UK Workshop 2021 UK Workshops 2022
Greece	16 Dec 2019; 23 Dec 2019; 10 Jan 2021; 1 Feb 2022; 23 Feb 2023	AUA	
Lithuania	29 Feb 2020; 18 Jan 2021; 5 Feb 2022	LAMMC	LIT Workshop 2021
Norway	5 Feb 2021	NIBIO	
Sweden	1 Feb 2020; 8 Feb 2020; 10 Feb 2021; 18 Feb 2022	SLU	SWE Workshop 2021
Finland	21 Feb 2021; 19 Feb 2022	LUKE	FIN Workshop 2021
Denmark	10 Dec 2019; 26 Feb 2021; 1 Mar 2022	SEGES	DEN Workshop 2021
Germany	5 Feb 2020; 14 Feb 2020; 1 Mar 2021; 5 Mar 2022	LfL	GER Workshop 2021
Slovenia	10 Feb 2020; 5 Mar 2021; 10 Mar 2022	MPS	
Italy	4 Feb 2020; 13 Feb 2020; 7 Mar 2021; 15 Mar 2022	Coldiretti	IT Workshop 2021

Table 3: Summary of the contribution of IPM Decisions resources to the implementation of the Sustainable Use Directive.

Relevant SUD article	Brief description of SUD article	IPM Decisions contribution	Relevant IPM Decisions output
Article 4: National Action Plans	Member states adopted National Action Plans, setting up quantitative objectives, targets, measures and timetables to reduce risks and impacts of pesticide use on human health and the environment, and to develop and introduce IPM and alternative approaches and techniques.	Project partners engaged with national bodies responsible for the development and curation of National Action Plans. The platform was demonstrated, and evidence relating to the benefits of IPM DSS were shared. The main contribution was in i) sharing relevant evidence on the benefit of IPM DSS (publications and project deliverables), and ii) highlighted free access to DSS through the platform that would facilitate uptake where this activity is cited in National Action Plans.	• D7.13 Project public update May 2023 • D4.17 DSS environmental and economic impact assessment for Europe
Article 5: Training	Member states ensure that all professional users, distributors and advisors have access to appropriate training by bodies designated by the competent authorities. Training subjects are detailed in SUD ANNEX I, and explicitly include IPM techniques (ANNEX I.4) and decision support (ANNEX I.5).	IPM Decisions contributed to the development of the IPMWORKS eLearning Models, which provide training on theory behind and application of Holistic IPM. Specifically, IPM Decisions supported development of Model 4 (Integrated Disease Management) and Module 5 (Integrated Invertebrate Management).	• Contribution to IPMWORKS eLearning modules
Article 14: Integrated Pest Management	Member States shall take all necessary measures to promote low pesticide-input pest management, giving wherever possible priority to non-chemical methods, so that professional users of pesticides switch to practices and products with the lowest risk to human health and the environment among those available for the same pest problem.	Member states are required to establish or support implementation of IPM, including access to information and tools for pest monitoring and decision making. The IPM Decisions platform is available in all Member States, and already translated into 12 languages with established process for further content translation. DSS descriptions have been shared through international networks, as well as supporting resources on the consultation and interpretation of DSS in application.	• Factsheets on EU FarmBook • DSS links and factsheets in IPMWORKS Toolbox • Practice Abstracts on EU CAP Network • Publications describing barriers and incentives for DSS uptake