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Food Safety

OVERVIEW REPORT

Sustainable Use of Pesticides

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DIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETY

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OVERVIEW REPORT
ON
THE IMPLEMENTATION OF MEMBER STATES' MEASURES TO ACHIEVE
THE SUSTAINABLE USE OF PESTICIDES UNDER DIRECTIVE 2009/128/EC

Executive Summary

Directive 2009/128/EC of the European Parliament and of the Council on the sustainable use of pesticides, (the “Directive”), was adopted on 21 October 2009 as part of the 2006 Thematic Strategy on the sustainable use of pesticides. The Directive provides for a range of actions to achieve a sustainable use of pesticides in the European Union by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of Integrated Pest Management (IPM) and of alternative approaches or techniques, such as non-chemical alternatives to pesticides.

This Overview Report provides a detailed summary of the main findings of the results of a questionnaire and a series of fact-finding missions to six Member States, gives examples of good practices in implementation and identifies the main obstacles encountered by Member States in the implementation of the Directive.

The main points are summarised as follows:

All Member States had adopted National Action Plans (NAPs), in many cases with significant delays, and with a huge diversity in their completeness and coverage. Twenty one Member States established risk reduction objectives, and nine Member States established use reduction objectives, with some Member States having a combination of both.

However, only five Member State NAPs set high-level measurable targets, of which four relate to risk reduction and one to use reduction. The Netherlands also has measurable targets for risk reduction, although these are established outside their NAP. The fact-finding series visited three of these six Member States (Denmark, Germany and the Netherlands) and in each case, substantial progress towards the achievement of their risk reduction targets could be demonstrated.

IPM is a cornerstone of the Directive, but compliance with the principles of IPM at individual grower level is not being systematically checked by Member States. Furthermore, Member States have not yet set clear criteria in order to ensure that the general principles of IPM are implemented by all professional users.

Twenty six Member States had set up inspection systems for spraying equipment, and approximately 900 000 sprayers had been inspected by the deadline of 26 November 2016. The lack of reliable data in some Member States on the total number of sprayers to be tested makes it impossible to determine the overall level of compliance. However, based on available data, the level of compliance is less than 50 % in at least eleven Member States.

All Member States had established a training and certification system by the deadline of 26 November 2013, and reported that almost four million professional operators had been trained. However, not all Member States could provide data on the total number of operators who need to be trained and certified. This means that it is not possible to determine the overall level of compliance. There were delays in training and certification of operators in six Member States. In the case of four of the six Member States visited (Denmark, Germany, the Netherlands and Poland) very high rates of compliance were reported, based on the results of their controls.

Aerial spraying is prohibited in all Member States and derogations are only granted under strict conditions. The area sprayed is low, is declining and is effectively controlled.

While Member States generally have systems to gather information on pesticide acute poisoning, the accuracy of this data and its use was questioned. Systems for gathering such

information on chronic poisoning are not widely implemented.

Member States have taken a range of measures to protect the aquatic environment from the impact of pesticides, to reduce the use or risks of pesticides in specific areas (such as public parks) and to promote the safe handling and storage of pesticides and remnants. However, progress in these areas is difficult to assess given the lack of measurable targets in most NAPs in these areas. Nevertheless, the fact-finding missions identified a range of good practices in these areas.

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ABBREVIATIONS AND DEFINITIONS USED IN THIS REPORT

Abbreviation	Explanation
CA(s)	Competent Authority(ies)
CAP	Common Agricultural Policy
ERP	Emissions Reduction Plan(s)
EU	European Union
ha	Hectare(s)
IPM	Integrated Pest Management
MRL	Maximum Residue Level
MS(s)	Member State(s)
NAP(s)	National Action Plan(s)
PLI	Pesticide Load Indicator
PPP(s)	Plant protection product(s)
SBA	Swedish Board of Agriculture
SEGES	Danish farm advisory services
The "Directive"	Directive 2009/128/EC on the sustainable use of pesticides (Sustainable Use Directive)
TFI	Treatment Frequency Index

1. INTRODUCTION, OBJECTIVES AND SCOPE

Directive 2009/128/EC of the European Parliament and of the Council on the sustainable use of pesticides (the "Directive") was adopted in 2009 as part of the 2006 Thematic Strategy on the sustainable use of pesticides. The Directive establishes a framework to achieve a sustainable use of pesticides in the European Union (EU) by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of Integrated Pest Management (IPM) and of alternative approaches or techniques such as non-chemical alternatives to pesticides.

This overview report describes the main results of a 2016 web-based questionnaire to Member States (MSs) and the findings and conclusions of a series of fact-finding missions carried out by the Health and Food Safety Directorate General of the European Commission in 2017 on the implementation of the Directive. The report also provides examples of good practice identified by Member States.

The web-based questionnaire was used to obtain an overview of the state of progress in MSs regarding the implementation of their National Action Plans (NAPs) in a largely quantitative manner, as due to the nature of surveys, it is very difficult to gather complete, and fully comparable, data. All MSs, except the United Kingdom (UK), responded to the questionnaire, however the UK CAs did provide information on some of the topics subsequently. In addition, there were data gaps in the responses provided by another four MSs (Bulgaria, Romania, Greece and France).

The series of fact-finding missions was carried out in agreement with MSs Competent Authorities (CAs). The objective of the mission series was to investigate the implementation of measures to achieve the sustainable use of pesticides, in particular the implementation of the requirements set out under the Directive, and also to identify the main obstacles encountered in the implementation of the Directive. The scope of the missions included relevant national legislation, the designation of relevant CAs, and the communication and co-operation within and between these CAs. The missions focused on Articles 4 to 15 of the Directive. The missions facilitated a more comprehensive examination of implementation of the Directive as well as the identification of good practices.

For the purposes of this report, good practices are those that have either demonstrated good results, or are considered to be capable of providing such results. It should be noted that the examples are not exhaustive; many examples of good practice were identified during the mission series and from the completed questionnaires. They do not necessarily constitute legal requirements, and, in a number of cases go beyond these. There is no guarantee that good practices identified in one Member State would necessarily work in another Member State.

The six MSs visited were Denmark, Germany, Italy, the Netherlands, Poland and Sweden. These Member States were chosen to give a cross section of different Member States covering varying geographical regions. They represent both large and small MSs, northern and southern European, centrally-organised and federal MSs. The relative importance of agriculture, and the agri-food industry in the overall economy, varies significantly between these MSs. Average farm sizes range from 10 hectares (ha) in Poland to almost 70 ha in Denmark, compared to an EU average of just over 16 ha. Similarly, the range of crops, the relative importance of organic agriculture and the area dedicated to minor crops vary

significantly between these MSs. All these factors result in each MS taking their own unique approach to implementation of the Directive.

The missions were undertaken between March and June 2017. They lasted one to two weeks and involved a team of two Health and Food Safety Directorate General officials and one MS national expert. The mission programme involved meetings with central and/or regional CAs and other interested parties as well as visits to relevant sites, such as demonstration farms.

Details of the individual missions are provided in Annex II and reports will be published in the usual way on the Directorate-General for Health and Food Safety website:

http://ec.europa.eu/food/audits-analysis/audit_reports/index.cfm.

The Directive¹ applies to pesticides that are defined as plant protection products (PPPs) under Regulation (EC) No 1107/2009 and, in keeping with this approach, all references to pesticides in this report refer to PPPs. A full list of the legal instruments referred to in this report is provided in Annex I and refers, where applicable, to the last amended version.

This Overview Report was prepared by the Health and Food Safety Directorate General and does not commit the European Commission. Only the Court of Justice of the European Union is competent to authoritatively interpret Union law.

2. BACKGROUND

This mission series was the first dedicated to investigate the implementation of measures to achieve the sustainable use of pesticides under the Directive.

During 2012–2014 and 2015–2016, two audit series covering official controls on the marketing and use of pesticides were undertaken, during which 19 and 11 MSs were audited, respectively. In both series, some aspects of the Directive were examined. In relation to the Directive, the overview report of the 2012–2014 series concluded that "*Initial measures were adequately put into place for the implementation of Directive 2009/128/EC, in particular, training and certification of professional users, safe handling and storage of PPPs, their containers and remnants, IPM and application equipment. This is a step forward to ensure the sustainable use of pesticides.*" (See overview report DG(SANTE)/2015-7567) http://ec.europa.eu/food/audits-analysis/overview_reports/details.cfm?rep_id=79.

The overview report of the 2015–2016 series concluded that "*All Member States visited had taken significant steps in the implementation of those aspects of Directive 2009/128/EC on the sustainable use of pesticides which were examined. These included the establishment of operator training programmes and sprayer testing systems. Areas treated with plant protection products by aerial spraying have declined significantly in recent years, and this practice is now confined to limited areas, under derogation.*" (See overview report DG(SANTE)/2016-6004) http://ec.europa.eu/food/audits-analysis/overview_reports/details.cfm?rep_id=109.

¹ Articles 2(1) and 3(10)(a) of the Directive

3. OVERVIEW OF MAIN FINDINGS

3.1. NATIONAL ACTION PLANS

1. Article 4 of the Directive requires MSs to adopt NAPs containing quantitative objectives, targets, measures and timetables to reduce risks and impacts of pesticide use and to encourage the development and introduction of IPM and of alternative approaches or techniques in order to reduce dependency on the use of pesticides. In addition, the NAPs shall also include indicators to monitor the use of pesticides containing active substances of particular concern, especially if alternatives are available. In their NAPs, MSs shall describe how they will implement measures pursuant to Articles 5 to 15 of the Directive.
2. All 28 MSs had drawn up NAPs which are available in English at https://ec.europa.eu/food/plant/pesticides/sustainable_use_pesticides_en. Twenty one MSs reported targets for pesticide risk reduction, and nine MSs had targets for pesticide use reduction with some MSs reporting targets for both risk and use reduction. Only five MSs set high-level measurable targets, with four having risk reduction targets (Belgium, Denmark, Greece and Germany) and one (France) having a use reduction target.
3. Of the six MSs visited, in the case of Denmark (1986), Germany (2004), the Netherlands (1990s) and Sweden (1980s), programmes had been in place for many years prior to the adoption of the Directive. These programmes had a broader scope than the Directive, but covered many Directive related topics. In the case of Italy and Poland, the NAPs adopted following the entry into force of the Directive were their first action plans in this area. The huge diversity in agriculture and land use patterns resulted in MSs taking different approaches, thus making it difficult to compare NAPs. In addition, MSs are engaged in a range of the Directive related actions, not all of which are documented in their NAP. For example, the German NAP does not address sprayer testing, as Germany has required testing of field sprayers since 1993. In Denmark the NAP is seen as a political statement of strategy, rather than a detailed description of objectives and actions. Consequently, the Danish NAP makes no reference to aerial spraying, even though this is currently prohibited under national legislation, and has been for over 20 years.
4. Denmark and Germany have established defined risk reduction targets of 40 % (Pesticide Load) and 30 % (environmental risk) respectively, whereas the other four MSs visited did not establish specific high level targets. Denmark's use of pesticides taxes as a tool in their risk reduction strategy is explored in detail in paragraph 10, as this approach is unique within the EU. Significantly, under the Directive, both Denmark and Sweden have changed their focus from use reduction to risk reduction, based on their experiences which showed that reduction in use was not the most effective means to reduce the risks associated with pesticides. Their rationale is that pesticides have different intrinsic properties and rates of use, and using a pesticide with a relatively high dose rate, but a relatively benign environmental and/or toxicological profile may be a lower risk than a product used at a lower rate, but with a less favourable profile, even though a lower quantity of active substance is used.
5. None of the six MSs visited had completed a full review of their NAP at the time of the missions, and therefore could not yet determine if all of their NAP targets had been achieved. However, the available information showed that Denmark had succeeded in achieving their goal of reducing the risks associated with pesticides by 40 % from 2011 to 2015, while Germany had achieved their target of a 30 % reduction in risk relating to the aquatic environment and non-target organisms compared to the 1996-2006 period.

6. These reductions in risk build upon the significant reductions in risk achieved prior to the Directive. In Sweden, the health and environmental risks associated with pesticides in 2015 were 69 % and 31 % lower than in 1988. In Germany, the environmental risks associated with pesticide use were reduced by over 50 % during the 1987–2007 period. In both cases, these significant reductions in risk occurred against a backdrop of static, or even, increased pesticide use in recent years in these countries. In the Netherlands, the national measure of pesticide impact on surface and drinking water was 85 % and 75 % lower respectively in 2010 compared to 1998. MSs attributed this reduction in risk to the more favourable toxicological and environmental profile of the active substances in currently authorised PPPs compared to the products of twenty years ago. Given that active substances are approved at an EU level, this reduction in risk associated with pesticides is very likely to be replicated across all MSs.
7. The lessons learned by MS from reviews of their NAPs at this stage are limited to the MSs which had action plans prior to the Directive. France's previous NAP established a use reduction target of 50 %. However, during that period, pesticide use increased by 5 % based on the average in the period 2009 to 2011 compared to the period 2011 to 2013. France has identified that the main challenge in achieving their use reduction target is ensuring the widespread adoption of innovative techniques, such as mechanical weeding, which are currently in use only on a relatively limited scale. In Denmark and Sweden, reviews of previous action plans resulted in a change in policy from use reduction to risk reduction. Interestingly, Germany's review of their previous action plan, echoes the French position by identifying the primary challenge as ensuring the widespread adoption of best practices. The review highlighted the importance of applied research, demonstration farms, advisory resources to ensure that best practices identified through research are disseminated to, and implemented by, farmers, and EU agri-environmental schemes to promote voluntary crop-specific or sector-specific IPM practices.
8. Member States are required to review their NAPs at least every five years and update their NAP if required based on this review. To date, only France and Lithuania have reviewed, and subsequently revised, their NAP. The revised French NAP covers the period 2017-2021 and maintains their policy of focusing on reducing pesticides use, with a target for reducing use by 25 % by 2020 and 50 % by 2025. The revised Lithuanian NAP will take effect from 2018. Denmark are finalising their review and expect their revised NAP to be published by the end of 2017. All 25 other MSs have indicated that they are on track to review and revise their NAPs by the end of 2018. This process provides MSs with an opportunity to determine the progress made under their first round NAP, and therefore should form a basis for the revision of future NAPs.
9. As described in paragraph 4, Denmark had historically used use reduction targets, but based on their experience, this approach was subsequently changed to focusing on risk reduction. This experience demonstrates the complexity of defining targets and indicators, and may be of interest to other MSs while they are in the process of reviewing their NAPs.

Danish case study

10. Denmark has had NAPs since 1986, focusing on use reduction, measured using the Treatment Frequency Index (TFI). In 1996, a new *ad valorem* tax on pesticides was introduced. The tax rate was set at 35 % for insecticides, 27 % for herbicides and 3 % for non-chemical pesticides. In 1998, the rates for insecticides and herbicides were increased to 54 % and 34 % respectively and a 34 % tax was imposed on fungicides.

While the volume of pesticides used did decrease over this period (halving from 1986 to 1997, due primarily to a switch to products with lower active substance concentrations), the TFI targets were not achieved.

11. In the early 2010s the CAs concluded that use reduction, measured using the TFI, was not the optimum tool to reduce risk, and that the taxation system in place up to 2013 was not sufficient to change grower practices.
12. To this end, a new indicator, the Pesticide Load Indicator (PLI), was developed to reflect the impact of individual pesticides on health and the environment. The PLI was designed to (i) provide a tool for farmers to make an informed selection between pesticides based on their properties and (ii) to provide the basis for a new pesticide tax replacing the previous *ad valorem* tax so that the most harmful pesticides to health and the environment would be subject to the highest taxes.
13. The current NAP, which was intended to cover the period 2013 to 2015, but which was subsequently extended to mid-2017, established a target of reducing the Pesticide Load by 40 % by the end of 2015 compared with 2011, based on the PLI.
14. Under the Danish system, the calculation of the environmental load of a pesticide is based on the intrinsic properties of the active substance and formulation. In the case of environmental fate, this is based upon the active substances degradation in soil, potential for bio-accumulation and transport to water. In the case of eco-toxicity the load is based on the active substances properties for acute and chronic toxicity and the relative load factor, modified for limited exposure. For calculating human health load, every risk phrase/hazard statement on the product label is converted to a score ranging from 10 to 100. This provides a measure of the load to which the operator is exposed when handling and applying pesticides. The Pesticide Load can be expressed per unit of product (pesticide load/kg of product) or per standard dose (pesticide load/ha). The calculated PLI does not take into account risk mitigation measures taken by farmers. Consequently, the PLI represents potential impact rather than real effects.
15. A new tax was introduced from 1 July 2013, to coincide with the NAP. It is composed of a "base tax" which is determined by the amount of active ingredient in the pesticide and the three load factors based on the toxicological, environmental fate and ecotoxicological properties of the product. The new tax was intended to significantly increase the price of pesticides containing active ingredients with a high potential impact on human health and the environment. By the same token, the level of taxes on less risky pesticides would be lower than the previous *ad valorem* tax. The highest tax of 7 709 Danish Krone (DKK)/kg, equivalent to 1 040 Euro (€)/kg, relates to insecticides containing the active ingredient *cypermethrin*, compared to herbicides containing *glyphosate*, which have a relatively low pesticide load and hence tax, with taxes up to DKK 51 DKK/l, equivalent to 6.90 €/litre.
16. The available data at the time of the mission showed that the PLI had reduced by 40 % based on sales (declining from 3.27 to 1.95) by the end of 2015, thus achieving the Danish target of a 40 % reduction. The reasons for this had not yet been analysed, but the authorities thought that a change to using pesticides with lower loads was the most likely reason.

Examples of good practices concerning the NAPs

17. Defined high level targets in the NAP e.g. Denmark and Germany have clear, precise and measurable targets, which can be used to determine progress. In the case of Germany, a target was established of a 20 % reduction in the environmental risks associated with pesticide use by 2018, and a 30 % reduction in risk by 2023, compared to the 1996–2005 period. Denmark established a target to reduce the Pesticide Load by 40 % by the end of 2015 compared with 2011, based on the PLI.

3.2. TRAINING AND CERTIFICATION

18. All MSs (except Luxembourg) had established training and certification systems by the deadline of 26 November 2013, and all MSs have restrictions in place on the sale of pesticides to non-professional users, such as home gardeners. MSs reported in response to the 2016 questionnaire that almost four million professional operators had been trained. There are delays in training and certification of operators in six MSs (Italy, the Czech Republic, Estonia, Lithuania, Slovakia and Malta), while information regarding Bulgaria, Hungary and Romania was incomplete or absent.
19. During the course of the six fact finding missions, the Commission verified the current level of compliance in this area as stated by the CAs of the MSs. In all cases systems for training and Certification of operators were in place.
20. All six MSs required that from November 2015, retailers and users of professional use pesticides must have undertaken training and possess a certificate proving appropriate professional knowledge. In all six MSs, training covers all mandatory aspects of the Directive.
21. Training requirements have been in place for at least some categories of operators since 1968 in Italy and since the 1990s in Denmark, Germany, the Netherlands, Poland and Sweden. Some MSs go beyond the EU requirements e.g. Denmark, Germany and Sweden have extended the training requirement to retailers of amateur use pesticides.
22. In the Netherlands, the authorities indicated that there are around 198 distributors in total, who hold a certificate and 68 759 professional users, which represents 100 % for these two categories of operators. In addition, 1 135 advisors were certified at the time of the mission. At the time of the mission, the Netherlands did not require crop agronomy advisors, who were not directly involved in selling pesticides to be trained and certified, but they planned to revise this national legislation to bring it into line with the Directive.
23. In Germany, the authorities estimated that there are approximately 12 000 distributors/retailers of pesticides and 300 000 professional users in the country. Each year about 5 500 sales staff working at pesticide retailers and 4 500 professional users are controlled during routine inspections at their premises to verify that they are trained and possess a relevant certificate, with compliance levels of 98-99 % consistently found in both cases. Since 2016, Länder controls at retailers include a check that professional use pesticides are only sold to trained professional users holding a certificate. While data on the results of these controls had not yet been compiled, both Länder visited reported compliance levels of virtually 100 %.
24. In Denmark, there are 26 000 trained operators covering distributors, advisors and professional users and almost 400 trained operators for the retail of non-professional use

pesticides. It is not a requirement for advisors to be certified. The authorities have been checking that professional users have the required certificates as part of their controls on these operators for a number of years. Compliance levels are typically > 95%. From 2017, controls on retailers check if staff are trained and it was planned to commence controls to check that professional use pesticides are only sold to trained professional users holding a certificate from July 2020.

25. In Poland, the target in the NAP was that 90 % of professional users would be trained and certified by 2017. The authorities estimated that there were 560 000 professional users which would be subject to these requirements. By the end of 2016, 76 % of these had been trained. However, the results of controls at retailers and professional users consistently indicate compliance levels of 98-99 %.
26. The Italian authorities indicated that the total number of distributors is 10 228 and 100 % hold a certificate. There are 5 325 advisors, all of whom are certified. As of 31 December 2016, out of a total of 800 000 professional users (an estimate), almost 340 000 were certified. Given the number of small scale growers who use contractors for the application of PPPs, the authorities estimated that that almost half of the professional users had not yet been trained.
27. The Swedish authorities indicated that over 20 000 professional users and 100 distributors had been trained. However, the authorities did not have data on what proportion these figures represented of all operators requiring to be trained and certified. The authorities do not require advisors to undergo training or to be certified.
28. Based on the questionnaire, in addition to Denmark and Sweden, three other MSs (Finland, Hungary and the UK) do not require advisors to be trained and certified, which is not in line with the Directive.



Graph 1. The number of operators trained and certified in the safe handling or use of PPPs in each MS.

29. While almost four million professional operators have been trained, it is not possible, at an EU level, to give an overall figure on compliance in this area as the total number of relevant operators is not known.

Examples of good practices in the area of training and certification

30. Technical training in agriculture/horticulture is a pre-requisite for all farmers and landscapers/park wardens in Germany, which the CAs believe provide a sound, scientific knowledge for their future careers in food production and landscape management. They added that nowadays most young farmers undertake additional education, with many studying agriculture to university degree level.
31. In Poland, the principles and techniques of IPM is a compulsory subject in all vocational training related to agriculture. In addition, the Ministry of Agriculture has also been proactive in encouraging Universities to build IPM into the curricula for courses on agriculture, which helps to ensure that all agriculture graduates have an education in IPM.
32. The ban on the sale of pesticides, except Ready-To-Use products, via self-service helps to ensure that amateur users receive guidance on the safe use of pesticides at the time of sale. This has been the practice in Germany for thirty years, and more recently in Denmark.
33. In Sweden, training is required for distributors/retailers selling both professional and non-professional use pesticides and all premises selling pesticides must have a trained person available to provide information on safe pesticide use. The CAs' view is that their policy of requiring retailers of amateur use pesticides to have trained staff available helps to ensure that amateur users receive sufficient advice at the time of purchase to guide them in safe use. They believe that this approach is preferable to relying on people to read the product label or other relevant literature and as such, they consider that this is a good practice.

3.3. PESTICIDE POISONING

34. Based on the responses to the questionnaire, 23 MSs have established systems to gather specific information on pesticide acute poisoning incidents and ten MSs have a dedicated system for gathering data on chronic poisoning. Of the MSs visited, all six had some system in place to gather information on both acute and chronic poisoning linked to pesticides, except for Italy, where there are regional systems, but no national system, for gathering chronic poisoning information. Overall, the accuracy of this data and its use was questioned, and the data is not comparable between MSs.
35. Member States do not record acute poisoning data in a harmonised manner, e.g. it is not possible in all MS to distinguish poisoning cases linked to chemicals in general from cases involving pesticides, or cases involving PPPs from those involving biocides. Similarly, all MSs recorded the number of enquiries relating to, rather than the number of proven cases of, acute poisoning. The limited value of currently available data can be demonstrated by the fact that the Italian authorities record over 600 acute poisoning incidents linked to PPPs annually, while the German authorities record 50-70 incidents annually and Poland have recorded no cases in the 2013-2015 period.
36. As regards the systems in place to monitor chronic poisoning, MSs emphasised that it is very difficult to collect accurate data on chronic health impacts linked to pesticides, as there is a wide range of causal factors linked with chronic health problems and there can be a significant time lag between exposure to the pesticide and expression of symptoms. Nevertheless, no cases of chronic poisoning definitively linked to pesticides were identified by the six MSs visited.

Examples of good practices in the area of pesticide poisoning

37. Analysis of trends in poisoning data is useful to identify emerging issues and to verify the effectiveness of risk-mitigation measures for authorised pesticides. The Italian National Institute of Health analyses reports of acute poisoning and publishes annual reports on acute poisoning, which include this detailed analysis.
38. The dissemination of information is important to inform interested parties of trends and emerging issues, and to this end, the Netherlands publish annual reports on acute² and chronic³ poisoning, which includes cases linked to pesticides.

Obstacles identified by MSs

39. A number of CAs emphasised that it is very difficult to collate accurate data on acute, and especially chronic, health impacts linked to pesticides, due to the wide range of other contributory factors associated with chronic health problems and the time lag between exposure and expression of symptoms.

3.4. PESTICIDE APPLICATION EQUIPMENT

40. All MS except Cyprus and Malta had established a testing system by the deadline of 26 November 2016. Most MSs do not have reliable data on the number of sprayers in use, but based on the data provided in the questionnaire, there were a total of 1.9 million sprayers to be tested in the 26 MSs with testing systems, of which 0.9 million units had been tested by the deadline. There was a wide variation in the level of compliance reported. In the case of nine MSs, the level of testing was below 50 % (Croatia, Greece, Hungary, Ireland, Italy, Latvia, Portugal, Spain and Sweden). For the remaining 15 MSs, compliance level was higher than 50 % and in some cases, approaching 100 %.
41. During the course of the six fact-finding missions, the Health and Food Safety Directorate General examined compliance levels in this area, based on information provided by the CAs. In the Netherlands, the level of testing was close to 100 %. In Germany, the compliance level was more than 93%. In Denmark, the compliance rate was between 77 % and 90 %. In Sweden the compliance rate was between 33 to 50 %. In Italy, the CA estimated that one third of the units had been inspected, although it is noteworthy that Italy is the only one of the six MSs visited that requires testing of hand-held equipment e.g. knapsack sprayers. In Poland, there was no reliable data on the number of sprayers to be tested, however in the course of their official controls to farms the CA found that 99 % of sprayer units had been tested.
42. A number of MSs emphasised that many larger farms, and producers certified under voluntary Quality Assurance schemes, go beyond the legal requirements and have their equipment tested annually.

² [https://www.umcutrecht.nl/nl/Subsites/Nationaal-Vergiftigingen-Informatie-Centrum-\(NVIC\)/Acute-vergiftigingen](https://www.umcutrecht.nl/nl/Subsites/Nationaal-Vergiftigingen-Informatie-Centrum-(NVIC)/Acute-vergiftigingen)

³ (www.rivm.nl, www.voedingscentrum.nl, www.rijksoverheid.nl/onderwerpen/bestrijdingsmiddelen/gewasbeschermingsmiddelen)



Picture 1. Since November 2016, all tractor and orchard sprayers must be tested.

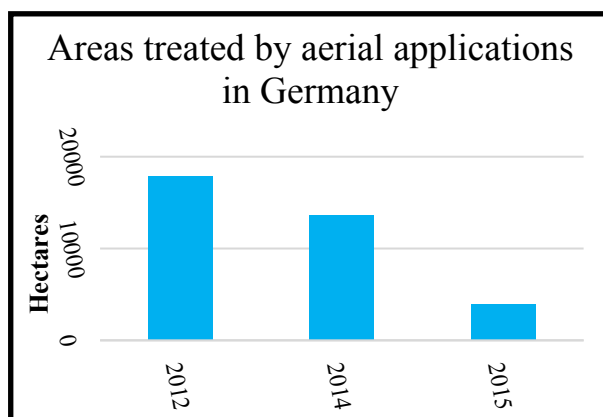
Examples of good practices in the area of pesticide application equipment

43. Sprayers owned by contractors are typically used more frequently, and apply pesticides to a greater area of crops, than machines owned by individual growers. To address this risk, Italy requires that contractors test their boom and orchard sprayers every two years and other types of sprayers every four years, whereas the Directive currently requires inspection at intervals not exceeding five years.
44. Some MSs have identified risks associated with spraying equipment not included within the scope of mandatory testing, and therefore have included this equipment in their testing programmes. Examples include low volume sprayers and granule applicators (the Netherlands) and seed treatment equipment (Italy, Poland).
45. A centralised database, such as that established by Denmark, for recording the results of all sprayer inspections can provide the authorities with data relating to all sprayers in the country, which can be used to prioritise future actions in this area. This data includes information on tank size, boom width and the most common faults detected during testing.
46. The Dutch CAs have established a comprehensive audit programme to check the quality of inspections performed by officially designated testing centres. This involves re-testing about 5 % of the sprayers tested by these centres each year.

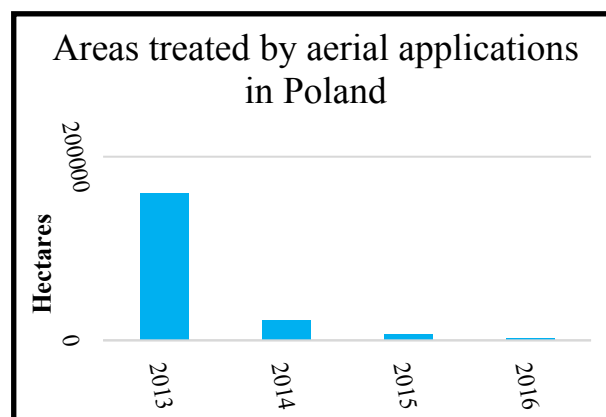
3.5. AERIAL SPRAYING

47. All 28 MSs have prohibited aerial spraying, even if this is not explicitly stated in their NAPs. Twenty one MSs allow for the possibility of derogations, and in 2015, at least nine MSs granted derogations covering just over 450 000 ha. France granted derogations, but did not provide data on the treated areas, while the responses of Bulgaria, Czech Republic, Greece, Romania and the UK to the 2016 questionnaire were not clear in this area. Spain (339 000 ha) and Hungary (88 000 ha) accounted for almost 95 % of reported aerial spraying in the EU in 2015.

48. In all six MSs visited, aerial spraying had been restricted, or even prohibited, prior to the Directive. Consequently, the area treated by aerial application of pesticides had fallen dramatically over the last twenty years, and continues to decline. In the case of Germany and Poland, the CAs provided data on the areas treated by aerial application in recent years, as shown in Graphs 2 and 3.



Graph 2. The areas treated by aerial application of pesticides in Germany since 2012.



Graph 3. The areas treated by aerial application of pesticides in Poland since 2013.

49. Derogations are possible in all six MSs in cases where there are no viable alternatives, and Germany, Italy and Poland have granted derogations in recent years for very limited areas.

50. Germany has granted derogations for aerial spraying in steep slope vineyards along the Upper Middle Rhine valley to control fungal diseases, and in forestry to control insect pests. Italy has granted derogations for aerial spraying in steep slope vineyards and forestry, while Poland has granted derogations in forestry. In all three MSs, the derogations are granted only in cases where there are no viable alternatives and are subject to a range of strict conditions. In the case of vineyards, the slopes are so steep that there are significant health and safety issues around the application of pesticides using tractor mounted sprayers.

51. The German CAs stated that vine growing on the terraces of the Upper Middle Rhine valley, which is integral to its classification as a World heritage site, is not possible without the use of fungicides. The Polish CAs highlighted that tractor sprayers cannot apply pesticides to tree tops, which is necessary to control certain pests, and the CA's view is that failure to control these pests would result in the death of the trees. The Italian CAs emphasised that all requests for aerial spraying in forestry were supported by a range of technical data and in most cases, non-chemical products containing *Bacillus thuringiensis* were used to control the pests.

52. In Germany and Poland, in all cases where permits are granted, there are a range of conditions in line with Article 9 of the Directive, so as to provide assurances on the safe use of the pesticide and the CAs conduct intensive controls to verify that the conditions of the permits are adhered to.



Picture 2. A steep slope vineyard along the Upper Middle Rhine valley.

3.6. INFORMATION AND AWARENESS-RAISING

53. The main tool used by MSs CAs, including the six MSs visited, for providing information on the sustainable use of pesticides to the general public is through websites. In addition, MSs highlighted specific information and awareness-raising campaigns targeting specific issues or sectors of society.
54. Based on the questionnaire, in six of the 28 MSs (Spain, Croatia, Sweden, Netherlands, Hungary, Malta) farmers must inform their neighbours and local residents before pesticide applications, at least upon request, under national provisions. Of the six MSs visited, there were a range of approaches to informing persons who might be exposed to spray drift e.g. in Italy and Sweden, it is mandatory for the spray operator/landowner to erect signs at the location to be treated.

Examples of good practices in the area of information and awareness raising

55. The Danish “Think before you spray programme” is a good example of a targeted awareness-raising campaign directed at a particular sector. It commenced in 2015 after a survey directed to home gardeners. Information was spread via leaflets and films at dealers, via newsletters and magazines and on websites⁴. The campaign gave advice on alternative methods for dealing with weeds and pests and promoted the use of Ready-To-Use pesticides.
56. The “Green Deal” agreements in the Netherlands are a good example of collaboration between a wide range of stakeholders to address a specific topic in a targeted manner. The Dutch authorities use the series of “Green Deal” agreements between the agricultural sector and the government for awareness-raising. Under these agreements, companies, other relevant organisations, local and regional governments and interest

⁴ <http://mst.dk/borger/sproejtemidler-biocider/sproejtemidler-i-haven/>

groups work with the national government on green growth and social issues. A number of these agreements relate to pesticides, including green PPPs (GD 164), recreation (GD 188), sustainable use of PPPs on sport grounds (GD 189) and sustainable use of PPPs by non-professional users (GD 211). In the period 2013-2015, the main topic of awareness-raising campaigns was minimising herbicide use in non-agricultural areas and, in particular, on hard surfaces (e.g. city pavements), which is considered as a problem for the abstraction of drinking water from surface water. Examples of flyers and brochures can be found online⁵.

3.7. AQUATIC ENVIRONMENT AND DRINKING WATER

57. The Directive builds on the work of specific legislation such as Directive 2000/60/EC, commonly known as the Water Framework Directive and Regulation (EC) No 1107/2009 under which MSs impose a range of conditions on the use of PPPs, such as mandatory buffer zones and use of low drift nozzles, in order to protect water quality.
58. The six MSs visited have taken a variety of approaches relating to water protection. Of the six, water protection is a particularly high priority in both Denmark and the Netherlands. In Denmark, all drinking water is sourced from groundwater, which is not treated before consumption. There is a special focus on water protection in the Netherlands and the need for a dedicated policy on surface water stems from the location of the country (the Rhine-Meuse-Scheldt river delta), as well as the high density of water courses (350 000 km of ditches).
59. In Germany, the use of all pesticides on areas not devoted to agriculture, horticulture or forestry is prohibited, except under a specific permit. Permits are only granted where there are no viable alternative control methods and the need to control the pest has been shown e.g. controlling weeds on railways for safety reasons. Sweden has a similar system of permits for pesticide use along roads, very permeable surfaces and sealed surfaces. The Netherlands have pioneered the implementation of emissions reduction plans (ERPs). Where pesticides are detected in surface waters, the product authorisation holders are obliged to draft and implement these plans to improve the situation.
60. The 28 MSs reported that they analyse 500 000 samples of surface, ground and drinking water for pesticides annually. This compares to approximately 80 000 food samples which are tested for pesticide residue annually. Based on the results of the questionnaire, over ninety nine per-cent of drinking water samples are compliant with the EU legal limit established by Directive 1998/83/EC. However, drinking water samples are normally taken after any treatment for the removal of pesticides has taken place.

Examples of good practices in the area of aquatic environment and drinking water

61. Buffer zones are an important risk management tool to protect water quality and the aquatic environment. Both Denmark and Sweden have a system of mandatory buffer zones complemented by a system of larger buffer zones determined by a customised

⁵ <http://www.nefyto.nl/Nefyto/media/Nefyto/Documenten/Nieuwsberichten/Flyer-Gewasbescherming-en-omwonenden-def-oktober-2013.pdf>
<http://www.nefyto.nl/Nefyto/media/Nefyto/Documenten/Nieuwsberichten/Brochure-gewasbeschermingsmiddelen-en-omwonenden-def-oktober-2013.pdf>.

risk assessment in each case, to ensure that appropriate measures to mitigate the risks are established.

62. Sweden requires a minimum buffer zone of 12 metres around wells used to abstract drinking water. In addition, sprayers cannot be filled or cleaned within 30 metres of water courses or wells. In addition to these buffer zones, County Administrative Boards (CABs) or municipalities may establish water protection areas. These are areas from which surface water or ground water is, or can be, used for drinking water. The CAB, or municipality, can enact a set of rules to protect water quality in these water protection areas. Under these rules, the use of pesticides may be banned or, more typically, prohibited except under a licence. Municipalities grant these licences on a case by case basis, based on an application and having considered a range of factors such as the pesticides to be used, soil type and what alternative plant protection measures have been applied to avoid the need for pesticide use.
63. Denmark has established a programme which offers significant assurances that their pesticide authorisation system ensures that authorised pesticides will not lead to groundwater contamination. Under Pesticide Leaching Assessment Programme, authorised pesticides are applied to six representative test fields in line with normal agricultural practices followed by intensive monitoring to determine if there is evidence of the pesticides, or their metabolites, leaching into groundwater. As a result of this programme, a small number of previously authorised pesticides have had their authorisations withdrawn in Denmark, while in other cases the conditions of use have been modified.
64. Low-drift nozzles help to reduce spray drift and hence pesticides entering watercourses. To promote the use of this important risk-mitigation tool, Germany has established a target, and a timeline, for the use of drift reducing nozzles/equipment. The target is that at least 50 % of boom and orchard sprayers have nozzles capable of reducing spray drift by at least 75 % by 2023.
65. In order to reduce the risk to the aquatic environment, MS can restrict the use of pesticides in certain areas. In Germany, pesticides are prohibited on all areas not devoted to agriculture, horticulture or forestry, except under a specific permit. Therefore, pesticide use on hard surfaces such as roads, footpaths and very permeable surfaces such as railways, is prohibited except under a permit. Permits are granted by the Länder authorities, in line with criteria agreed at a national level. Permits are only granted where there are no viable alternative control methods and the need to control the pest has been shown e.g. controlling weeds on railways for safety reasons. In both 2014 and 2015, the 2 500 permits granted nationally mainly applied to pesticide use on roads, railways and to combatting invasive weed species.
66. Due to the nature of the landscape, the Netherlands has specific challenges in the area of water quality. The CAs have undertaken a number of specific targeted actions to address these challenges. PPP authorisation holders are obliged to draft and implement ERPs in cases of excessive emissions of pesticides to surface water. The CAs, in conjunction with other interested parties, have developed a set of 17 factsheets outlining practical measures for reducing emissions of pesticides to surface water, which are publicly available online⁶. The CAs have also developed a farmyard emission scan, which is a tool to help growers to identify critical points/sources of

⁶ <http://www.milieumeetlat.nl/en/emissiebeperving.html>.

emission by replying to a web-based questionnaire, which is only available to subscribers⁷.

3.8. REDUCTION IN PESTICIDE USE IN SPECIFIC AREAS

67. Twenty six MSs reported in their response to the questionnaire that they prohibited or restricted the use of pesticides in protected areas (as defined in Directive 2000/60/EC), and conservation areas (as defined in Directives 2009/147/EC and 92/43/EEC), while Ireland and the UK did not provide information in this area. However, most of the NAPs set no specific use reduction targets for public areas.
68. All six MSs visited have introduced measures to ensure the safe use of pesticides in public areas in line with the Directive. These measures complement those taken under Regulation (EC) No 1107/2009 as part of the product evaluation and authorisation process, which means that pesticides used in public areas are authorised specifically for this use, only after a detailed evaluation of a package of studies to ensure that the use of these products poses no risk to members of the public, when used in line with the label.
69. In Poland, Germany, Italy and Sweden, there is a general prohibition of pesticide use in public areas. In the case of Poland derogations are not possible, while in the other three MSs, derogations may be granted, but priority must be given to biological controls and low-risk PPPs. The Netherlands has prohibited the use of pesticides on hard surfaces, as use on these surfaces is more likely to lead to run-off and contamination of surface waters, but derogations are possible. Denmark has been particularly active in this area. Through a series of voluntary agreements since 1998, public authorities have undertaken to reduce pesticide use in public areas, with significant reductions achieved. Pesticide use on railways has been reduced by 50 % using spot spraying. A quota for pesticide use has been imposed on each golf course resulting in significant reductions in the volumes of pesticides used.

Examples of good practices in the area of reduction in pesticide use in specific areas

70. In order to reduce the risks associated with pesticides in public areas, MSs must ensure that the use of pesticides is minimised or prohibited in these areas. Germany and Sweden have both taken specific measure in this area. Germany has prohibited the use of all pesticides in areas designated for the public, such as public parks, sports grounds, school grounds and in proximity to health care facilities, except under a specific permit. In Sweden, before pesticides are used along roads, very permeable surfaces and sealed surfaces, a licence must be obtained by the relevant municipality.
71. Technology can be used to ensure more targeted use of pesticides, resulting in reduced use, while maintaining high levels of control. The approach of the Danish railway company is a relevant example in this area, as they have succeeded in reducing pesticide use by 50 % by using targeted application. A sensor is mounted on a customised spray train to detect weeds, which are then spot sprayed, thus limiting pesticide use to the parts of the track where weeds are present.
72. The publication of information can be a useful tool to encourage operators to change their practices. Denmark provided an example of this where they adopted a specific

⁷ <https://www.erfemissiescan.nl/>

regulation to reduce the use of pesticides on golf courses in 2013, setting maximum permitted levels for pesticide use on each distinct area of each golf course. The CA publishes pesticide use reports from individual golf courses and overall national compliance with targets, while each golf club displays its own statistics either on its own website or in the club house.



Pictures 3 and 4. Weeding can be used as an alternative to herbicides in public areas.

3.9. HANDLING AND STORAGE OF PESTICIDES

73. Twenty five MSs reported in their response to the questionnaire that they had established systems for the collection and safe disposal of empty pesticide containers, while 21 MSs had systems for the safe disposal of expired pesticides. Greece reported that they have no system in place for collection of empty packages and containers, while Bulgaria and the UK did not provide a response.
74. The handling, storage and transport of pesticides is covered by a range of European and national legislation which preceded the Directive, and NAPs give little detail in this area in many cases. Nevertheless, in the visited MSs, the authorities stated that operators are knowledgeable in this area as the handling and storage of pesticides is covered in mandatory training.
75. All six MSs visited have systems for the safe disposal of empty packaging and remnants of pesticides. The German and Swedish pesticide industries operate a voluntary system for the disposal of empty pesticide packaging. In Netherlands, the system is jointly operated by the industry and public authorities, and almost 100 % of packaging is disposed of in this way. On the other hand, while safe disposal of empty packaging is a legal requirement in Poland, and systems are in place at no cost to the farmer, just half of all used packaging is collected and disposed of using the system.

Examples of good practices in the area of handling and storage of pesticides

76. EU co-funded Rural Development programmes can be used to improve facilities for farmers. In Italy, growers can use these funds for the construction of new pesticide storage and mixing facilities. They can also use these funds to purchase technical devices to prevent contamination of water supplies when filling their sprayers, equipment for cleaning sprayers and empty containers, and drift reduction devices.
77. The pesticide industry has been pro-active in some MS in promoting good practices. For example, in Germany, the pesticide industry has established a voluntary, self-funding system for the disposal of empty pesticide packaging⁸ for over 20 years. All

packaging accepted under this scheme must be triple rinsed. There is no charge for the scheme and it is estimated that 75 % of all pesticide packaging is disposed of through this scheme.

78. Italy provided an example of reducing the administrative burden for professional users of pesticides. In their case, all companies dealing with waste storage, processing and disposal, including empty pesticide containers and remnants, must be authorised and must keep records on hazardous waste on behalf of their clients. This record keeping is done at national level using the "Waste Tracking Control System" web-based platform, which facilitates tracking empty pesticide packaging and hazardous waste from the user to the collection center, which reduces the administrative burden for individual professional users.

3.10. INTEGRATED PEST MANAGEMENT

79. All 28 MSs have provided a range of tools to growers to guide them in IPM. In the case of the six MSs visited, all except Germany, have developed officially recognised crop, or sector specific, IPM guidelines. The German authorities have taken a conscious decision that these guidelines should be developed by grower organisations, so as to ensure their relevance and implementation, but to date growers have not developed such guidelines. In all six MSs visited, there are pest monitoring networks, and systems to disseminate the resultant information to growers and advisors. These are publicly funded, except in the case of the Netherlands. In these six MSs, pest monitoring data, meteorological data and scientifically based pest thresholds, form the basis for advice to guide growers in taking appropriate plant protection measures. The range of pest and crops monitored, the intensity of monitoring and the frequency of the resultant bulletins varies between MSs. All six MSs have established demonstration farms to promote innovative IPM techniques to growers.



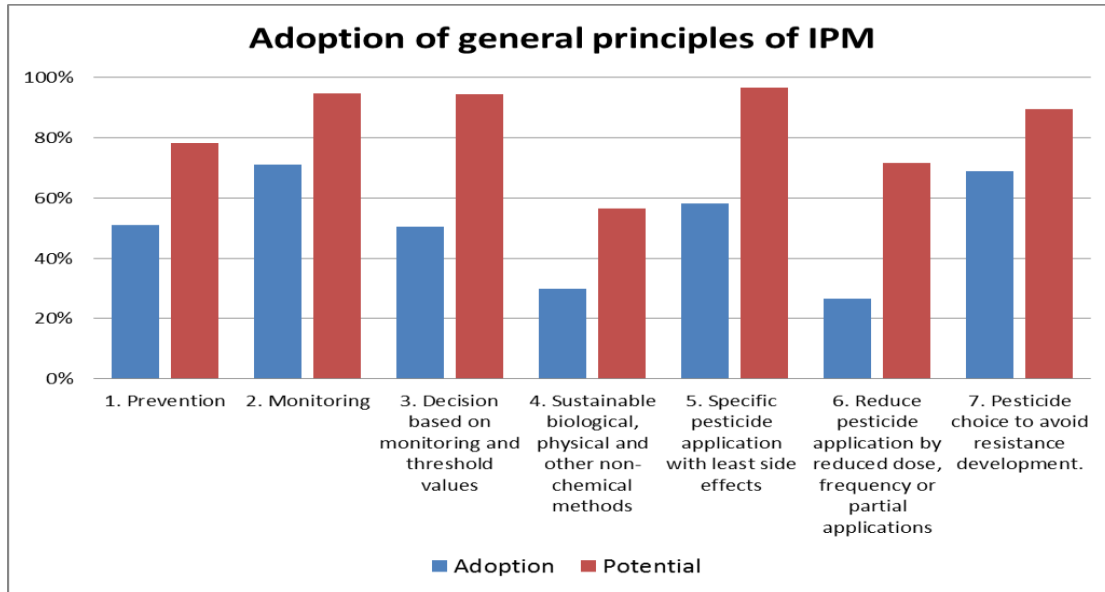
Pictures 5 and 6. Selection of suitable varieties and break crops such as oilseed rape are important components of IPM.

80. All MSs use Rural Development Funds under the Common Agricultural Policy (CAP) to support organic farmers. The proportion of land devoted to organic production systems varies between MSs, and regions within individual MSs. Of the six MSs visited, it ranged from under 3 % in the Netherlands to over 15 % in Sweden, compared to an EU average of 6.2 %. The Swedish authorities attribute the relatively high level of organic agriculture

⁸ www.pamira.de

to consumer demand for organic produce and the relatively low pest and disease pressure due to their climate, particularly the cold winters.

81. Both Germany and Italy make extensive use of Rural Development Funds under the CAP to promote IPM practices which they believe that farmers would not undertake, at least to the same extent, in the absence of payments, as farmers perceive these techniques as costing them money. In Italy, growers receive these additional payments for keeping detailed additional records of crop production, such as sowing date and the use of fertilisers. In Germany, growers can claim additional payments for IPM related measures such as using non-chemical, rather than chemical, pesticides and for adopting specific crop rotation practices.
82. Five of the MSs visited took the view that the vast majority, if not all, of their growers were IPM compliant, but the grounds for reaching this conclusion varied widely, while Poland had data showing compliance levels ranging from moderate to excellent. None of the six MSs had established systems to explicitly examine compliance with all eight principles of IPM and all six highlighted difficulties in determining compliance with the principles of IPM as set in the Annex III of the Directive.
83. Member States determined compliance with IPM in a range of ways. The Danish CAs concluded that all users comply with the principles of IPM by virtue of having achieved the target 40 % reduction in the pesticide load as described in paragraph 16.
84. In Germany, complying with the “necessary minimum” is deemed to mean compliance with IPM. Compliance is determined based upon examination of crop records from a network of 146 reference farms considered to be typical growers. The “necessary minimum” is the minimum quantity of pesticides deemed necessary to produce the crop. It is determined at Länder level based on pest infestation levels, pest thresholds and weather conditions, and taking into account the use of non-chemical controls and the alternation of active substances for effective resistance management. The Länder advisory services provide advice to growers, based on all these factors, and the CAs stated that by adhering to this advice, growers would be compliant with the “necessary minimum”. The CAs emphasized that the “necessary minimum” depends on a wide range of factors, including weather events, soil types and topography, and by its nature, is specific to local areas.
85. In the Netherlands, plant protection monitors, in which all IPM measures must be recorded by the farmer are mandatory. The monitor must be kept up to date and completed within two months after the end of the growing season. Records kept are required to cover all IPM measures taken, including crop rotation, use of resistant varieties, biological, physical and non-chemical methods, selection of pesticides based on risks for environment and humans, monitoring of harmful organisms, use of warning and forecasting systems and resistance management. The plant protection monitor is intended to help growers to evaluate their IPM approach and adapt it for the following growing season.
86. In addition, in 2016, the Dutch CAs performed a survey to gather information on the level of IPM implementation at farm level and to get an insight with regard to limitations for its implementation, as well as to identify opportunities for improvement.



Graph 4: Level of implementation of general principles of IPM, based on a 2016 survey undertaken by the CAs in the Netherlands.

87. In Italy, there are three levels of IPM implementation; statutory IPM, Integrated Production as a specific agri-environmental measure funded by EU Rural Development funds under the CAP, and the *National Quality Integrated Production System*. For statutory IPM, the relevant CAs check to what extent growers are aware of general IPM principles during routine inspections at farm level under Regulation (EC) No 1107/2009, but there is no element of monitoring or verification that IPM general principles are applied in practice. In the case of integrated production, compliance with IPM general principles is checked during inspections by the Paying Agencies. Growers, who receive payments under this specific measure, are required to keep more detailed records and not only records on pesticide use. The *National Quality Integrated Production System* is a voluntary scheme, similar to organic farming certification. Annual inspections are performed at certified operators by approved Control Bodies. In order for certification to be granted, it must be verified that IPM principles and specific IPM measures have been applied during the growing season, as well as in the post-harvest stage.

88. The Polish CAs monitor and assess the implementation of IPM principles in three main ways, an annual survey of 1 500 pesticide users, a survey conducted by the Central Statistical Office on 60 000 users every five years and through information from official controls. A specific questionnaire for use as part of official control on users has been developed covering the eight IPM principles set in Annex III of the Directive. The CAs conduct more than 20 000 official controls on professional users every year. The results of these assessments are not consistent, showing that the methods of assessment need further development.

89. In Sweden, the central CAs have provided guidelines and a checklist to municipalities to assess the implementation of IPM principles. Municipalities include some IPM related questions in their controls on pesticide users, including questions on the prevention of pests, diseases and weeds, ensuring good growing conditions for the crop to prevent pesticide use and the use of alternative controls. However, all of the eight IPM principles listed in Annex III of the Directive are not systematically assessed. The central CAs undertook projects in 2015 and 2016 during which on-the-spot visits were carried out on arable farmers, greenhouses and nurseries. Some, but not all, of the eight IPM principles

listed in Annex III of the Directive were assessed. The topics addressed included preventative measures, pest monitoring and whether non-chemical controls were used.

90. The number of non-chemical pesticides authorised by MSs has increased significantly in recent years. These products provide an alternative to chemical pesticides for growers. Nevertheless, there is significant variation between MSs, with the proportion of these products ranging from less than 1 % to over 13 % of all authorised pesticides in specific MSs.
91. The importance of independent, publicly-funded research and advisory services was emphasised by grower organisations in the course of all six missions. Indeed, the review of Germany's previous NAP highlighted the Länder advisory services as having a critical role in promoting the sustainable use of pesticides. During all six missions, both CAs and grower organisations acknowledged that there are insufficient alternative control methods and techniques available to growers of field crops, compounded by a low level of implementation of some IPM techniques in these crops, as graphically illustrated in the case of the Netherlands by Graph 4 in paragraph 79.

Examples of good practices in the area of IPM

92. An adequately funded integrated agricultural education, research and advisory services is a good model for providing high-quality, independent information to growers by helping to ensure close collaboration between research and advisory services. In addition, incorporating agricultural education into these services means young farmers are trained in the most up to date techniques available. Within Germany, the Rhineland Palatinate integrated structure of education, research and advisory services follows this model and could be considered as an example of a good practice.
93. Evaluating the success of actions taken and adapting accordingly is a cornerstone of IPM. To embed this practise, the Netherlands requires all growers to maintain detailed records associated with the crop known as plant protection monitors. These monitors include all crop management measures taken, and provide a useful tool for growers and advisors to review the actions taken and adapt their strategies for the following year.
94. Decision support systems can help growers and their advisors in their crop protection decision making. A good example of an integrated approach to pest monitoring, including the use of decision support systems, and dissemination of information was seen in Germany. The ISIP system⁹ (Information System for Integrated Plant Production), collates all official pest monitoring information on over 150 different pests on all major agricultural and horticultural crops. This data is then used, in conjunction with data from 600 weather stations, and scientifically based pest thresholds, to guide growers in taking appropriate plant protection measures. This includes information on variety choice, rotation, plant nutrition, as well as treatment of pests. The Länder have also developed the ZEPP¹⁰ decision support system (Central Institute for Decision Support Systems in Crop Protection). There is on-going investment in this system to improve the quality of the guidance provided and, in particular, to link the system with precision farming tools. Each Länder issues daily bulletins via email, based on ISIP and ZEPP data, informing growers on pest levels on crops in their region, and guiding their pest control choices. This service is free in

⁹ <http://www.isip.de/isip/servlet/isip-de/infothek/uebersicht>,

¹⁰ <http://www.zepp.info/ueber-uns?id=99>

some Länder, but fees apply in others.

95. Information Technology tools can be used to provide guidance to growers on IPM in a timely manner. In this area, the Danish farm advisory services (SEGES) are currently developing a smart phone application that will allow farmers to map the weeds in their fields, which could facilitate targeted application of pesticides. In 2016, they started to use webinars to disseminate advisory information. In addition, they have developed videos for additional training courses giving examples of good practice such as the use of low-drift nozzles. These webinars and videos are freely available on the SEGES IPM-specific website¹¹.
96. Non-chemical pesticides broaden the range of IPM tools available to growers, while reducing dependence on chemical pesticides. Denmark provided a good example of an initiative in this area with a dedicated funding programme to support the costs of authorising non-chemical pesticides. Under this programme, applicants can receive up to 100 % of the total costs associated with gaining authorisation for a new pesticide. This fund has been in place since 2010 and comprises up to 1 million DKK, equivalent to 135 000 €, per year.
97. SEGES have developed a range of IPM tools for advisors and growers, some of which are freely available, whereas others are only available to clients¹². As an example, they have an online tool available to growers to assess their level of IPM implementation. This takes the form of a questionnaire, with points allocated for good IPM practices. Growers can use this tool to take a snapshot of their IPM implementation at a point in time, and to measure changes in practices over time.
98. IPM guidelines can help growers and their advisors, but to be relevant, IPM must be tailored to local conditions. Italy provides a good example in this area. Italy has developed IPM guidelines for over 95 % of the crops grown in the country. At national level, there are general IPM guidelines, outlining the minimum requirements with regard to IPM. These are complemented by crop-specific IPM guidelines at regional level which take into account specific regional issues.
99. The Polish CAs have developed a very successful web portal¹³ to make information on monitoring of harmful organisms available. Access to this information enhances decision-making capacity relating to plant protection strategies by helping advisors and growers to make informed choices on the timing and technique to be used against pests and diseases.

Obstacles identified by MSs

100. Croatia, Cyprus, Denmark, Ireland, Latvia, Lithuania, the Netherlands, Poland and Sweden all identified challenges in controlling the implementation of the eight principles of IPM at individual grower level. The Czech Republic added that it is very difficult to control something that doesn't have clear rules and is dependent on many factors.
101. The Czech Republic identified possible conflicts between IPM good practices and other statutory requirements e.g. minimum tillage to reduce soil erosion versus

¹¹ <https://www.landbrugsinfo.dk/planteavl/plantevaern/ipm/sider/startside.aspx>,

¹² <https://www.landbrugsinfo.dk/planteavl/plantevaern/ipm/sider/startside.aspx>

¹³ www.agrofagi.com.pl

ploughing to bury crop debris and reduce the pest burden on the succeeding crop. They added that economic considerations heavily influence cropping choices, and hence, rotation. The variety of crop sown may be based on consumer preferences, rather than agronomic characteristics, such as resistance to diseases.

102. In Germany, the Länder advisory services are a critical part of the sustainable use of pesticides, as they provide independent research and advisory services, particularly in promoting alternative pest control techniques. These services are either free, or greatly subsidised, but are currently limited by financial constraints within the Länder. In the two Länder visited by the mission team, advisor numbers, a proxy for the service provided to growers, have declined by 50 % over the last 30 years, in Rhineland Palatinate, and this decline has continued during the period of the current NAP. In Lower Saxony, while advisor numbers had remained constant over the last 10 years, the CA acknowledged that more advisors could help to promote alternative pest control techniques.
103. Denmark highlighted that not all available IPM tools are widely used at farm level, e.g. rotation to help to control grass-weeds on some farms. They attribute this primarily to growers concentrating on growing winter crops, rather than having a better rotation with more spring crops, which would facilitate more cultural controls. They added that growers are incentivised to focus on winter crops as very often these are the most profitable, and in addition, farmers are required to maintain green cover on their land throughout the year as a water quality protection measure.
104. The Dutch CAs highlighted that farmers are reluctant to apply alternative methods to chemical PPPs, if they face an unacceptably high risk to their economic viability in case these alternative methods do not work. They also referred to a number of challenges for IPM implementation including the availability of low-risk PPPs, bridging the gap between research and commercial practice, the harmonisation of IPM and phytosanitary requirements and the use and targeting of financial incentives to promote IPM.
105. The German CAs highlighted that some economically important pests of widely grown field crops are becoming increasingly resistant to pesticides, which they attribute to the repeated use of a limited range of pesticides with the same mode of action. They gave the example of pollen beetle in oil seed rape, where resistance to pyrethroid insecticides has increased significantly over the last ten years.
106. Germany, Slovenia and Sweden also noted that, in their view, there is a lack of financially-viable, effective non-chemical control techniques compared to the chemical pesticides that are available. The German CAs highlighted the case of wheat, where fungal diseases can result in significant yield losses, if not controlled. In their view there are no varieties with sufficient resistance to avoid the need for fungicide treatments and no effective cultural controls e.g. rotation is of no benefit and there are no effective biological pesticides to combat this disease.
107. Sweden highlighted the lack of pesticides authorised for minor crops, such as fruit and vegetable crops and less widely grown field crops such as beans. They attributed this to the MS specific authorisation system under Regulation (EC) No 1107/2009 and the relatively small size of the Swedish market, which means that the financial rewards for pesticide companies in seeking authorisation for these pesticides in Sweden is limited. This lack of pesticides acts as a disincentive to grow crops such as beans, which are important in the context of rotation, and limits growers ability to

implement good resistance management practices.

108. The lack of alternatives to cereal crops, or poorer financial returns from these alternative crops, leading to an over-reliance on cereals, and a sub-optimal rotation on some farms was highlighted as an issue in Sweden. The lack of alternative crops is particularly an issue in more northerly parts of Sweden due to climatic constraints e.g. sugar beet growing is confined to southern parts of Sweden. There is no market for some alternative crops e.g. the only large scale buyer of peas in Sweden recently closed their Swedish operations, meaning farmers no longer grow this crop.
109. Sweden has identified a number of obstacles arising from their specific climatic conditions, and other environmental factors. In particular, the lack of specific crop breeding programmes to develop new varieties appropriate to Swedish conditions, and the use of pest thresholds which have been established outside of Sweden.
110. A number of interested parties met during the Sweden mission referred to difficulties in developing, and gaining widespread adoption of, alternative control methods and techniques in field crops. This was attributed to a lack of research into finding alternative controls, resulting in a situation where there are very limited alternatives to pesticides in some cases. Secondly and more critically, there are insufficient applied research and dedicated advisory services to show farmers in a practical way, that some of the alternative control techniques that are available, could be incorporated into their farming practices to a greater extent, thereby reducing their dependence on chemical pesticides.

3.11. RISK INDICATORS

111. The risks associated with pesticides in the EU have reduced considerably over the last twenty years and continue to decline. This can clearly be seen in the Danish, Dutch, German and Swedish data referred to in paragraphs 5 and 6. This is primarily due to the more favourable toxicological and environmental profile of the active substances in currently authorised PPPs compared to the products of twenty years ago, and therefore is an EU-wide, rather than a MS-specific phenomenon.
112. Twenty four MSs included risk indicators in their NAPs using a range of approaches. Of the six MSs visited, both Denmark (Pesticide Load Index) and the Netherlands (Environmental Indicator for Pesticides) use a single high-level indicator to capture trends in the risks associated with pesticides, whereas Sweden (national risk index for health and the environment and the toxicity index) and Germany (risk index for aquatic non-target organisms and risk index for terrestrial non-target organisms) both use two high level indicators. The Danish, Dutch, Swedish national risk index and both German indices are broadly comparable in that they are calculated based on pesticide sales and the intrinsic properties of the products sold. The Swedish toxicity index shows the incidence of pesticides detected in aquatic environments, and is based upon the actual findings of pesticides in a small number of water courses.
113. Denmark, Germany and Sweden also have a range of sector specific indicators such as the number of Maximum Residue Level (MRL) breaches in food detected in pesticide residue monitoring programmes. Poland has no single high level indicator but uses a series of sector specific indicators, such as the number of MRL breaches, while Italy has not yet established any indicators. Sweden is the only one of the six MSs monitoring trends in the use of specific active substances. They measure trends in the use of

pendimethalin, because of its bio-accumulative and persistent properties, *bentazone*, because of the frequency of its detection in Swedish groundwater at levels above 0.1µg/l and *pyrethroid* insecticides, due to findings in surface water monitoring in 2010. Sales of pesticides containing these active substances have remained broadly unchanged over the last eight years, except for *pendimethalin* containing products, which are no longer authorised. Germany is the only MS to have indicators to measure the yield increases associated with pesticide use, through measuring the difference in yield between untreated and treated crops and an area efficiency indicator i.e. the cultivated area required to produce one tonne of a crop.

Examples of good practices in the area of risk indicators

114. High-level indicators to monitor trends in the risks associated with pesticides are useful as they provide a clear method to monitor progress and communicate the outcome to the wider public. Examples of MS with high-level indicators include Denmark (Pesticide Load Index), the Netherlands (Environmental Indicator for Pesticides), Sweden (national risk index for health and the environment and the toxicity index) and Germany (risk index for aquatic non-target organisms and risk index for terrestrial non-target organisms).
115. Progress made with the German NAP is reviewed using a comprehensive set of indicators linked to the plan's targets, thus making it possible to review progress towards achieving the NAPs targets. The German Plant Protection Index summarises the periodic results of the indicator system. It provides a graphic summary of the progress towards the achievement of each indicator, showing the initial value at the start of the NAP, the target value and the current position. The degree of achievement of the target is stated as a percentage, and is colour coded, thereby providing an intuitive tool for informing the public of the progress made in each area.

4. ACKNOWLEDGEMENTS

The Health and Food Safety Directorate General would like to acknowledge the contribution of the National Experts who gave of both their time and their expertise in contributing to the success of this mission series. National Experts are CA officials that work in the specific area being examined, and work with Health and Food Safety Directorate General officials as part of the mission team for the duration of the specific mission. Their detailed knowledge of technical aspects of the legislation and control systems contributed greatly to the value-added component of the mission series.

Finally, the Health and Food Safety Directorate General would like to thank all the CA officials, and other interested parties met during the mission series for their co-operation and positive approach, which greatly facilitated our work.

ANNEX 1 – LEGAL REFERENCES

Legal Reference	Official Journal	Title
Dir. 2009/128/EC	OJ L 309, 24.11.2009, p. 71-86	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
Reg. 1107/2009	OJ L 309, 24.11.2009, p. 1-50	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
Dir. 2000/60/EC	OJ L 327, 22.12.2000, p. 1-73	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
Dir. 98/83/EC	OJ L 330, 5.12.1998, p. 32-54	Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption
Dir. 92/43/EEC	OJ L 206, 22.7.1992, p. 7–50	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
Dir. 2009/147/EC	OJ L 20, 26.1.2010, p. 7–25	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

ANNEX II: DETAILS OF MISSIONS UNDERTAKEN

Member State	Dates of mission	SANTE reference number
Germany	5/3/17 – 15/03/17	2017-6013
Netherlands	26/3/17 – 31/03/17	2017-6012
Denmark	2/5/17 – 10/05/17	2017-6007
Italy	2/5/17 – 11/05/17	2017-6006
Poland	7/6/17 – 14/06/17	2017-6015
Sweden	11/6/17 – 16/06/17	2017-6011

The individual mission reports and Competent Authority comments on draft reports are at http://ec.europa.eu/food/auditsanalysis/audit_reports/index.cfm.

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