Annex to minutes of government meeting of 16 March 2023 I3, LI2023/02045

Sweden’s national action plan on the sustainable use of plant protection products 2023-2027

Table of contents

1 Introduction

This is the third national action plan on the sustainable use of plant protection products that Sweden has drawn up under Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides ('the Directive')[1]. The Directive establishes a framework to achieve sustainable use of pesticides by reducing the risks and impact of pesticide use on human health and the environment and promoting the use of integrated pest management and of alternative approaches or techniques such as non-chemical alternatives to pesticides.

It is a key requirement under the Directive that Member States draw up and adopt action plans. In the plans, Member States are to set up their quantitative objectives, targets, measures and timetables to reduce the risks and impact of plant protection products on human health and the environment and to encourage the development and introduction of integrated pest management and of alternative approaches or techniques in order to reduce dependency on pesticides. The national action plans are to be reviewed at least every 5 years. Member States are to describe in their national action plans how they will implement measures pursuant to Articles 5 to 15 of the Directive in order to achieve the objectives referred to in the Directive.

The action plan concerns only plant protection products. However, the term 'pesticides' is used in the action plan in cases where biocides are also referred to and where national and EU legislation uses the term pesticides. Terms used in the action plan and a list of their definitions can be found in Article 3 of the Directive.

The action plan applies for the period 2023-2027 or until a new one is adopted.

[1] https://eur-lex.europa.eu/eli/dir/2009/128/2009-11-25.

2 National action plan

The Directive lays down that, when drawing up and revising their national action plans, Member States must take account of the health, social, economic and environmental impact of the measures envisaged, of specific national, regional and local conditions and of all relevant stakeholder groups.

The Swedish action plans for the sustainable use of plant protection products have evolved since the adoption of the Swedish environmental quality objectives in 1999 in order to more closely align with those environmental objectives relevant to the main aim of the Directive. The Swedish Food Strategy has also played a role in the work on the action plan in recent years. In 2017 the Riksdag (Swedish Parliament) decided on the objectives of a food strategy to form a basis for food policy until 2030. The overall goal of the Food Strategy is a competitive food chain where total food production increases while relevant national environmental objectives are met. At present, competitive agriculture requires some continued use of plant protection products, yet the risks to health and the environment from the use of such products must be reduced. In order to make further advances in minimising the risks and impact of the use of plant protection products on health and the environment and to respond to decreasing availability of plant protection products, work is needed to facilitate access to alternative methods and techniques and to introduce low-risk plant protection products.

2.1 Evaluation

The Swedish Board of Agriculture is the authority responsible for coordinating and managing the work on the action plan and for coordinating the follow-up and evaluation. The Board of Agriculture is to submit proposals for amendments to the action plan for the next period based on an evaluation of the previous action plan. Coordination should take place between the authorities concerned in order to examine and analyse the work in relation to the objectives set. Every 2 years, industry and other stakeholders should be invited to more in-depth discussion of the work under the action plan and be given the opportunity to comment. The plan should be followed up and evaluated at least once every 5 years. Updates to the action plan that are adopted by the Government, as well as follow-up and evaluations, must be published on websites for the public and stakeholders such as industry and interest groups. Updates and follow-up to the action plan must also be communicated to the European Commission. The Ordinance (2014:425) on pesticides (‘the Pesticides Ordinance’) lays down that parts of the action plan are to be monitored and reported on an annual basis. These reports are published on the Board of Agriculture’s website.

The evaluation of the national action plan for 2019-2022, carried out by the Board of Agriculture in 2021 in collaboration with the other authorities concerned, presented the following conclusions:

- The use of plant protection products in Swedish agriculture has been monitored for many years. In the 1980s and 90s use of such products decreased sharply, but in recent years it has remained stable, both in terms of total quantities of active substances sold and dosage per hectare.

- The overall aim of the action plan is to reduce the risk to health and the environment, which is quantified using a number of indicators. They show an overall trend of reduced risk to health and the environment.

- The health risks for users of plant protection products, as well as the risks to the environment, have decreased significantly since the 1990s. The levels of plant protection product residues in Swedish-grown crops remain low.

The evaluation is available on the Board of Agriculture's website[2].

2.2 Challenges

Climate change and uncertainties on the world market have an impact on the prospects for enhancing the sustainability of food production. Increased pest and weed problems are foreseen, prompted by changed biological conditions that can lead to more severe crop damage. This in turn may lead to an increased need for plant protection. At the same time, a lack of diversity in plant protection products may contribute to the more predominant use of certain groups of products, potentially leading to pests and weeds developing resistance to the active substances. A further effect of climate change may be increased problems with leaching of plant protection products into surface and groundwater due to changes in precipitation patterns.

2.2.1 Human health and the environment

The overall risk to human health and the environment has fallen but the environmental and health risk index, which had remained stable for more than 10 years, has increased slightly in recent years. The toxicity index has remained stable over the last 10 years, but at a significantly higher level than when the index was launched in 2002. However, this can largely be explained by the fact that the analytical methods have improved since the early years, with more substances included and lower detection thresholds. The use of plant protection products of the highest concern, also termed candidates for substitution, has decreased by more than a third since 2015.

Residues of plant protection products above the limit values have been found in a small number of samples of Swedish-grown crops in the period 2016-2020. The risks to Swedish consumers remain low and constant over time. Both the environmental quality objective 'A Non-Toxic Environment' and the current action plan contain indicators for the protection of aquatic organisms, but there is a need to develop and improve the knowledge base regarding drinking water supply and quality. Drinking water producers are required to analyse the water supplied for the presence of plant protection products. They carry out the analyses based on an assessment of what residues could be present. This assessment can be difficult to make, which leads to a risk of underestimation of the presence of certain individual active substances. It is relatively common for water from private wells to have pesticide levels above the national guideline value for good groundwater chemical status. However, findings in groundwater are largely dominated by substances that are no longer authorised for use and by substances primarily used outside agriculture. Over the years, the registration process for new products has increasingly taken into account environmental aspects in product authorisation, and improved pesticide handling as a result of training and advice has reduced the risk of point emissions.

2.2.2 Residues in surface and groundwater

The risk to aquatic organisms from plant protection products in surface water has not decreased during the period studied. Plant protection products detected in surface water over the last 10 years (converted to toxicity index) are dominated by substances that have not been used in agriculture for

[2] https://webbutiken.jordbruksverket.se/sv/artiklar/ra2110.html.

a long time or that have recently been banned. The proportion of samples where at least one plant protection product exceeds its guideline value for the protection of aquatic organisms has remained relatively unchanged in the national environmental monitoring carried out in agriculture-intensive areas. The substances imidacloprid and diflufenican have had the highest proportion of samples with values exceeding the benchmarks. Imidacloprid has not been authorised for use in Sweden since 2020. The latest measurement for diflufenican shows a trend break, with levels decreasing. Since 2018 the information and education campaign 'Focus on pesticide use' has aimed to tackle the problems of diflufenican.

Progress is being made on reducing risks of leakage of plant protection products during filling and cleaning of sprayers. Surveys carried out since 2017 show that virtually all professional users of plant protection products use the recommended protective equipment and have procedures in place to minimise risks. Safety surrounding storage, filling sites and equipment for filling and cleaning is improving in line with increasing awareness, training, information and technological developments.

2.2.3 Risks to pollinators and other beneficial insects

Studies show that the number of pollinators is declining, both at species and individual level, in Sweden and elsewhere in the world. A decline in pollinator numbers has a negative impact on agriculture, horticulture and biodiversity. The use of plant protection products has been highlighted as one of several factors presumed to contribute to the decline. One challenge is the reduction in pollinator habitats. It is important to develop cultivation methods that combine positive effects on both biodiversity and production. This development may need to be stimulated.

Since 2019 the Board of Agriculture has published a list of current plant protection products that are harmful to pollinators with details of how they may be used and any restrictions that apply. The use of a number of plant protection products considered to be harmful to pollinators has decreased over the past 10 years. Most neonicotinoids, which are considered particularly harmful to both insects and the environment in general, have been banned in the EU. Continued efforts are needed to raise awareness of the importance of promoting pollinators and to disseminate information on how to help pollinators and how to minimise the use of plant protection products harmful to pollinators.

2.2.4 Sustainable farming systems

All professional users of plant protection products must make use of integrated pest management. This involves preventing pest problems, monitoring risks of harm, tailoring pest management measures and following up and evaluating the measures. Integrated pest management plays a key role in achieving the objectives of sustainable cultivation systems, especially with regard to reducing dependency on plant protection products and reducing risks in the use of such products. An important aspect of reducing dependency on plant protection products is using crop varieties that are resilient or resistant to pests. Developing new varieties takes a long time, but it is an important area in the work on integrated pest management. The Board of Agriculture regularly produces guidance on integrated pest management and the plant protection centres use the principles of prevention, monitoring, tailoring and follow-up in their advisory work. However, it is difficult to check to what extent these principles are actually applied. In 2018, 2020 and 2022, the relevant authorities carried out joint supervision projects to ensure that the principles of integrated pest management were followed by farmers and other professional users. It is important to continue carrying out such supervision projects.

2.3 Participation of the public, industry and stakeholder organisations

As part of drawing up the proposal for an action plan for 2023-2027, the relevant authorities have collaborated with research groups and participated in joint workshops with them. The industry and stakeholder organisations have had the opportunity to discuss the issues at several information meetings held by the Board of Agriculture as part of the process of drawing up a proposal for a new action plan. In spring 2022 there was an opportunity for private individuals, organisations and businesses to comment on the Board of Agriculture's proposal using a form on the Board's website. The Board of Agriculture has circulated its proposed national action plan for consultation to businesses, stakeholder and industry associations, other authorities, universities, advisory organisations for professional users, etc.

Since 1997 the information and education campaign 'Focus on pesticide use' has focused on improving the handling and application of plant protection products in Swedish agriculture, forestry and horticulture in order to reduce the risks to health and the environment. The campaign's management team and steering group include representatives of the Federation of Swedish Farmers (LRF), the Board of Agriculture, the Swedish Environmental Protection Agency, the Swedish Chemicals Agency, the Swedish Work Environment Authority, Lantmännen and the Swedish Crop Protection Association. The aim of the campaign is to minimise the environmental and health risks from the use of plant protection products in agriculture and horticulture in Sweden.

Under the Food Strategy, the Board of Agriculture has been given the task of heading a Plant Protection Council. The council focuses on preventive work to establish efficient and sustainable plant protection practices. The Plant Protection Council comprises representatives of the Board of Agriculture, the Chemicals Agency, the Environmental Protection Agency, the Swedish Food Agency, the Swedish Agency for Marine and Water Management, the Swedish University of Agricultural Sciences (SLU), LRF, Föreningen Sveriges Spannmålsodlare, the Swedish Crop Protection Association, the Rural Economy and Agricultural Societies and the Swedish Society for Nature Conservation.

3 Identified priorities and objectives, measures and follow-up

In its work on the action plan, the Government has identified one main objective and four milestones, and three priorities requiring particular attention.

3.1 Identified priorities requiring particular attention

Under the Directive, Member States are to identify priority items that require particular attention. The Government considers that there are three areas requiring particular attention. Two of these were also identified as priorities in the action plan for the previous period. They are autumn herbicide treatment of autumn-sown crops and use of plant protection products harmful to pollinators. The third priority, monitoring the use of plant protection products with active substances that are candidates for substitution, was included as a follow-up item in the previous action plan.

3.1.1 Autumn herbicide treatment of autumn-sown crops

The increasing share of autumn-sown crops has led to an increase in the use of pesticides in autumn, when the risk of leaching is higher due to unstable weather and high precipitation. A number of the substances with the highest impact on the toxicity index or that most significantly exceed guideline values in surface water are autumn herbicides. The aim of this priority is to reduce the active substances from autumn herbicides detected in surface waters through training, information and advice. The priority is followed up by means of the analyses of residues in surface water that are included in the toxicity index.

3.1.2 Use of plant protection products harmful to pollinators

The threats to pollinators are increasing and the use of plant protection products for insect control has a detrimental impact on the habitats of many of the insects in the farmed landscape. For this priority, the objective is to reduce the need for plant protection products harmful to pollinators through training, information and advice. The Chemicals Agency indicates whether a plant protection product is to be regarded as harmful to pollinators when it authorises it. The Board of Agriculture publishes an annual summary of the products classified as harmful to pollinators. The Chemicals Agency also compiles annual sales statistics for active substances contained in plant protection products.

3.1.3 Use of plant protection products containing active substances listed as candidates for substitution

The work to replace active substances of particular concern contained in plant protection products is carried out both at national and EU level. These substances are classified as candidates for substitution. The EU has maintained a list of these substances since 2015. The EU's Farm to Fork Strategy[3] aims to reduce the use of these substances by 50% by 2030. In 2021 the Swedish Government adopted a new milestone target for the environmental quality objective 'A Non-Toxic Environment' to significantly reduce the use of these substances by 2030.

[3] https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en.

3.2 Overall objective and milestones

The action plan includes one overall objective and four milestones. The overall objective of the national action plan is to reduce risks to human health and the environment from the use of plant protection products in Sweden. The four milestones are:

1. Reducing the risks to human health by:
    a) increasing awareness among professional users regarding the safe handling and use of plant protection products;
    b) reducing the overall risk to consumers from the use of plant protection products and continuing to ensure low levels of residues in drinking water and Swedish-grown crops;
    c) significantly reducing the use of substances that are candidates for substitution.

2. Reducing residues of plant protection products in surface water and groundwater, eventually reaching near zero in line with the Swedish Parliament's environmental quality objective 'A Non-Toxic Environment'.

3. Reducing the risks to pollinators and other beneficial insects by:
    a) improving access to habitats for pollinators and other beneficial insects in both flat country and mixed areas; and
    b) minimising use of plant protection products harmful to pollinators.

4. Sustainable farming systems are to continue to be developed and increasingly applied to strengthen the capacity of the agricultural landscape for food production and other ecosystem services, and to provide long-term fertility while reducing dependence on chemical plant protection products.

The following sections present the milestones for the action plan, relevant measures to achieve the milestones and follow-up by means of indicators or other measurements. Section 3.7 provides overviews of indicators and measures, the main authorities responsible and links to the different milestones.

3.3 Milestone 1 Risks to human health

Reducing the risks to human health by:
    a) increasing awareness among professional users regarding the safe handling and use of plant protection products;
    b) reducing the overall risk to consumers from the use of plant protection products and continuing to ensure low levels of residues in drinking water and Swedish-grown crops;
    c) significantly reducing the use of substances that are candidates for substitution.

3.3.1 Measures to achieve the milestone

The following measures are considered to be able to help achieve the milestone:

- Training, information, advice, and guidance on self-monitoring for stakeholders. The initiatives will also cover safe handling and storage of plant protection products, use of technical aids, disposal of hazardous waste and the use of protective equipment;
- Annual digital newsletter to professional users authorised to use plant protection products. Because authorisation is valid for 5 years, professional users need to be provided with information on rule changes, substances requiring particular attention, etc. on an annual basis;
- Improved wording of conditions of use in product authorisation decisions and user information in order to improve the application and handling of plant protection products;
- Coordination between authorities of guidance on substances and metabolites that need to be monitored in relation to residues of plant protection products in raw water and drinking water;
- Expanded information initiatives on the substances and products that constitute candidates for substitution.

3.3.2 Follow-up of the milestone

In order to monitor the milestone on risks to human health, trends in a number of important areas will be used as a yardstick. The Swedish Chemicals Agency has for a long time had a risk index for health and the environment linked to the use of plant protection products. This is reported annually under the environmental quality objective 'A Non-Toxic Environment'. The risk index is also important for this action plan and its follow-up. The overall use of plant protection products is reported annually by both the Chemicals Agency and Statistics Sweden, based on the annual quantities sold of active substances in plant protection products. In order to obtain a comparable measure of use regardless of the size of the agricultural area farmed, a hectare dose is calculated, i.e. kg of plant protection products used per hectare. Hectare doses are calculated both as part of the risk index and by Statistics Sweden. The Directive also requires Member States to identify trends in the sale and use of certain active substances, selected to review the possibilities of developing alternative approaches or otherwise reducing the use of these substances. In Sweden, this is done by the Chemicals Agency by compiling sales statistics for the substances. The substances concerned are listed in section 5.11.3. There are also a group of substances classified as candidates for substitution in the EU which are followed up separately in Sweden. Candidates for substitution are specifically indicated in the action plan both under certain active substances and as one of the identified priorities requiring particular attention (see section 4 below).

For the working environment of professional users and those working in close contact with treated surfaces and crops, it is important that technical equipment, procedures and protective equipment significantly minimise the risks of the work. This has been studied every year since 2017 through surveys of participants in professional training courses to obtain authorisation to use plant protection products. The Board of Agriculture compiles these results annually and publishes them on its website. The questions asked in the surveys concern areas such as handling and storage of plant protection products, use of protective equipment and technical equipment.

For consumers of Swedish-grown crops, the risks have been very low for a long time. The trend is monitored by the National Food Agency, which analyses the residues of plant protection products in both domestic and imported food sold in Sweden and publishes the aggregated results. At EU level, the European Food Safety Authority (EFSA) compiles and publishes the results of all Member States' domestic residue checks annually. An additional follow-up measure is specifically compiling the results for Swedish production of crops and residues present in them. Correspondingly, clearer reporting of residues of plant protection products in drinking water should be compiled and published.

The follow-up of the milestone includes the following indicators:

- National environmental and health risk index;
- Use of plant protection products on arable land in Sweden, calculated as quantities of active substances sold, converted to hectare doses in agricultural production;
- Sales statistics for certain active substances and for candidates for substitution;
- Statistics on the handling of plant protection products, protective equipment and spraying equipment at farm level, for professional users and others in the vicinity who may be exposed to the products;
- Presence of residues of plant protection products in domestically grown crops;
- Presence of residues of plant protection products in drinking water.

3.4 Milestone 2 Risks to the environment

> Reducing residues of plant protection products in surface water and groundwater, eventually reaching near zero in line with the Swedish Parliament's environmental quality objective 'A Non-Toxic Environment'.

3.4.1 Measures to achieve the milestone

The following measures are considered to be able to help achieve the milestone:

- Activities such as information, advice and environmental aid to increase the number and size of protected areas;
- Training, information and advice to stakeholders to reduce the risks associated with autumn herbicide treatment;
- Training, information, advice and guidance on self-monitoring for stakeholders. The initiatives will also cover safe handling and storage of plant protection products, use of technical aids and disposal of hazardous waste.

3.4.2 Follow-up of the milestone

Residues of plant protection products in surface water and groundwater are monitored through national programmes. Trends in levels of plant protection products exceeding guideline values or limit values in surface water are monitored based on sampling and analysis carried out within the environmental monitoring system (primarily the national environmental monitoring in four type areas with a high proportion of agricultural land).

The follow-up of the milestone includes the following indicators:

- Toxicity index, divided into authorised and non-authorised substances;
- Trends in levels of plant protection products in groundwater, based on data from environmental monitoring and raw water checks;
- Number of companies with protected areas and total size of protected areas;
- National environmental and health risk index;
- Use of plant protection products on arable land in Sweden, calculated as quantities of active substances sold, converted to hectare doses in agricultural production;
- Sales statistics for certain active substances and for candidates for substitution.

3.5 Milestone 3 Protection of beneficial insects

Reducing the risks to pollinators and other beneficial insects by:

a) improving access to habitats for pollinators and other beneficial insects in both flat country and mixed areas; and

b) minimising use of plant protection products harmful to pollinators.

3.5.1 Measures to achieve the milestone

Rich insect biodiversity is important for agriculture and horticulture. Reducing the impact on insects is an important objective of the action plan, as plant protection products have been shown to have a negative effect on numbers of insects at both species and individual level.

The following measures are considered to be able to help achieve the milestone:

- Training, information and advice on the benefits and vulnerability of beneficial insects and ways of adapting cultivation to benefit them, for example through a diverse agricultural landscape with habitats in the form of floral resources, and roosting and overwintering sites;
- Improved product and user information for plant protection products that may be harmful to pollinators;
- Development of indicators for measures benefiting pollinators and other beneficial insects;
- Continued development of supervisory guidance for county administrative boards and municipalities on measures benefiting pollinators and other beneficial insects.

The work to protect pollinators and other beneficial insects is also part of both the identified priorities requiring particular attention and best practice that can serve as an example to achieve the objective of the Directive (see section 4 below).

3.5.2 Follow-up of the milestone

The following indicators are considered useful to follow up the measure:

- Statistics on trends in sales of active substances in products identified as harmful to pollinators at the time of authorisation;
- The number of course participants per year who pass training authorising them to use plant protection products and follow-up courses;
- Number of participants who pass the mandatory online training linked to the authorisation training;
- Number of recipients of annual information letters providing news in the area of authorisation (see measures to achieve milestone 3.3.1);
- Number of advice sessions given under the 'Focus on Nutrients' project regarding biodiversity in the arable landscape.

3.6 Milestone 4 Sustainable farming systems

> Sustainable farming systems are to continue to be developed and increasingly applied to strengthen the capacity of the agricultural landscape for food production and other ecosystem services, and to provide long-term fertility while reducing dependence on chemical plant protection products.

3.6.1 Measures to achieve the milestone

The following measures are considered to be able to help achieve the milestone:

- Training, information and advice on integrated pest management, preventive measures, monitoring strategies, precision control, tailored application and follow-up of the use of chemical plant protection products;
- Training, information and advice on the application of long-term strategies and alternative methods and techniques for sustainable farming systems;
- Information initiatives for those concerned on the value of increased diversification in terms of cultivated biodiversity.

This milestone also includes an identified priority requiring particular attention: the increasing proportion of autumn-sown crops, which has meant an increase in herbicide treatments during the autumn. Farming methods and systems that increase diversity in the field, as well as technology development, precision control, etc., represent best practice that can serve as an example to achieve the objective of the Directive (see section 4 below).

3.6.2 Follow-up of the milestone

Joint indicators on plant protection effectiveness and sustainable farming systems need to be drawn up by the authorities. The indicators below are considered useful to follow up the measure:

- The number of course participants per year who pass authorisation and follow-up training and the number of participants per year from authorisation and follow-up training who are familiar with and apply integrated pest control when planning plant protection interventions;
- Number of participants who pass the mandatory online training linked to the authorisation training;
- Number of initial advice sessions carried out under the 'Focus on Nutrients' project and the number of advice sessions carried out under 'Focus on Nutrients' regarding sustainable farming systems;
- Share of organically cultivated arable land;
- Use of plant protection products on arable land in Sweden, calculated as quantities of active substances sold, converted to hectare doses in agricultural production.

3.7 Summary of measures and indicators for each milestone

This section provides an overview of measures and indicators that are considered relevant to achieve both the overall objective and the four milestones.

1. Reducing the risks to human health by:
    a) increasing awareness among professional users regarding the safe handling and use of plant protection products;
    b) reducing the overall risk to consumers from the use of plant protection products and continuing to ensure low levels of residues in drinking water and Swedish-grown crops;
    c) significantly reducing the use of substances that are candidates for substitution.

2. Reducing residues of plant protection products in surface water and groundwater, eventually reaching close to zero in line with the Riksdag's environmental quality objective 'A Non-Toxic Environment'.

3. Reducing the risks to pollinators and other beneficial insects by:
    a) improving access to habitats for pollinators and other beneficial insects in both flat country and mixed areas; and
    b) minimising use of plant protection products harmful to pollinators.

4. Sustainable farming systems are to continue to be developed and increasingly applied to strengthen the capacity of the agricultural landscape for food production and other ecosystem services, and to provide long-term fertility while reducing dependency on chemical plant protection products.

3.7.1 Milestones and measures

All measures are presented below with their links to the various milestones. The last column identifies the authority or authorities that have primary responsibility for the measure. However, a number of the measures require cooperation between multiple authorities.

Measures	**Milestone**				**Authority with primary responsibility**
	1	**2**	**3**	**4**	
Training, information and advice, as well as guidance on self-monitoring, e.g. on safe handling and storage of plant protection products, use of technical aids, disposal of hazardous waste and the use of protective equipment.	X	X			Swedish Board of Agriculture
Annual information for professional users authorised to use plant protection products.	X				Swedish Board of Agriculture
Improved wording of conditions of use in product authorisation decisions and user information in order to improve the application and handling of plant protection products.	X				Swedish Chemicals Agency and Work Environment Authority
Coordination between authorities of guidance on substances to be monitored in relation to residues of plant protection products in raw water and drinking water.	X				National Food Agency
Expanded information initiatives on the substances and products that constitute candidates for substitution.	X				Swedish Chemicals Agency
Number and size of protected areas is increased through measures such as information, advice and environmental aid.		X			Swedish Board of Agriculture
Training, information and advice to stakeholders to reduce the risks associated with autumn herbicide treatment.		X			Swedish Board of Agriculture and Swedish Chemicals Agency
Training, information and advice on pollinators and ways of adapting cultivation to benefit them.			X		Swedish Board of Agriculture
Improved product and user information for plant protection products that may be harmful to pollinators.			X		Swedish Chemicals Agency
Development of indicators for measures benefiting pollinators and other beneficial insects.			X		Environmental Protection Agency
Continued development of supervisory guidance for county administrative boards and municipalities on measures benefiting pollinators and other beneficial insects.			X		Swedish Board of Agriculture
Training, information and advice on integrated pest management, preventive measures, monitoring strategies, tailored application and follow-up of the use of chemical plant protection products.				X	Swedish Board of Agriculture
Training, information and advice on the application of long-term strategies and alternative methods and techniques for sustainable farming systems.				X	Swedish Board of Agriculture
Information initiatives on the value of increased diversification in terms of cultivated biodiversity.				X	Swedish Board of Agriculture

3.7.2 Milestones and indicators

All indicators are presented below with their links to the various milestones. The last column identifies the authority or authorities that have primary responsibility for the indicator. However, a number of the measures require cooperation between multiple authorities.

Indicator	**Milestone**				**Authority with primary responsibility**
	1	**2**	**3**	**4**	
1 National risk index for human health and the environment	X	X			Swedish Chemicals Agency
2 Sales statistics for plant protection products on arable land, calculated as doses per hectare in agricultural production.	X	X		X	Statistics Sweden
3 Sales statistics for certain active substances, including candidates for substitution	X	X			Swedish Chemicals Agency
4 Monitoring the development of measures at farm level, for professional users and others in the vicinity where plant protection products are used (questionnaire)	X				Swedish Board of Agriculture
5 Presence of residues of plant protection products in domestically grown crops and drinking water	X				National Food Agency
6 Toxicity index, divided into authorised and non-authorised substances		X			Swedish Chemicals Agency
7 Trends in levels of plant protection products in groundwater, based on data from environmental monitoring and raw water checks		X			Geological Survey of Sweden
8 Number of companies with protected areas and total size of protected areas		X			Swedish Board of Agriculture
9 Sales statistics for active substances in products identified as harmful to pollinators at the time of authorisation.			X		Swedish Chemicals Agency
10 Number of participants per year on training authorising them to use plant protection products and follow-up courses.			X		Swedish Board of Agriculture
11 Number of participants who pass the mandatory online training linked to the authorisation training.			X		Swedish Board of Agriculture
12 Number of recipients of annual information letters with news in the area of authorisation.			X		Swedish Board of Agriculture
13 Number of advice sessions given under ‘Focus on Nutrients’ regarding biodiversity in the arable landscape.			X		Swedish Board of Agriculture
14 Number of course participants per year from authorisation and follow-up training who are familiar with and apply integrated pest control when planning plant protection interventions.				X	Swedish Board of Agriculture
15 Number of participants who pass the mandatory online training linked to the authorisation training.				X	Swedish Board of Agriculture
16 Number of initial advice sessions carried out under ‘Focus on Nutrients’ and the number of advice sessions carried out under ‘Focus on Nutrients’ regarding sustainable farming systems.				X	Swedish Board of Agriculture
17 Share of organic arable land				X	Swedish Board of Agriculture

4 Identified best practice

4.1 Best practice that can serve as an example to achieve the objectives of the Directive

Under the Directive, Member States are to identify best practice that can serve as an example to achieve the Directive's objective to reduce the risks and impact of pesticide use on human health and the environment and to encourage the development and introduction of integrated pest management and of alternative approaches or techniques in order to reduce dependency on the use of pesticides. In accordance with Ordinance (2014:425) on pesticides ('the Pesticides Ordinance'), the Board of Agriculture must identify best practice annually, make it available to the public and communicate the results to the Commission and the other Member States.

The Government has identified best practice that can serve as an example in three areas as follows:

- Flowering field margins, for pollinator habitats and biodiversity on farmland. Beetle banks, skylark plots, multifunctional protected areas, flowering buffer zones, etc. also increase biodiversity.

Training, information and advice are the main measures to increase awareness of the importance of biodiversity in agricultural landscapes. The Board of Agriculture's project 'Biodiversity in open landscapes'[4] and many similar initiatives show the potential that there is to develop habitats in different parts of the ecosystems in the agricultural landscape[5].

- Farming methods or systems that increase diversity in the field, for example through longer crop rotations with more crops in a rotation, intercropping or alternating between crops with different growth characteristics and root depths, can prevent plant health problems, reduce the need for plant protection interventions and increase long-term fertility.

Here too, training, information and advice are the main measures. In 2021 researchers at the Swedish University of Agricultural Sciences (SLU) drew up the report 'Cropping systems with sustainable crop protection'[6]. The work on the report and the continuation of that work, in combination with various cooperation and development projects, may have major significance for the implementation of more sustainable arable farming.

- Technological developments in the application of plant protection products, such as nozzles, section closing and adapted dose within the field, to both to reduce undesired effects and increase the impact of the plant protection products.

Many initiatives are carried out in the areas of information, training and advice to highlight new technology that allows for greater precision in plant protection. The rapid technological developments in the area of precision control and possible methods and strategies to help reduce the use of chemical plant protection products and increase their sustainability were highlighted in a mapping exercise by the Plant Protection Council in 2021[7].

[4] https://jordbruksverket.se/vaxter/odling/biologisk-mangfald/akerlandskapet.
[5] Board of Agriculture, 2019, 'Plan för odlingslandskapets biologiska mångfald' [Plan for farmland biodiversity], https://webbutiken.jordbruksverket.se/sv/artiklar/ra191.html.
[6] Lundin et al, SLU, 2022, 'Odlingssystem med hållbart växtskydd' [Cropping systems with sustainable crop protection], https://pub.epsilon.slu.se/26843/1/lundin_o_et_al_220127.pdf.
[7] 'Precisionsbekämpning i växtskyddsarbetet' [Precision control in plant protection]. https://webbutiken.jordbruksverket.se/sv/artiklar/ovr603.html.

5 Measures in accordance with the requirements of the Directive

This section describes how the requirements for Member States' national action plans in chapters II-V of the Directive are implemented in Sweden.

5.1 Training (Article 5)

In accordance with Chapter 2, Section 11 of the Pesticides Ordinance, the Board of Agriculture is responsible for training users on plant protection products in agriculture, forestry and horticulture. The Board is responsible for providing the training for seed treatment, treatment of individual plants in forest plantations and treatment of stumps against root rot. Under the Swedish Board of Agriculture Regulations (SJVFS 2014:35) on authorisation to use plant protection products, the county administrative boards are responsible for other training courses covering topics including use of plant protection products on agricultural and horticultural crops. The county administrative boards' courses represent the bulk of the training activities. Under Chapter 2, Section 11 of the Pesticides Ordinance, the Public Health Agency has responsibility for training users of plant protection products as regards use in and around storage facilities or other storage areas, and the Work Environment Authority has responsibility for training users as regards uses that do not come under the responsibility of another authority. The Chemicals Agency is responsible for training distributors in accordance with Chapter 2, Section 13 of the Pesticides Ordinance and has appointed the county administrative boards to deliver these courses.

5.2 Requirements for sales (Article 6)

The requirements of Article 6 of the Directive have been transposed in Sweden by Chapter 2, Sections 28-29 of the Pesticides Ordinance. The Ordinance lays down requirements for distributors supplying plant protection products to have trained staff to provide relevant information on use, risks and safety instructions at the time of sale. It also specifies to whom class 1 or 2 plant protection products may be transferred. Plant protection products may only be transferred to those who hold or have someone in their organisation who holds a valid authorisation for use, or who intend to pass on the product to others who hold or have someone in their organisation who holds a valid authorisation.

5.3 Information and awareness raising (Article 7)

The Board of Agriculture, the Chemicals Agency, the Forest Agency, the Environmental Protection Agency and SLU all have information on plant protection products on their websites. The information covers the authorisation process for plant protection products, risks to health and the environment from the use of such products, responsible application of plant protection products and alternatives to chemical plant protection products.

The Swedish Poisons Information Centre, which is organised under the Medical Products Agency, gathers information on risks, symptoms and treatment in the event of acute poisoning with medicinal products, chemical substances, plants, fungi or animals in accordance with Article 7(2) of the Directive. The Poisons Information Centre also has product information for almost 100 000 chemical products, including plant protection products. The centre keeps statistics on poisoning incidents recorded by the health service.

5.4 Inspection of equipment in use (Article 8)

Requirements concerning the inspection of application equipment are laid down in the Pesticides Ordinance and in the Board of Agriculture Regulations and General Guidance (SJVFS 2016:23) on the review, functional testing and approval of equipment for the professional application of plant protection products. Under Chapter 2, Section 52 of the Pesticides Ordinance, equipment for the professional application of plant protection products may only be used if the person using the equipment can demonstrate that it is approved by the Board of Agriculture. Approval is granted for 3 years from the date on which the spray underwent functional testing (Chapter 2, Section 54 of the Pesticides Ordinance).

Equipment for professional application of plant protection products must be in good condition, appropriate for its purpose and well calibrated in accordance with Chapter 2, Section 51 of the Pesticides Ordinance. In accordance with the above-mentioned Board of Agriculture regulations, professional users are required to carry out regular 'own technical checks' of the plant protection equipment they use. This must be done at least once a year.

5.5 Aerial spraying (Article 9)

In Sweden, Chapter 14, Section 7 of the Environmental Code prohibits the application of pesticides from aircraft, including drones. As regards plant protection products, Chapter 2, Section 47 of the Pesticides Ordinance allows exemptions from the ban in exceptional cases and provided that the requirements laid down in Article 9 of the Directive on aerial spraying are met. Such exemptions are granted by the Environmental Protection Agency on a case-by-case basis.

5.6 Information to the public (Article 10)

Under Article 31(4)(b) of Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC[8], authorisation of a plant protection product may be subject to conditions requiring the user, prior to using the product, to inform any neighbours who could be exposed to the spray drift and who have requested to be informed. In areas to which the public has free access (not arable land), those intending to apply plant protection products are also required under Chapter 2, Section 45 of the Pesticides Ordinance to provide information about the application on clearly visible notices. Further provisions on this are set out in the Swedish Environmental Protection Agency Regulations (NFS 2015:2) on the application and certain other handling of plant protection products and the Forest Agency Regulations (SKSFS 2016:2) on the application of plant protection products on forest land.

5.7 Specific measures to protect the aquatic environment and drinking water (Article 11)

Chapter 2, Section 4 of the Environmental Code contains a general obligation to choose less hazardous chemicals if there are alternatives, known as the 'product choice principle'. Chapter 2, Section 34(1) of the Pesticides Ordinance requires those who use plant protection products in the course of their professional activity to give preference to products that are not hazardous to the aquatic environment. Data is available from the Centre for Pesticides in the Environment at SLU which can serve as a basis for understanding what substances may present a higher or lower risk to the environment.

Under Chapter 2, Section 3 of the Environmental Code, users are also required to use the best available techniques to prevent, stop or impede the activity or measure from causing damage or detriment to human health or the environment. As a basis for selecting the best techniques, training provided by the Board of Agriculture to those wishing to obtain authorisation to use plant protection products includes modules on spraying techniques and ways of reducing drift.

The Pesticides Ordinance and the Environmental Protection Agency Regulations (NFS 2015:2) on the application and certain other handling of plant protection products lay down that anyone handling pesticides must determine and observe the buffer distances necessary in the circumstances for the protection of water sources, lakes, watercourses and surrounding land. There are both fixed buffer zones and buffer zones adapted to the circumstances of the site and the time of spraying. Guidelines and advice are available to help the user determine the distance required.

The Environmental Protection Agency Regulations (NFS 2015:2) on the application and certain other handling of plant protection products prohibit the professional use of plant protection products without a permit in those parts of a water protection area designated as a water source zone, primary (inner) buffer zone and secondary (outer) buffer zone. Water protection areas that are established or modified after 1 January 2018 are subject to a derogation, meaning that an assessment is carried out at local level as to whether there

[8] https://EUR-Lex - 32009R1107 - EN - EUR-Lex (europa.eu).

is a need for a permit requirement for the use of plant protection products. This is governed by separate regulations for the water protection area concerned.

Under Chapter 7, Section 22 of the Environmental Code, water protection areas with associated regulations may be established by a county administrative board or municipality. Handling of plant protection products in water protection areas may be regulated by water protection regulations, which may cover both professional and private use. By dividing the water protection area into different zones (normally 2-3), the regulations can be adapted to the needs of the respective zones. This may mean that application or handling is prohibited, or that a permit or notification is required in the zone.

Professional use of plant protection products along roads and on very permeable or sealed surfaces, for example a farmyard, is restricted under Chapter 2, Section 40 of the Pesticides Ordinance by the requirement for a permit from the municipal council. Professional application of plant protection products along roads with the aim of preventing the spread of invasive alien species or quarantine pests requires only notification to the municipality. For the application of plant protection products along railways, notification to the municipality is required in addition to product authorisation.

In accordance with Chapter 2, Section 34a of the Environmental Monitoring Ordinance (2011:13), the municipality is entitled to access the registers that farmers keep under Article 67(1) of Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. The public can access the register by contacting the municipality. Drinking water producers are obliged to monitor the water for pesticides likely to be present in a water supply. Where necessary, drinking water producers can request information on the plant protection products used in the vicinity of a water source.

5.7.1 Advice on the protection of aquatic environments

Residues from plant protection products are found frequently in drinking water and private and municipal groundwater sources, sometimes even above the limit value. Findings in groundwater are dominated by substances that are no longer permitted to be used and that were primarily used outside agriculture. However, findings in surface water are more often of substances that are currently authorised and used in farming.

The findings of plant protection products in water indicate that procedures and methods for the handling and application of plant protection products need to be continually improved in order to reduce the associated risks. Training, advice and information will therefore continue to be provided on this issue. Work will continue in line with that currently being undertaken, for example through the mandatory authorisation training[9], 'Focus on Nutrients'[10] and the information and education campaign 'Focus on pesticide use'[11]. The content and design of the activities will evolve.

5.7.2 Water management and monitoring of surface and groundwater sources

As regards the limit values for groundwater, i.e. the levels that must not be exceeded in groundwater, the environmental quality standard laid down in Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration[12] is applied in Sweden. A different limit value is used only when a lower value is justified to protect a drinking water resource or a groundwater-dependent ecosystem. Groundwater can play an important role in the ecosystems to which water is supplied, referred to as groundwater-dependent ecosystems.

Action programmes under Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy[13] contain some measures linked to the use of plant protection products, such as specifying that action should target those

[9] https://jordbruksverket.se/vaxter/odling/vaxtskydd/att-anvanda-vaxtskyddsmedel/krav-pa-godkand-utbildning-och-utrustning.
[10] https://greppa.nu.
[11] https://sakertvaxtskydd.se.
[12] https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX%3A32006L0118.
[13] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:32000L0060.

areas where the environmental quality standards for water are not met. The action programmes thus reinforce the work on sustainable use of plant protection products. Under the Swedish action programmes, the Board of Agriculture and the county administrative boards are tasked with developing professional training and advisory services. This measure aims to reduce the impact of the use of plant protection products in areas where there is a risk of the environmental quality standards for water not being met due to the use of these products.

5.7.3 Water from private wells

The national environmental monitoring and sampling of groundwater carried out in Sweden is currently designed specifically to examine the presence of residues of plant protection products on agricultural land. The presence of plant protection products in private wells is an area where further study is needed.

5.8 Reduction of pesticide use or risks in specific areas (Article 12)

Chapter 2, Section 37 of the Pesticides Ordinance states that there is a general prohibition on applying plant protection products on meadows or pastures which are not suitable for ploughing but which can be used for mowing and grazing, on school and nursery playgrounds or on children's playgrounds accessible to the public, in parks and gardens and other areas which are primarily intended as recreational areas accessible to the public, on allotments and in greenhouses which are not used for commercial purposes, on land for housing and on potted plants in domestic gardens, and on indoor plants with the exception of plants in production premises and plants in warehouses and similar premises. The Chemicals Agency Regulations (KIFS 2022:3) on pesticides set out exemptions for products containing low-risk substances. Chapter 2, Section 39a of the Pesticides Ordinance states that the use of plant protection products to control vegetation in lakes, watercourses, wetlands and other water bodies is not permitted. Under Chapter 2, Section 39d of the Pesticides Ordinance, there are certain possibilities of exemptions from the ban. Chapter 2, Section 40 of the Pesticides Ordinance also states that the use of plant protection products is prohibited without a special permit in parks and gardens accessible to the public and which are not already covered by the prohibition, on sports and leisure facilities, in connection with planning and construction work, on roads, gravel surfaces and other very permeable surfaces, and on surfaces made of asphalt, concrete or other sealed materials.

5.9 Handling and storage of pesticides and treatment of their packaging and remnants (Article 13)

Requirements for the handling and storage of pesticide remnants and packaging and remnants are laid down in the Pesticides Ordinance, the Environmental Protection Agency Regulations (NFS 2015:2) on the application and certain other handling of plant protection products, and the Chemicals Agency Regulations (KIFS 2008:2) on chemical products and biotechnical organisms. There is a requirement that chemical products which are hazardous to human health or the environment be stored such that risks to human health and the environment are minimised and such that they cannot be accessed by unauthorised persons. They must be kept out of reach of young children and well separated from products intended for consumption. Plant protection products for professional use must be stored in a leakproof space or container, and it must be possible to collect leaks or spills. Dilution, mixing and filling of plant protection products and external cleaning of equipment used for the application of plant protection products must be carried out in a suitable location. When dilution, mixing, filling and external cleaning take place in the vicinity of aquatic environments such as drainage wells and lakes, fixed buffer zones must be observed.

At the time of authorisation, plant protection products are classified into three different classes: 1, 2 and 3. Professional users may use products from all classes. Non-professional users may use only class 3 products. A product shall not be assigned to class 3 if it needs to be handled with particular care due to risks to human health or the environment or if it contains active substances other than those approved as low-risk or listed in Annex 1 to the Chemicals Agency Regulations (KIFS 2022:3) on pesticides. This also applies to plant protection products supplied in the form of a concentrate that must be diluted before use, unless they are particularly low-risk products.

Specific information and training initiatives are organised in order to increase the number of sprayers using appropriate protective equipment and best practice when handling plant protection products. The Work Environment Authority has carried out projects with the aim of improving the working environment by increasing use of technical aids and improving the use of protective equipment. Basic principles have been drawn up for what personal protective equipment is appropriate for the handling of plant protection products. The basic principles and the personal protective equipment which is normally considered adequate for various common situations have been described in an information document from the Work Environment Authority[14]. The information document has made it easier for different parties to disseminate knowledge in the area.

There are specific rules on the handling of hazardous waste. Remnants of plant protection products are classified as hazardous waste. How dangerous a plant protection product is, and therefore also how dangerous waste remants and packaging are, depends entirely on the substances it contains. The classification of waste is crucial for the application of a number of environmental regulations. Among other things, classification is the basis for the safe disposal of waste in accordance with the Waste Ordinance (2020:614). The members of the Swedish Crop Protection Association, the trade association for Swedish plant protection companies, are affiliated to SvepRetur, an industry-owned company with collection and recycling systems for plastic packaging. This means that empty and cleaned packaging can be deposited at designated collection points at no extra charge.

Procedures and methods for the handling and application of plant protection products need to be continually improved in order to reduce the associated risks. Training, advice and information will therefore continue to be provided in this area. Work will continue in line with that currently being undertaken, for example through the mandatory authorisation training, 'Focus on Nutrients' and the information and education campaign 'Focus on pesticide use'. The content and design of the activities will evolve.

5.10 Integrated pest management (Article 14)

Article 14 of the Directive lays down that '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 [or] products with the lowest risk to human health and the environment among those available for the same pest problem.' That Article lays down that low pesticide-input pest management includes integrated pest management as well as organic farming pursuant to Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products[15]. In short, Member States are required to:

- establish or support the establishment of necessary conditions for the implementation of integrated pest management by providing access to information and tools for pest and weed monitoring, as well as advisory services and decision-making support for integrated pest management;

- ensure that the general principles of integrated pest management as set out in Annex III to the Directive are implemented by all professional users. In brief, the principles include the prevention of plant health problems, the observation and monitoring of the risk of damage, and the tailoring, follow-up and evaluation of control measures;

- encourage the implementation of crop- or sector-specific guidelines.

Requirements for integrated pest management are regulated in the Pesticides Ordinance and the Swedish Board of Agriculture Regulations and General Guidance (SJVFS 2014:42) on integrated pest management. According to the Board of Agriculture Regulations and General Guidance, anyone considering the use of plant protection products must primarily use preventive methods to suppress pests, weeds and other

[14] https://www.av.se/globalassets/filer/publikationer/broschyrer/ditt-grundskydd-mot-vaxtskyddsmedel-broschyr-adi643.pdf.
[15] The Regulation has now been repealed and has been replaced by Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007.

organisms that may justify plant protection measures. Monitoring of harmful organisms should be carried out using appropriate methods and tools where available. As far as possible, the choice of plant protection measures should be based on the outcome of the monitoring. Those who need to apply plant protection measures must limit their use of plant protection products and other measures to what is necessary and choose methods that are appropriate in the short and long term. They must choose sustainable biological, physical or other non-chemical methods if they have a satisfactory effect.

Users must also use plant protection products that are as targeted as possible and have the least adverse effects on health and the environment, and must use strategies to combat pesticide resistance to the extent possible. As far as possible, users of plant protection products must study the effectiveness of the application of the plant protection product. Documentation requirements are laid down in the Pesticides Ordinance and the Swedish Board of Agriculture Regulations (SJVFS 2015:49) on documentation requirements for professional users of plant protection products.

5.10.1 Development of supervision

The Board of Agriculture is responsible for providing supervisory guidance on the rules on integrated pest management. The county administrative boards have regional responsibility and the municipalities carry out the practical supervision. In 2021-2022 these authorities carried out a joint initiative to enhance the supervision. This included training for those carrying out the supervision and material to support supervision in the form of a checklist and handbook. As a complement to the authorities' supervisory guidance initiative, the Swedish Board of Agriculture has published the advice document *Hur bra är du på integrerat växtskydd (IPM)?* [How good are you at integrated pest management (IPM)?], aimed at professional growers.

5.10.2 Information, training and advice

Sweden has long been working on information and training on integrated pest management, with a focus on the need for preventive measures, tailored use of plant protection products, use of alternative methods and techniques and the evaluation of measures taken. Specific efforts have been made to develop knowledge on integrated pest management and alternative methods and techniques.

The transfer of knowledge to the industry is a prerequisite for implementing integrated pest management. For instance, skills in diagnosing different pests and knowledge of their biology are fundamental in order to be able to tailor control measures. The mandatory training for all those who want to use plant protection products professionally plays an important part in improving users' knowledge. One of the days in the basic training course for professional users deals with integrated pest management.

The Board of Agriculture's plant protection centres have a coordinating role in the field of plant health and play an important part in disseminating knowledge. Their activities include the management of forecasting and warnings, drawing up control strategies and the dissemination of knowledge in different forms to advisers on the application of integrated pest management. Efforts will continue to be made to improve users' skills and provide advice on integrated pest management through information, training and advisory services. Work will continue in line with that currently being undertaken, for example through the activities of the plant protection centres[16], the mandatory authorisation training[17], 'Focus on Nutrients'[18] and the information and education campaign 'Focus on pesticide use'[19]. The content and design of the activities will continually be adapted to needs and new technology.

5.10.3 Forecasting and warning system

The forecasting and warning system for farms, field vegetables and fruit is based on surveying some 1 000 fields in Sweden for pests during the growing season. The results are compiled from the latest surveys and appropriate control strategies are drawn up. There is regular reporting to local advisers in order to reach both

[16] https://jordbruksverket.se/vaxter/odling/vaxtskydd/aktuellt-fran-vaxtskyddscentralerna.
[17] https://jordbruksverket.se/vaxter/odling/vaxtskydd/att-anvanda-vaxtskyddsmedel/krav-pa-godkand-utbildning-och-utrustning.
[18] https://greppa.nu/.
[19] https://www.sakertvaxtskydd.se/.

advisers and users of plant protection products and to help tailor plant protection to the current situation during the growing season. The data collected is available through an online service[20].

The work on the plant protection centres' forecasting and warning system and resulting tailoring of plant protection has to be continually updated and developed in order to optimise its impact.

5.10.4 Crop-specific guidelines

The Board of Agriculture has drawn up crop-specific guidelines for several agricultural and horticultural crops to provide professional growers with guidance on how best to apply integrated pest management. The guidelines are updated regularly to take account of the latest knowledge, for example regarding available forecasting and control methods. The guidelines, also known as cultivation guides, are available on the Board of Agriculture's website[21].

5.10.5 Knowledge base

In order to achieve the objective of implementing integrated pest management, knowledge is needed from research, trialling and development activities. Both applied trials, including testing, and more basic research and development are needed. A number of areas have been identified where further study needs to be carried out and disseminated, such as control thresholds, preventive measures, cultivation systems combining different ways of dealing with pest problems using both chemical and non-chemical methods, more detailed biological understanding of different plant protection issues and the development of systems that provide decision-making support for plant protection measures.

More basic knowledge is needed in areas such as new cultivation systems, the impact of plant protection measures on the environment, and the effects of plant protection products on individual organisms and ecosystems. In order for new crop rotations or cultivation systems to gain acceptance among growers, multi-year calculations are needed showing profitability. The areas identified as targets for further study are closely in line with the problems described by other countries. The continuous input of new knowledge is necessary for the successful implementation of integrated pest management.

5.11 Indicators (Article 15)

Since 2019 the Directive has contained two harmonised risk indicators for plant protection products that are calculated annually by all Member States, HRI 1 and HRI 2. In HRI 1, the use of plant protection products is calculated based on the quantities of active substances sold in the products, combined with a specific risk weighting. HRI 2 comprises the number of authorisations granted with a weighting. The trends from the baseline years 2011-2013 are followed in a trend report. This is published both by the EU[22] and on the Board of Agriculture's website[23]. Further harmonised risk indicators are currently being developed by the European Commission and once adopted will be included in the reports for the indicators.

The Member States are to identify trends in the use of certain active substances. They are also to identify priority items requiring particular attention, such as particular active substances, crops, regions or practices, or best practice that can be used as an example in order to achieve the objectives of the Directive to reduce the risks and impact of pesticide use on human health and the environment. Furthermore, they are to encourage the development and introduction of integrated pest management and of alternative approaches or techniques in order to reduce dependency on pesticides.

Sweden communicates the results of the evaluations carried out to the Commission and makes the information available to the public on the Board of Agriculture website. The Pesticides Ordinance also lays down that these analyses are to be published annually, which takes place via the Board of Agriculture website.

[20] https://jordbruksverket.se/e-tjanster-databaser-och-appar/e-tjanster-och-databaser-vaxter/prognoser-och-varningar/prognos-och-varning---resultat.
[21] https://webbutiken.jordbruksverket.se/sv/artiklar/odlingsvagledning-ipm/index.html.
[22] https://ec.europa.eu/food/plants/pesticides/sustainable-use-pesticides/harmonised-risk-indicators_en.
[23] https://jordbruksverket.se/jordbruket-miljon-och-klimatet/giftfri-miljo.

5.11.1. National risk indicators

In Sweden, there are two main national risk indicators that have been in use for a long time – the environmental and health risk index and the toxicity index. Both of these indices are also indicators in the Swedish environmental objectives system for monitoring the environmental quality objective 'A Non-Toxic Environment', and are reported annually both by the Chemicals Agency[24] and in the reports on the environmental objectives[25]. The indices show trends for potential risks to the environment and health and to aquatic organisms in surface water, respectively.

5.11.2 Identified priorities requiring particular attention

The action plan highlights a number of active substances contained in plant protection products that should be monitored, in so far as the trend in quantities sold is reported. It also highlights three identified priorities. Under the Pesticides Ordinance, both usage trends of certain active substances and the priority areas must be reported annually.

5.11.3 Usage trends for certain active substances

Based on a weighting of different factors, eight substances have been selected as the active substances that should be monitored more closely in the next period. All substances are among the 10 substances that have the greatest impact on at least two of the aforementioned indicators. In addition, metribuzin continues to be monitored.

The active substances listed below for follow-up during the period are all intended to be used for weed control. This reflects the fact that weed control is by far the most common use of plant protection products in Sweden, over 80% in 2021. The available statistics to monitor trends in use are based on data on the quantities of each active substance sold annually in plant protection products and reported annually by the Chemicals Agency[26]. The trends in the sales statistics for the following active substances will be monitored over the period 2023-2027.

• Glyphosate

Glysophate, which is contained in 18 plant protection products for treating weeds, crop rotation, etc., is by far the most widely used substance in plant protection products in Sweden, with sales of just over 800 tonnes in 2021. The large quantity puts the substance among the 10 substances that have the greatest impact on both HRI 1 and the environmental and health risk index. However, it is found in very small quantities in surface water and therefore only comprises 0.1% of the total for the toxicity index. Glyphosate is under evaluation. According to the European Food Safety Authority's timetable, the evaluation is expected to be completed in summer 2023.

• Prosulfocarb

Prosulfocarb is also contained in weed treatment products and is the most sold substance after glyphosate, with 280 tonnes sold in 2021. It is one of the 10 substances with the greatest impact in HRI 1 and the health risk index, and is being monitored due to its high volatility, i.e. that it can contaminate surrounding areas through spray drift. The 'Focus on pesticide use' campaign has therefore run a targeted information campaign in collaboration with the industry on the use of prosulfocarb since 2019.

• MCPA

The third most sold substance in Sweden in 2021 was MCPA (128 tonnes), which is also an ingredient in weed treatment products. The substance is one of the 10 substances with the greatest impact on all the above indices: HRI 1, the environmental and health risk index and the toxicity index.

[24] https://www.kemi.se/om-kemikalieinspektionen/vart-uppdrag/giftfri-miljo.
[25] https://sverigesmiljomal.se/miljomalen/giftfri-miljo/vaxtskyddsmedel-i-ytvatten/.
[26] https://www.kemi.se/publikationer/forsalda-kvantiteter-av-bekampningsmedel.

• Metamitron
Metamitron is an active substance for weed treatment with relatively high annual sales (approx. 55 tonnes in 2021) and is one of the substances with the greatest impact on both HRI 1 and the environmental risk index.

• Fluroxypyr
Fluroxypyr is an active substance in weed treatment products and had annual sales of approximately 40 tonnes in 2021. It is included in both HRI 1 and the environmental and health risk index.

• Prothioconazole
Prothioconazole is an active substance in fungicides and approximately 30 tonnes were sold in 2021. It is one of the 10 substances with the highest impact in HRI 1, the health risk index and the toxicity index.

• Tebuconazole
Tebuconazole is used both as a seed pickling agent and fungicide and is also a candidate for substitution. The quantity sold has increased sharply over the past decade and was approximately 35 tonnes in 2021.

• Diflufenican
Diflufenican is another substance used in herbicides and candidate for substitution. The quantity sold was just under 16 tonnes in 2021. In Sweden, the substance has been found at higher levels in surface water analyses carried out for the toxicity index than any other substance from herbicides, and it is also much debated in the EU. In 2018-2020 a campaign was initiated by the Plant Protection Council and run by the 'Focus on pesticide use' campaign to reduce diflufenican leaching where possible. No clear results have been seen from the campaign as yet, but the work of the campaign has continued in the 2021 and 2022 growing seasons.

• Metribuzin
Metribuzin is a substance contained in plant protection products for weed control and the annual quantity sold in recent years has been just under 5 tonnes. Metribuzin is one of the 10 substances (authorised in 2021) with the greatest impact on the toxicity index, and is also one of the substances that most significantly exceeded the guideline value for residues in surface water in the period 2016-2019. The substance has also been identified as a candidate for substitution.

The Chemicals Agency is responsible for producing annual statistics on the quantities sold of these substances. The Board of Agriculture is to report on trends in use over time, measured as annual quantities of each substance sold, and to publish the information annually on its website.

6. Authorities responsible for the implementation of the action plan

Various authorities are responsible for transposing the Directive into Swedish law and for ensuring that the objectives of the Directive are achieved. Broad cooperation between the authorities on the implementation of the action plan is followed by joint measures and initiatives.

The Swedish Board of Agriculture is tasked with working actively towards competitive food production that is environmentally and animal-friendly for the benefit of consumers. It is responsible for the training and permits required for professional use of plant protection products and is also responsible for supervisory guidance on the use of plant protection products in agriculture and horticulture. The authority adopts regulations concerning authorisation and permits to use plant protection products on a professional basis, integrated pest management, documentation requirements (spray log) and mandatory functional testing of spray equipment. It includes regional plant protection centres that provide advisers and growers with information and advice to tailor and reduce the risks of chemical control. The Board of Agriculture is one of the authorities responsible for the environmental objectives system and must take measures to minimise the environmental impact of agriculture.

The Swedish Chemicals Agency examines applications for authorisation to sell and use pesticides, referred to as 'authorisation for plant protection products', in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market. When a product is authorised, the conditions governing its use are also communicated. All authorised pesticides are entered into a database known as the Pesticide Register. The agency is also responsible for operational supervision of the placing on the market of pesticides by primary suppliers and supervisory guidance for the country's municipalities as regards checks on pesticide distributors and the handling of the products by the public. The agency is responsible for informing, supporting and cooperating with companies, authorities and other stakeholders on pesticides. It compiles annual statistics on quantities of pesticides sold and is responsible for monitoring and evaluating the environmental quality objective 'A Non-Toxic Environment', set by the Riksdag.

The Swedish Environmental Protection Agency is the managing authority in the area of the environment for activities concerning the climate and air, soil, biodiversity, contaminated sites, cycles and waste, environmental monitoring and environmental research. The agency has a key role in environmental work, including the role of encouraging, supporting and coordinating the various stakeholders in the implementation of environmental policy. It issues regulations on the application and handling of plant protection products in the external environment and has a guiding responsibility for supervision under the Environmental Code. The agency has responsibility for supervisory guidance for all uses of plant protection products other than in agriculture, horticulture and forestry. This means supervisory guidance for professional use of plant protection products on, for example, golf courses and railway embankments. It is also responsible for testing use of nematodes, insects and arachnids for pest control.

The Swedish Agency for Marine and Water Management is the management authority in the environmental field for issues concerning the preservation, restoration and sustainable use of lakes, watercourses and seas. The agency is to allocate funds for environmental monitoring in consultation with the Environmental Protection Agency and describe and analyse the environmental situation within its area of responsibility. It is also responsible for coordinating the work of the water authorities

and may issue regulations on water management in relation to surface water. This work includes monitoring the work at EU level on Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council (the Priority Substances Directive) and establishing assessment criteria for particularly polluting substances in the aquatic environment. Furthermore, the agency has core responsibility for both water protection areas and guidance on site protection aimed at the conservation of marine or aquatic environments or groundwater.

The Swedish Food Agency runs a programme to monitor pesticide residues in food. The agency also issues regulations concerning requirements for the production and supply of drinking water.

The Swedish Work Environment Authority decides on regulations on safety and the work environment for the handling and use of chemical pesticides.

The Geological Survey of Sweden has responsibilities under the environmental objectives system, including for following up the environmental quality objective 'Good-Quality Groundwater'. Within water management, the Geological Survey takes decisions on regulations where they relate to groundwater. It is also a data host for data on groundwater and environmental toxins, carries out national environmental monitoring of groundwater and collects voluntarily submitted water chemistry data from water sources and private wells.

The Swedish Forest Agency is responsible for supervisory guidance in areas relating to forestry and adopts regulations on the application of certain provisions of the Pesticide Ordinance relating to the use of plant protection products on forest land.

The Public Health Agency of Sweden is responsible for training and permits for the use of plant protection products in classes 1 and 2 in and around storerooms and other storage facilities. The agency is also responsible for supervisory guidance on matters relating to chemical products and biotechnical organisms in accordance with Chapter 14 of the Environmental Code if the matters are covered by decisions issued by the agency under the Pesticides Ordinance.

The county administrative boards have regional responsibility for authorisation training and for training and advice within the 'Focus on Nutrients' initiative. Checks on the use of plant protection products by primary producers are carried out by municipalities and county administrative boards. Checks on distributors are carried out by the Chemicals Agency.