



# **The Finnish National Action Plan on the Sustainable Use of Plant Protection Products**

**Interim report  
2011-2017**

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## 1. Summary

The purpose of this interim report is to assess the implementation and impacts of the Finnish National Action Plan on the Sustainable Use of Plant Protection Products for 2011-2017<sup>1</sup> (hereinafter 'the National Action Plan' or 'the NAP'). The NAP was published in March 2011, and it specified the objectives, measures and timetables for reducing the hazards and risks arising from the use of plant protection products ('PPPs'), as well as the dependency on the use of chemical PPPs while maintaining a high level of plant health.

### *Reduced health risks*

Monitoring of PPP residues is the most effective method to analyse concentrations of PPP residues in food. The monitoring has been continued and the share of domestic samples has been increased. The Finnish Customs Laboratory and the Finnish Food Safety Authority Evira have expanded their analysis sets and acquired equipment necessary to perform these analyses. The estimated exposure to PPPs from food is as a rule at a safe level in Finland.

Particular attention has been paid to the risks related to the use of PPPs by consumers. As a new measure, PPPs are now categorised into products intended for professional or for consumer use on the basis of their characteristics. All professional PPP users must acquire certification authorising them to purchase and use PPPs intended for professional use.

The monitoring of acute and chronic poisoning incidents provides information about the products and active substances that pose the highest risk to human health.

### *Reduced environmental risks*

Reducing the use of chemical PPPs has been promoted within the environment payment scheme for farmers. The most effective measures have been those that have reduced the area of agricultural land treated with PPPs. The sampling procedures and analysis set used in the environmental monitoring of PPPs have been expanded. The monitoring results are compared against the relevant environmental quality standards (EQS). Only in few cases has the relevant EQS been exceeded.

During the programming period, the assessment of water body restrictions has been developed towards a more risk-based approach. In addition to the assessment of the risk of spray drift, the risk of run-off and drain flow of PPPs is also assessed in connection with the PPP authorisation process.

The management of risks arising from application equipment has been enhanced by expanding the scope of obligation to inspect sprayers to cover a larger number of sprayers intended for professional use.

### *Raised awareness*

Awareness of the safe use of PPPs has been raised through various means of communication. The single most effective measure has been the establishment of the plant protection training and certification system. During the programming period, all individuals using PPPs in the course of their professional activities acquired the plant protection certification. In addition, the advisory services on PPPs have been developed and supplemented with the principles of integrated pest management.

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<sup>1</sup> Ministry of Agriculture and Forestry 2011: National Action Plan on the Sustainable Use of Plant Protection Products, Helsinki, working group memorandum mmm 2011:4. [http://mmm.fi/documents/1410837/1724539/trm2011\\_4.pdf/30affcf0-bea1-4689-8a77-050a76a53347](http://mmm.fi/documents/1410837/1724539/trm2011_4.pdf/30affcf0-bea1-4689-8a77-050a76a53347)

#### *Promotion of integrated pest management*

During the programming period, several measures have been implemented to promote integrated pest management. The most effective measures concern changes to farmer support schemes, monitoring and advisory and training services to professional PPP users. The topic is also being studied extensively. The major challenge in this area is how to encourage users of PPPs to adopt new practices and information and to apply them in their everyday work.

#### *Introduction of comparative assessment*

In the context of the PPP authorisation process, comparative assessment means replacing PPPs identified as the most harmful with less harmful products. The objective of this measure is to reduce the risks of PPP use. The measure was initiated in 2017, so it will not be possible to assess its impact until the end of the next programming period.

#### *Further measures*

The second National Action Plan will be published in February 2018 for the period 2018-2022. Once the new NAP period ends, the implementation of the entire programming period and its impacts on risks arising from PPPs will be assessed as a whole.

## 2. Introduction

The Finnish National Action Plan on the Sustainable Use of Plant Protection Products<sup>1</sup> (hereinafter ‘the National Action Plan’ or ‘the NAP’) was published as a working group memorandum of the Ministry of Agriculture and Forestry in March 2011. It includes the objectives, measures and timetables for reducing the hazards and risks arising from the use of PPPs. The NAP was drafted in accordance with the Sustainable Use Directive<sup>2</sup>. The Sustainable Use Directive was implemented in Finland through the Act on plant protection products<sup>3</sup> (hereinafter ‘the PPP Act’).

The NAP divides the measures into three periods of implementation: 2011-2014, 2015-2017 and 2018-2020. The present report covers the NAP measures that have been implemented up to 2017. A lot has already been accomplished, but there is still some work left to be done. The report contains an assessment of the success and effectiveness of the actions taken and provides recommendations for future action. The new action plan for the years 2018-2022 (NAP II) will be published separately.

This interim report was edited by Pauliina Laitinen from the Finnish Safety and Chemicals Agency, Tukes. The working group was composed of the members of the NAP steering group: Tove Jern and Antero Nikander, Ministry of Agriculture and Forestry (MMM); Eeva Nurmi, Ministry of the Environment (YM); Jari Poutanen, Finnish Food Safety Authority Evira; Marja Jalli, Pasi Mattila and Marja Poteri, Natural Resources Institute Finland (Luke); Sari Autio, Finnish Organic Research Institute (FORI); Katri Siimes, Finnish Environment Institute (SYKE); Milja Koponen, Finnish Institute of Occupational Health (TTL); Sari Peltonen and Terhi Taulavuori, ProAgria Association of Rural Advisory Centres; Mika Virtanen and Antti Lavonen, Central Union of Agricultural Producers and Forest Owners (MTK); Rikard Korkman, Central Union of Swedish-speaking Agricultural Producers in Finland (SLC); Mari Raininko, Finnish Crop Protection Association KASTE; Asmo Saarinen (Pertti Rajala), Finnish Plant Protection Society; Soile Prokkola, Finnish Association for Organic Farming (Luomuliitto); Hanna Skogster, Central Organisation for Finnish Horticulture (Puutarhaliitto); Eija-Leena Hynninen, Lotta Kaila, Kaija Kallio-Mannila, Pauliina Laitinen and Satu Rantala, Tukes. Many thanks to the members of the steering group and those who commented on the report, such as representatives of Evira, the Regional State Administrative Agency for Eastern Finland, Luke, SYKE, Tukes, and TTL.

Of the original parties involved with the NAP, the MTT Agrifood Research Finland and the Finnish Forest Research Institute (Metla) merged with the Finnish Game and Fisheries Research Institute (RKTL) into the Natural Resources Institute Finland (Luke) at the start of 2015. This report primarily refers to the current name of these institutes.

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<sup>2</sup> Directive 2009/128/EC of the European Parliament and of the Council establishing a framework for Community action to achieve the sustainable use of pesticides. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0071:0086:FI:PDF>

<sup>3</sup> Act on plant protection products (laki kasvinsuojeluaineista) 1563/2011. <http://www.finlex.fi/fi/laki/ajantasa/2011/20111563>

### 3. Objectives, actions taken and effectiveness thereof

The core objective of the National Action Plan on the Sustainable Use of Plant Protection Products is to reduce the risks of PPP use to human health and to the environment. The goal is to reduce the dependency on the use of chemical PPPs while maintaining a high level of plant health. To achieve the core objective, the aim is to:

- promote the development and adoption of integrated pest management and alternative cultivation techniques, practices and methods;
- raise awareness regarding PPPs and safe use thereof;
- reduce the use of the most harmful PPPs with the help of the comparative assessment.

The NAP includes the objectives and measures to be implemented to achieve them. In this interim report, the measures taken are categorised under the following topics: reduced health risks, reduced environmental risks, raised awareness regarding the safe use of plant protection products, promotion of integrated pest management, and introduction of comparative assessment.

#### 3.1. Reduced health risks

The objective of the measures aiming to reduce health risks is to keep the use of PPPs at a level that does not cause risk to consumers or professional PPP users. Furthermore, the use of PPPs may not cause maximum residue levels to be exceeded in food or animal feed or in drinking water. Acceptable exposure levels are set for applicators, workers and bystanders. Active substances and PPPs must comply with these levels in order to be eligible for registration. The aim is also to provide sufficient information on the safe use of PPPs and on ways to reduce risks to both professional and non-professional users.

##### 3.1.1. Consumer protection and PPP residues

*MEASURE: Monitoring of PPP residues is to be continued and it is to be ensured that domestic samples account for a sufficiently large share of the overall sample set. Methods are to be developed to ensure that all relevant PPPs that have been approved in Finland are included in the analysis set. Evira is to modify the database used for the reporting of PPP residues in which results are archived and which enables the comparison, compilation of statistics and reporting of results (e.g. to the EFSA). The annual publication on residue results is also to be revised and the consumer guide updated. The adequacy of existing measures is to be assessed. Evira*

#### Actions taken

*Intake of plant protection products from food is at a safe level*

The Finnish Food Safety Authority Evira controls the level of PPP residues in food and publishes the results once a year<sup>4, 5</sup>. Each year, some 2 000 products are tested for residues of PPPs. Of these products, around 550 are produced in Finland, and of these, more than 300 products are organically produced. In cases concerning domestic non-

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<sup>4</sup> Finnish Food Safety Authority Evira 2017: Residues of plant protection products. <https://www.evira.fi/en/foodstuff/manufacture-and-sales/common-requirements-for-composition/residues-of-plant-protection-products/>

<sup>5</sup> Finnish Food Safety Authority Evira 2017: Control of plant protection product residues in food. <https://www.evira.fi/en/foodstuff/manufacture-and-sales/common-requirements-for-composition/residues-of-plant-protection-products/control/>

conforming batches, the use of PPPs is investigated at the farm level. The levels of residues in food and feed products produced in Finland are the lowest in Europe<sup>6</sup>.

As a rule, the estimated intake of PPPs from food, as well as both acute and chronic exposure levels are at a safe level<sup>7</sup>. It is recommended to favour domestic products or products of EU origin in the diet of young children. According to the results of the baby food control project implemented in 2014<sup>8</sup>, no plant PPP residues were found in baby food. In organic products, residues are detected only rarely.

#### *Fewer residues in domestic foods*

The residue control is performed on a risk basis and through random checks, utilising different types of control technologies. Each year around 2-4 % of samples exceed the maximum allowable limit for residues. Domestic products contain fewer residues than imported foods. The website of the Ministry of Agriculture and Forestry contains a summary of the legislation concerning PPP residues<sup>9</sup>. The database used for the reporting of PPP residues has not been modified.

Previously, Evira published an annual report<sup>10</sup> on residue control results, but it took more than a year after carrying out the controls to publish the report. Since then, the reporting has been simplified and now the results are published on the website of Evira in a timely manner soon after the year under review has ended<sup>5</sup>. A guideline on PPPs targeted at consumers was published in 2012<sup>11</sup>. The food processing industry also performs residue controls independently.

*MEASURE: The consumer safety report is to be completed. Evira*

#### **Actions taken**

*Exposure to PPP residues is characterised by a low chronic exposure level*

In 2010, Evira conducted an investigation<sup>7</sup> on PPP residues in food and on the cumulative risk assessment of the residues. In addition to adults, the assessment was also carried out among groups of children. Furthermore, for the first time, the assessment also covered both chronic and acute exposure. Exposure to PPP residues is characterised by a low chronic exposure level, where higher acute exposure is occasionally seen. Particularly for young children, the probability of exposure to residues does not in all respects fulfil the goals set, and therefore monitoring of exposure to PPPs needs to be continued.

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<sup>6</sup> European Food Safety Authority 2017: The 2015 European Union report on pesticide residues in food. <http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2017.4791/epdf>

<sup>7</sup> Laakso J., Lavinto M., Rasikari H., Karlström U., Siivinen K., Lukkarinen T., Ovaskainen M-L., Sinkko H., Tapanainen H., and Virtanen S. 2010: Ravinnon kasvinsuojeluainejäämät – Kumulatiivinen riskinarviointi [Dietary exposure to plant protection products – a cumulative risk assessment]. Evira Research Reports 3/2010. <https://www.evira.fi/globalassets/tietoa-evilasta/julkaisut/julkaisusarjat/kasvit/ravinnon-kasvinsuojeluainejaamat---kumulatiivinen-riskinarviointi.pdf>

<sup>8</sup> Finnish Food Safety Authority Evira 2017: Lastenruokien valvontahanke – loppuraportti [Baby food control project – final report]. [https://www.evira.fi/globalassets/elintarvikkeet/valmistus-ja-myynti/erityisruokavaliovalmisteet/lastenruokat/lastenruokien\\_valvontahanke\\_2014\\_loppuraportti.pdf](https://www.evira.fi/globalassets/elintarvikkeet/valmistus-ja-myynti/erityisruokavaliovalmisteet/lastenruokat/lastenruokien_valvontahanke_2014_loppuraportti.pdf)

<sup>9</sup> Ministry of Agriculture and Forestry 2017: Torjunta-ainejäämien enimmäismäärät [Maximum residue limits for pesticides]. <http://mmm.fi/torjunta-ainejaamat>

<sup>10</sup> Finnish Food Safety Authority Evira 2017: Kasvinsuojeluaineiden jäämävalvonta Suomessa – 2011 [Pesticide residue control in Finland – 2011]. <https://www.evira.fi/globalassets/tietoa-evilasta/julkaisut/julkaisusarjat/kasvit/kasvinsuojeluaineiden-jaamavalvonta-suomessa---2011.pdf>

<sup>11</sup> Finnish Food Safety Authority Evira 2012: Tiesitkö tämän kasvinsuojeluainejäämistä? [Did you know this about plant protection products?] <https://www.evira.fi/tietoa-evilasta/julkaisut/elintarvikkeet/esitteet/tiesitko-taman-kasvinsuojeluainejaamista/>

#### *Food consumption data have been included in the residue risk assessment model*

For the development of the residue risk assessment model, it is essential to use up-to-date food consumption data<sup>12</sup>. The latest consumption data were included in 2017 in the Pesticide Residue Intake Model (PRIMo 3)<sup>13</sup> used in the residue risk assessment. The average level of public exposure to PPPs can be modelled on the basis of residue control results and food consumption figures. There are some inaccuracies in the PRIMo and food consumption figures for certain products (e.g. brans, beans). The goal is to investigate the reasons for the inaccuracies to the extent possible and to clarify the inaccuracies by comparing the relevant data with corresponding data from other Member States.

Using up-to-date food consumption figures, the PRIMo can be used to model acute and chronic exposure to residues among children, men and women. Furthermore, it is also possible to review the exposure separately among consumers and non-consumers for each foodstuff. For example, the model can be used to investigate the exposure to PPPs among consumers of wheat and among those who do not use any wheat.

#### *Exposure to residues among vegans and non-vegetarians has been studied*

A joint research project by Evira, THL and the universities of Helsinki and Eastern Finland examined food consumption among vegans and non-vegetarians<sup>14</sup>. Data concerning vegan diets have not yet been included in the PRIMo. The consumption figures concerning vegan diets could supplement the data already in the PRIMo for certain foodstuffs. Another objective of the research project is to examine exposure to PPPs using different biomonitoring methods. The aim of the currently ongoing biomonitoring phase of the project is to validate the method of assessing exposure on the basis of food consumption figures.

→ Proposed action: Development of the risk assessment procedure by supplementing and updating the food consumption figures. Monitoring and, if necessary, participating in the development work concerning the PRIMo in the EU.

*MEASURE: Joint investigation with the Finnish Customs Laboratory into the potential for including a greater number of PPPs used in Finland in the analysis set. Evira*

#### **Actions taken**

In connection with the cumulative risk assessment concerning the dietary exposure to residues<sup>7</sup>, Evira also conducted an assessment of the residue analysis set in use, and proposed that the Finnish Customs Laboratory expanded its analysis set to cover several dozens of new active substances. The Finnish Customs Laboratory has expanded its analysis set and acquired the equipment necessary to perform these analyses. The multi-residual analysis of Finnish Customs now covers more than 300 different compounds. The analysis set used at Evira is currently being expanded. The analysis adopted in 2017 covers nearly 185 active substances. In 2018, the analysis set will be expanded to cover more than 200 active substances. In terms of active substances approved in Finland, there are no differences between the analysis sets of the Customs Laboratory and Evira; however, the analysis set used by the Customs Laboratory also covers some active substances that are not approved for use in Finland.

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<sup>12</sup> Paturi M., Tapanainen H., Reinivuo H., Pietinen P. (eds) 2008: The National FINDIET 2007 Survey. Publications of the National Public Health Institute B 23/2008. <http://www.julkari.fi/bitstream/handle/10024/78088/2008b23.pdf>

<sup>13</sup> European Food Safety Authority 2017: Pesticide Evaluation – Tools. <https://www.efsa.europa.eu/en/applications/pesticides/tools>

<sup>14</sup> Elorinne A-L., Alfthan G., Erlund I., Kivimäki H., Paju A., Salminen I., Turpeinen U., Voutilainen S., Laakso J. 2016: Food and Nutrient Intake and Nutritional Status of Finnish Vegans and Non-Vegetarians. PLOS ONE 11(3): e0151296. <https://doi.org/10.1371/journal.pone.0151296>

### 3.1.2. Worker and user protection

*MEASURE: Inclusion of home gardener exposure in operator exposure assessments. Only products requiring minimal personal protective equipment are to be approved for non-professional use. Tukes*

#### Actions taken

The assessment of home gardener exposure was started in 2011. It was also included in the EU guidance document for the Northern Zone in 2013<sup>15</sup>.

PPPs were classified into products suitable for professional use and for consumer use in 2015. When purchasing products approved for professional use, buyers are required to provide the seller with the valid plant protection certificates of the intended users of the product. Products intended for consumer use can be freely acquired by anyone. Products intended for consumer use have been considered sufficiently safe to handle even without the relevant training. As a rule, the use of such products only requires wearing chemical-resistant protective gloves — no special personal protective equipment (PPE) is required.

The exposure of applicators, workers and bystanders is assessed in connection with the relevant product risk assessment. A product may only be approved for use if the exposure remains at an acceptable level. The risk assessment also covers determining the re-entry period for the product. The product-specific re-entry period must be complied with, for example, in greenhouses, where employees could be exposed to harmful concentration levels if starting to work within the space too soon after the application of the product.

*MEASURE: Inclusion of occupational health and safety in training aimed at users, retailers and advisors of PPPs (see 'Training' in section 3.3.2) TTL, Tukes*

#### Actions taken

The Government Decree on Chemical Agents at Work<sup>16</sup> governs the safe use of chemicals in the workplace and obligates employers to protect their employees against hazards arising from exposure to chemicals. Employers' obligations include, among other things, identification and assessment of hazards, providing training for employees on the safe use of chemicals, and arranging for appropriate PPE to be used by employees.<sup>17</sup> In plant protection training, topics important in terms of the protection of workers include occupational safety and health issues and particularly issues that farmer-employers must take into account. These themes could also be covered in the future as part of measures concerning awareness raising and training.

The current plant protection training targeted at professional users also covers themes relevant to the protection of workers, such as regular maintenance and careful use of application equipment, careful use of products, contents of the safety data sheet, product-specific PPE requirements and compliance with these, and employer and employee obligations. An expert from the Finnish Institute of Occupational Health has also prepared a general module concerning the protection of workers, as well as a corresponding module concerning forest management for the training of PPE training providers and examination bodies. The topic of occupational safety was also included

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<sup>15</sup> Finnish Safety and Chemicals Agency Tukes 2018: Plant protection products. <http://www.tukes.fi/en/Palvelut/Forms/Plant-protection-products/>

<sup>16</sup> Government Decree on Chemical Agents at Work 715/2001. <https://www.finlex.fi/fi/laki/ajantasa/2001/20010715>

<sup>17</sup> Occupational Safety and Health Act 738/2002. <https://www.finlex.fi/fi/laki/ajantasa/2002/20020738>

in the online training materials provided by Tukes<sup>18, 19</sup>. These materials are available to trainers and freely available on the internet to ensure that the information reaches all professional PPP users.

In connection with training arranged for tree nursery workers, it has been revealed that the guidelines concerning the protection of tree planters involve some inaccuracies regarding the requirements for protective gloves. For example, not all product labels indicate whether planting gloves need to be chemical-resistant. Tree nursery companies' internal training and guidelines for tree planters emphasise the need to use nitrile gloves. Consequently, there is clearly a need to prepare uniform guidelines specifying the appropriate gloves for tree planters and how to formulate the PPE requirements on the labels of tree plant shipments.

*Training has been arranged for occupational safety and health inspectors and occupational health care providers*

It is important that the inspectors of the Regional State Administrative Agency (AVI) and occupational health care providers are familiar with the basic legal requirements concerning, for example, plant protection certification so that they can provide appropriate advice to entrepreneurs and particularly employers. The area of occupational safety and health at the AVI is responsible for carrying out checks on farms. In terms of the management of chemical hazards, the aim of these checks is to ensure that:

- the workplace has an up-to-date list of the chemicals used and of the related safety data sheets;
- the hazards involved in using such chemicals are identified and assessed;
- the measures necessary to enhance occupational safety are taken; and
- occupational safety is supervised and monitored.

New plant protection practices and the requirements of the plant protection legislation were covered in the training arranged in 2014 for AVI inspectors responsible for occupational safety and health inspections in the primary production sector. The topic was also discussed in the supplementary training for occupational health care staff specialised in occupational health care for farmers.

→ Proposed action: The quality of indoor air in tractors during the spraying of PPPs should be investigated. A thesis examining the topic of indoor air in tractors<sup>20</sup> revealed that the standard air filters used in tractors are not sufficient to protect the worker against exposure to PPPs.

→ Proposed action: Development of PPE requirements on product labels to be more precise and user-friendly. Informing professional users of appropriate protection methods.

*MEASURE: Investigation of means of gathering information on acute poisoning incidents and, as far as possible, chronic poisoning incidents related to PPPs. Tukes*

## **Actions taken**

### *Acute poisoning incidents*

The Poison Information Centre is responsible for gathering information on acute poisoning incidents. The data are collected in a register maintained by the Poison Information Centre, but no separate statistics are collected on poisoning incidents involving PPPs. Occupational health care providers are also required to investigate possible chemical exposure involved in the work and to monitor the impacts of work-related health hazards on employee health.<sup>21</sup> Exposure to

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<sup>18</sup> Finnish Safety and Chemicals Agency Tukes 2014: Kasvinsuojeluaineiden kestävä käyttö [Sustainable use of plant protection products]. [www.tukes.fi/kasvinsuojelu](http://www.tukes.fi/kasvinsuojelu)

<sup>19</sup> Finnish Safety and Chemicals Agency Tukes 2014: Hållbar användning av växtskyddsmedel [Sustainable use of plant protection products]. [www.tukes.fi/vaxtskydd](http://www.tukes.fi/vaxtskydd)

<sup>20</sup> Riihelä T. 2017: Traktoreiden suodattimet ja kasvinsuojeluaineille altistuminen [Tractor Filters and Exposure to Pesticides]. Bachelor's thesis, Tampere University of Applied Sciences, Automobile and transport engineering. <http://urn.fi/URN:NBN:fi:amk-201702122304>.

<sup>21</sup> Government Decree on the Principles of Good Occupational Health Care Practice, the Content of Occupational Health Care and the Qualifications of Professionals and Experts 708/2013. <http://www.finlex.fi/fi/laki/alkup/2013/20130708>

certain PPPs can be monitored, for example, through regular blood tests. Data concerning personal health status is considered confidential personal data and thus cannot be included in any reports.

The Finnish Institute of Occupational Health (TTL) has investigated poisoning incidents caused by PPPs and the related symptoms in two projects. Together with the Poison Information Centre, the TTL also carried out an investigation on suspected poisoning incidents in 2014, but the poor reach of the survey decreased the validity of the results. An interview survey targeted at farmers<sup>22</sup> (n = more than 3 000) examined, among other things, plant protection work safety practices, symptoms experienced by workers, and the use and clarity of safety guidelines. The number of cases involving acute display of symptoms or acute poisoning has decreased even though the use of PPE has not significantly increased in recent years. The results of the survey were compared with corresponding data gathered a decade earlier. This probably stems from the fact that PPPs approved after the entry into force of the EU Regulation concerning the placing of plant protection products on the market are safer for users than earlier products. In addition, safer formulations, improved application technologies and enhanced expertise among users have also contributed to the reduction in the number of poisoning incidents.

#### *Chronic poisoning incidents*

Chemical exposure in work and exposure of workers to chemicals must be regularly monitored.<sup>23, 24</sup> The Finnish Institute of Occupational Health has prepared guidelines for occupational health care providers on how to carry out monitoring.<sup>25, 26</sup> The guidelines also cover the monitoring of PPPs. Unfortunately, the methods available to identify a link between exposure to PPPs and health problems are still scarce.

For users of organophosphates or carbamates, the level of acetylcholinesterase inhibitors in blood is monitored. Currently, dimethoate is the only organophosphate approved for use in Finland. The total number of samples taken each year is less than ten. For users of pyrethroids, the level of phenoxybenzoic acid (a degradation product of pyrethroids) in urine is monitored. The monitoring results have not caused any concern about potential poisoning incidents. The Finnish Institute of Occupational Health also participates in the Human Biomonitoring for EU project<sup>27</sup>. The project also investigates the aggregate effects of PPPs, and new exposure monitoring methods may also be developed within the framework of the project, if deemed necessary.

The monitoring of work-related diseases is based on the legislation governing occupational diseases<sup>28</sup>. A health detriment must have a medically justified causal link to chemical exposure from work before it can be included on the list of occupational diseases<sup>29</sup>. In 2006-2014, 0-2 occupational diseases linked to PPPs, such as allergic (contact) dermatitis or asthma, have been reported per year. Individuals exposed to carcinogenic substances (CLP categories 1A, 1B) in their work are registered in the ASA register<sup>30</sup>. The list of carcinogenic substances does not contain any PPPs.

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<sup>22</sup> Finnish Institute of Occupational Health 2016: Työterveys ja maatalous Suomessa 2014 [Occupational health and agriculture in Finland in 2014]. <https://www.julkari.fi/bitstream/handle/10024/130362/TyoterveysJaMaatalousSuomessa2014.pdf>

<sup>23</sup> Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R1107&from=EN>

<sup>24</sup> Government Decree on Medical Examinations in Work that Presents a Special Risk of Illness 1485/2001. <http://www.finlex.fi/fi/laki/alkup/2001/20011485>

<sup>25</sup> Karhula A-L 2006: Työterveystarkastukset työterveyshuollossa [Occupational health examinations in occupational health care]. Finnish Institute of Occupational Health, 2<sup>nd</sup> edition, 524 pages.

<sup>26</sup> Koponen, M. 2010: Kasvinsuojeluaineet ja työturvallisuus [Plant protection products and occupational safety]. The Centre for Occupational Safety, 32 pages.

<sup>27</sup> HBM4EU 2018: Coordinating and advancing human biomonitoring in Europe to provide evidence for chemical policy making. [www.hbm4eu.eu](http://www.hbm4eu.eu)

<sup>28</sup> Workers' Compensation Act 459/2015. <http://www.finlex.fi/fi/laki/alkup/2015/20150459>

<sup>29</sup> Government Decree on the list of occupational diseases (valtioneuvoston asetus ammattitautiluettelosta) 769/2015. <http://www.finlex.fi/fi/laki/alkup/2015/20150769>

<sup>30</sup> Finnish Institute of Occupational Health 2018: ASA-rekisteri [ASA register]. <https://www.ttl.fi/rekisterit/asa-rekisteri/>

According to a cancer prevalence study covering 1.5 million [sic; should be 15 million] people in Nordic countries, compared to other occupational categories, the cancer incidence rate is lower among farmers and gardeners.<sup>31</sup>

#### *Emergency response guidelines for certain PPPs*

In Finland, emergency response planning guidelines (i.e. OVA guidelines) have been drafted for certain PPPs. These include MCPA, diquat, pyraclostrobin and alpha-cypermethrin.<sup>32</sup> The active substances of these PPPs have been analysed using the prioritisation tool developed by the Finnish Institute of Occupational Health and Verifin, and the results are published in the KEMPRI database. The OVA guidelines are primarily targeted at the emergency response, environmental and health authorities.

### **3.1.3. Effectiveness of measures aiming to reduce health risks**

#### *How can the measures taken reduce the risks arising from the use of PPPs?*

Enhancing residue control and expanding the analysis sets help to generate more data about potential exposure of consumers to PPPs. More effective and extensive control also provides comprehensive information about the exceeding of maximum residue levels and helps to perform more thorough assessments of overall exposure. Furthermore, the investigation of the exposure level among adults and children according to their food consumption habits helps to design communications measures that can steer consumers to choose products that are as safe as possible. Monitoring of the maximum residue levels also ensures that products that are unsafe to use cannot enter the markets.

Particular attention has been paid to the risks related to the use of PPPs by consumers. As part of the product authorisation process, the risks caused to users from consumer uses of PPPs are also assessed, so consumer use of PPPs can be restricted at the product authorisation stage. In accordance with the new categorisation of PPPs to those suitable for professional uses and those for consumer uses, only products that involve minimum risks and do not require using professional-grade PPE have been approved for consumer use. If a consumer wants to use products exclusively approved for professional use, they may acquire a plant protection certificate intended for professional users. The training and certification will provide the consumer with sufficient information about the safe use of products approved for professional use.

Providing training for farmers and their stakeholder groups increases awareness and understanding about the health risks involved in PPPs and about protection against such risks. The results of the research investigating health and safety at work among farmers<sup>22</sup> can also be utilised in the future in monitoring the achievement of objectives; e.g. has the number of poisoning incidents decreased or what is the status of the use of PPE among farmers?

The monitoring of acute and chronic poisoning incidents provides information about the products and active substances that pose the highest risk to human health. It is possible to intervene with the sale of problematic products by changing the authorisation requirements or by withdrawing authorisation.

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<sup>31</sup> Pukkala E., Martinsen J.I., Lynge E., Gunnarsdottir H.K., Sparén P, Tryggvadottir L., Weiderpass E. & Kjaerheim K. 2009: Occupation and cancer – follow-up of 15 million people in five Nordic countries. *Acta Oncologica* 48:5, 646-790. <http://www.tandfonline.com/doi/pdf/10.1080/02841860902913546>

<sup>32</sup> Finnish Institute of Occupational Health 2018: Onnettomuuden vaaraa aiheuttavat aineet – turvallisuusohjeet (OVA-ohjeet) [Safety guidelines concerning substances involving the risk of accident (OVA guidelines)]. <http://www.ttl.fi/ova/>

### *What still needs to be done?*

The protection of workers has been included as part of PPP training, but its effectiveness is difficult to assess. Other measures aimed at reducing health risks have integrated tools for monitoring the success of the measures.

### *Market surveillance of PPPs and the control of the use of PPPs enable the reduction of health risks*

One of the objectives specified in the NAP was to reduce health risks by increasing controls, but the NAP did not propose a dedicated measure to achieve this objective. The Finnish Safety and Chemicals Agency Tukes and the Centres for Economic Development, Transport and the Environment (ELY Centres) are responsible for the market surveillance of PPPs and control of the use of PPPs. Market surveillance includes ensuring that the labels used on marketed PPPs comply with the product labels approved by Tukes. In addition, the market surveillance involves performing laboratory analyses to check that the marketed PPPs conform to the relevant requirements. Another objective of the market surveillance is to identify potential counterfeit PPPs. No significant breaches have been detected. Minor deficiencies in product labelling have been corrected by providing guidance to the relevant operators. Furthermore, the area of occupational safety and health at the Regional State Administrative Agency (AVI) is responsible for monitoring workplaces with workers working under employment contracts. The steering of the control of the use of PPPs will be transferred from Tukes to the Finnish Food Authority, which will be established at the beginning of 2019.

The use of PPPs in accordance with the product labels approved by Tukes keeps PPP residues at an acceptable level in products of plant origin, animal feed and household water and groundwater. The use of PPPs according to instructions has not always been enough to prevent residues from ending up in surface waters or groundwater, but the residue levels detected have not caused any health risks. Purifying even small residue concentrations from household water causes significant costs to water supply plants.

Control of the use of PPPs includes checking that PPPs are used in accordance with the instructions on the product label. In addition, the control involves verifying that PPPs have been used only for approved purposes, and that any re-entry periods, consecutive restrictions on use, groundwater restrictions and storage instructions are observed. The good residue control results show that Finnish operators use PPPs in an appropriate manner.

Control of the use of PPPs only rarely reveals such breaches in the use of PPPs that require Tukes to take major action such as disposing of the produced crop. An example of such a breach is exceeding the maximum residue level (MRL) in the harvested crop. Usually, the breaches are minor and only require instructing the operator to correct the deficiencies detected in the controls. An example of a minor breach is missing records concerning the use of PPPs in circumstances where the use of PPPs is minimal and the substances used involve only a minimum risk.

### *Effectiveness of the controls*

The safe use of PPPs requires that:

- the product labels and contents of PPPs comply with the product authorisation issued by Tukes and
- PPPs are used in accordance with the product label approved by Tukes.

The market surveillance of PPPs enables any breaches concerning product label information on PPPs available on the market to be addressed, as well as deficiencies concerning product contents. Control of the use of PPPs

enables any breaches concerning the use of PPPs to be addressed. According to the control results, abuse of PPPs is not common.

### 3.2. Reduced environmental risks

The objective of the measures aiming at reducing environmental risks is to develop and steer the appropriate and sustainable use of PPPs so that minimum risk is caused to the environment and nature. The users of PPPs are required to choose the PPP or control method which causes the lowest risk to the environment<sup>33</sup>. The good chemical status of surface waters and groundwaters<sup>34</sup> must be maintained in terms of PPPs.

#### 3.2.1. Development of risk assessment-based environmental restrictions

*MEASURE: Investigation of the potential for introducing a risk-based approach in the determination of product-specific water body restrictions. Determination of how spraying techniques can be used to reduce spray drift, so that restrictions can be adapted according to the technique employed. Tukes, Luke, SYKE*

#### Actions taken

##### *Product-specific water body protection*

The product-specific water body risk assessment is currently based on the FOCUS models<sup>35</sup> agreed at the EU level. In addition to spray drift, the model also takes into account run-off and drain flow. The risk management methods in use include nozzles that reduce the risk of spray drift, buffer zones to water bodies and buffer zones with perennial vegetation. Where required, drain flow can be prevented through usage period restrictions; for example, the use may be restricted during rainy periods in autumn. Run-off can be prevented through a 10 metre wide product-specific buffer zone. If the risk management methods are not sufficient to protect aquatic organisms, the product cannot be approved for use.

##### *Surface waters are protected against spray drift and run-off of PPPs.*

The product-specific risk assessment must specify either the buffer zones to water bodies that help to reduce spray drift or the run-off buffer zone. The buffer zone is determined on the basis of whether more product is likely to end up in surface waters through spray drift or run-off. The product-specific spray drift buffer zone can be up to 50 metres, but the run-off buffer zone is 10 metres. Vegetation prevents run-off efficiently and therefore it is recommended to establish perennial grasslands on run-off buffer zones. Farmers may apply for environment payments for perennial grasslands established on run-off buffer zones.

##### *Protection of water bodies against spray drift*

Risk-based buffer-zones to protect water bodies against spray drift were introduced in 2015. The width of the new buffer zones may be reduced in accordance with the instructions for use if using an application technique that reduces the risk of spray drift. The Tukes website<sup>36</sup> contains a list of the nozzles and maximum allowable pressures that can reduce the risk of spray drift by 50/75/90 %. The buffer zone for arable crops is at most 20 metres, for berry bushes at most 30 metres and for fruit trees at most 50 metres. The publication of the nozzle list was based on a joint investigation by Luke and Tukes on how to reduce the risk of spray drift through different application techniques.

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<sup>33</sup> Chemicals Act 599/2013. <http://www.finlex.fi/fi/laki/ajantasa/2013/20130599#L4P19>

<sup>34</sup> Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32000L0060>

<sup>35</sup> Joint Research Centre 2018: FOCUS DG SANTE. <https://esdac.jrc.ec.europa.eu/projects/focus-dg-sante>

<sup>36</sup> Finnish Safety and Chemicals Agency Tukes 2018: Vesistörajoitus [Water body restrictions]. [www.tukes.fi/vesistorajoitus](http://www.tukes.fi/vesistorajoitus)

Extensive efforts have been made to raise awareness about water body buffer zones, for example, through presentations, press releases, articles in newspapers and magazines and agricultural and horticultural exhibitions. The information campaign has reached different user categories in the sectors of agriculture, forestry and horticulture through the training system and various operators referred to in the NAP.

For several products, the water body buffer zone requirement was decreased because the product-specific risk assessment required a narrower buffer zone compared to the previous hazard-based buffer zone. For some products, the buffer zone was increased. On the basis of the risk assessment, the good chemical status of surface waters should not deteriorate if the farmers comply with the buffer zones required in the product labels. However, it should be remembered that these risk assessments are based on modelling, and therefore it is still important to continue to monitor the concentrations of active substances in water bodies. If the environmental quality standards are exceeded, the buffer zones can be increased.

An ongoing thesis work<sup>37</sup> investigates the risk management alternatives for low-dose substances and phenoxy-acid herbicides and examines the concentrations of PPPs in rivers. The conclusion from the interviews with farmers conducted for the thesis was that the guidelines concerning the protection of water bodies should be clarified and better communicated to farmers.

#### *Impacts of techniques reducing spray drift on the effectiveness of herbicides*

With financing from the Ministry of Agriculture and Forestry, Luke investigated the impact of nozzles that reduce spray drift on the effectiveness of certain herbicides in broadleaf and grass weed control among cereal and pea crops during the 2015 growing season. The field test was implemented using both tractor-mounted sprayers and portable field-test sprayers. Nozzles reducing the risk of spray drift do not decrease the effectiveness of the products in controlling weeds. The investigation demonstrated that the use of nozzles reducing spray drift in good weather conditions does not significantly reduce the effect of herbicides in controlling weeds and verified that this new risk management measure does not prevent the appropriate use of PPPs.

#### *Recommendation concerning the protection of vegetation outside the treatment area*

On the basis of a risk assessment, Tukes recommends establishing a buffer zone to protect crops and natural flora located outside the treatment area. This recommendation is product-specific and risk-based: using a buffer zone is only recommended if the risk assessment shows that spray drift of the product could have harmful effects on other vegetation. The buffer zone may be reduced according to the instructions if using nozzles decreasing spray drift.

*MEASURE: Investigation of the potential for employing the conditions for agri-environmental support to encourage farmers to establish permanently plant-covered buffer zones near water bodies to reduce the risks of PPPs. Investigation of the potential of agri-environmental support to encourage farmers to protect groundwater more extensively and in different ways during preparations for the new programming period beginning in 2014. MMM, Tukes, SYKE*

*MEASURE: Investigation of the feasibility of the use of permanent plant cover and buffer zones of sufficient width in reducing the risk to aquatic organisms caused by PPPs. Tukes, SYKE, MMM*

### **Actions taken**

#### *Protection of water bodies in the environment payment scheme*

The 2015-2020 environment payment scheme includes a mandatory measure that parcels bordering water bodies must have a 3-10 metre wide buffer zone covered with vegetation to prevent the run-off of nutrients and PPPs

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<sup>37</sup> Saari, K. 2017: Pienannosherbisidien ja fenoksihappojen riskienhallintavaihtoehto [Risk management alternatives for low-dose herbicides and phenoxy acids]. A Master's thesis seminar session concerning ongoing thesis preparation, 22 November 2017, the University of Eastern Finland.

into the water body. Other measures protecting water bodies include the establishment of perennial environment grasslands, biodiversity strips and buffer zones, which all aim to reduce the run-off of fertilisers and PPPs into water bodies and main drains.

A biodiversity strip can be established along the margins of a reference parcel that is not adjacent to a body of water. A biodiversity strip, which may not be more than three metres wide, promotes biodiversity and provides a favourable habitat for pollinators and natural enemies of pests. Of all the measures promoting biodiversity, nature management fields sown with meadow plants are the best way to secure pollination compared with biodiversity strips established on field and forest margins<sup>38</sup>.

Farmers may establish buffer zones on parcels located on a Natura site, groundwater area, or along the margins of water bodies or main drains, or on parcels bordering wetlands that are managed under an environmental contract. In certain archipelago areas, it is possible to establish a buffer zone on all parcels eligible for compensation under an environmental commitment. The buffer zone must be more than three metres wide. It must also have perennial grassland that is not treated with fertilisers or PPPs.

PPPs may only be used on buffer strips, biodiversity strips and buffer zones in the patch treatment of difficult cases of weed, and as a rule, no fertilisers may be used on such strips or zones.

#### *Groundwater protection*

Some PPPs and their degradation products can easily migrate in soil and therefore their use in groundwater areas (groundwater area classes I and II / 1 and 2) is either completely forbidden or restricted. Bans or restrictions on use must be indicated on the product label. An unconditional ban on the use in groundwater areas must be indicated on the product label as follows: 'This plant protection product (and/or its degradation product(s)) may migrate in soil. Therefore, it is prohibited to use the product in groundwater areas important for water supply or other groundwater areas suitable for water supply (groundwater area classes I and II /1 and 2). A minimum 30-100 metres wide buffer zone that is not treated with the plant protection product must be left around wells and springs used for household water supply. The use of the plant protection product in areas with coarse-grained sandy soil or coarser soil types should be avoided.'

#### *Minimum requirements for the use of PPPs concern environment payments and organic production*

In 2016, approximately 90 % of all farmers were committed to the environment payment scheme. The requirement for all committed farmers is that there must be a three- metre wide buffer strip covered with vegetation on fields adjacent to a body of water. In addition, the area of riparian zone grasslands indicated in parcel-specific measures in environmental commitments totalled 60 000 ha. Part of the area is located in groundwater areas. The area target for the catch crop measure was also exceeded several times over. Catch crops use nutrients left in the soil and prevents the proliferation of weeds. In organic farming, different types of undersown crops are used to control weeds.

Since 2015, organic payments have been included in the Rural Development Programme in a separate payment scheme. The area of organically cultivated land is steadily increasing. According to Evira's preliminary data, the area of organically cultivated land and fields in a transition stage totalled 263 580 ha in 2017, which is 11.7 % of the total arable land in Finland.

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<sup>38</sup> Miettinen A., Alanen E-L., Hyytiäinen K. and Kuussaari M. 2002: Peltoluonnon monimuotoisuutta edistävät toimenpiteet edullisuusjärjestykseen [Measures promoting biodiversity on cultivated fields categorised according to their costs]. [https://www.researchgate.net/publication/265652485\\_Peltoluonnon\\_monimuotoisuutta\\_edistavat\\_toimenpiteet\\_edullisuusjarjestykseen\\_in\\_Finnish](https://www.researchgate.net/publication/265652485_Peltoluonnon_monimuotoisuutta_edistavat_toimenpiteet_edullisuusjarjestykseen_in_Finnish)

*MEASURE: Clarification of the criteria used by other EU countries for the determination of groundwater restrictions; PPP use v. groundwater areas. Tukes, SYKE*

#### **Actions taken**

The guidance document for the Northern Zone provides Member State -specific guidelines for the modelling of concentrations in groundwater. There are differences in the calculation models, input parameters and scenarios between Northern Zone Member States. Sweden, Norway and Denmark use the MACRO model and national scenarios. Finland and the Baltic States, on the other hand, use the EU FOCUS Pearl and Pelmo models and the Hamburg and Jokioinen scenarios developed in the EU. On average, migration of PPPs is slightly lower according to the FOCUS scenarios compared with the MACRO scenarios. Furthermore, Denmark and Lithuania use stricter input parameters in modelling compared with other countries. Due to this, concentrations according to groundwater modelling vary between Member States. The investigations performed on the topic did not lead to any changes in the criteria for imposing groundwater restrictions.

Acceptability of PPPs is also affected by the maximum allowable concentrations of active substances and their main degradation products in groundwater set in the Drinking Water Directive (0.1 µg/l for a single substance or product and 0.5 µg/l for the sum of these). The toxicological relevance of degradation products is assessed in accordance with the relevant EU guidelines<sup>39</sup>. The PPP authorisation practices vary in different countries in terms of toxicologically irrelevant degradation products. In Denmark, a product may not be approved for use if the concentration of a toxicologically irrelevant degradation product exceeds the limit value of 0.1 µg/l. In the corresponding situation in Finland, the use of the product is only prohibited in classified groundwater areas. In addition, a product may not be approved for use in Finland, if the sum of toxicologically irrelevant degradation products exceeds the limit value 10 µg/l. In other Nordic countries and in the Baltic States, the limit value for the concentration of toxicologically irrelevant degradation products in groundwater is 10 µg/l.

*MEASURE: Promotion of diverse crop rotation to be investigated during preparations for the new programming period beginning in 2014. MMM, Tukes, SYKE*

#### **Actions taken**

Since 2015, the conditions for the greening payments included in the single farm payment scheme have covered the requirement for three crops, which promotes crop rotation. On farms exceeding 30 ha in size, a minimum of three different crops must be cultivated, and on 10-30 ha farms, a minimum of two crops. As an exception, only two crops are required to be grown on farms exceeding 10 ha in size and that are located north of the 62 parallel or in adjacent areas. The requirement for three crops does not apply to farms of which more than 75 % is covered by grasslands. Furthermore, 5 % of the arable land on farms located in Southwest Finland, Uusimaa and Åland must be reserved for ecological focus areas (EFAs). Acceptable EFA types include fallow land, nitrogen-fixing crops, short-rotation energy wood and landscape features in accordance with the cross-compliance conditions of agri-environmental support. As from 2018, it is prohibited to apply PPPs on EFAs.

According to Evira's preliminary data, the area of organically cultivated land with versatile crop rotation totalled 226 700 ha in 2017. This is more than 11 % of the total arable land in Finland and the figure is steadily increasing.

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<sup>39</sup> European Commission 2003: Guidance document on the assessment of the relevance of metabolites in groundwater of substances regulated under council directive 91/414/EEC. [https://ec.europa.eu/food/sites/food/files/plant/docs/pesticides\\_ppp\\_app-proc\\_guide\\_fate\\_metabolites-groundwtr.pdf](https://ec.europa.eu/food/sites/food/files/plant/docs/pesticides_ppp_app-proc_guide_fate_metabolites-groundwtr.pdf)

*MEASURE: Determination of alternative washing methods for different sprayers (e.g. biobed, wash tower).*  
Tukes, Luke

### **Actions taken**

Training materials emphasise the importance of the selection of the sprayer washing site and recommend washing on a biobed or a grass-covered area, for example, to prevent the water used in the cleaning from ending up in surface waters or groundwater. A guide published by the Central Organisation for Finnish Horticulture contains instructions on how to select an appropriate washing and filling site and to use a biobed, but it does not include instructions on how to construct a biobed. The Farmit.net service maintained by agricultural enterprises includes instructions on building a biobed<sup>40</sup>. Biobeds are also used in some tree nurseries.

→ Proposed action: Preparing a guide on appropriate washing methods and on washing site selection utilising relevant research results and, for example, the biobed guide published in Sweden<sup>41</sup> and the biobed guide published by the Finnish Forest Research Institute<sup>42</sup>.

### **3.2.2. Setting of environmental quality standards (EQS) for all PPPs on the market**

*MEASURE: Setting of environmental quality standards (EQS) for all PPPs on the market.*

### **Actions taken**

A report published by SYKE proposed setting of EQSs for all PPPs on the market in 2009<sup>43</sup>. The EQSs specified in the report have been used at SYKE to evaluate monitoring results. Monitoring results have been primarily compared with the values specified in the Government Decree on Substances Dangerous and Harmful to the Aquatic Environment<sup>44</sup>, but these values concern only a few PPPs available on the market. Results have also been compared with the EQS proposals by SYKE and with Swedish reference values<sup>45</sup>. For some PPPs observed, it has not been possible to find appropriate EQSs, but corresponding annual average EQSs have been determined for these on the basis of the ecotoxicological data included in the PPDB database<sup>46</sup> maintained by the University of Hertfordshire.

According to monitoring results, EQSs are exceeded only rarely. It could be useful to prepare principles and operating instructions for situations where the EQS of an active substance is exceeded. Identifying the source of contamination requires collaboration between research institutes and authorities. If the use concerns an authorised use, there should be policies in place to enable amending the instructions for use or withdrawing the marketing authorisation to ensure that the use of the PPP will not cause any further problems. The monitoring of impacts of risk management measures on residues of active substances in water should be enhanced.

→ Proposed action: Updating of EQSs for PPPs approved for use since 2009 and drafting an action plan for situations where the EQS is exceeded.

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<sup>40</sup> Farmit.net 2018: Biopeti – ruiskun pesu- ja täyttöpaikka [Biobed – a site for washing and filling sprayers]. <https://www.farmit.net/kasvinviljely/kasvinsuojelu/ruiskutusvinkit/biopeti>

<sup>41</sup> Säkert Växtskydd (Safe Plant Protection) 2018: Bygg Säkert. [https://www.sakertvaxtskydd.se/PageFiles/385/2013-06-04\\_Broschyr\\_Biobadd\\_Screen.pdf](https://www.sakertvaxtskydd.se/PageFiles/385/2013-06-04_Broschyr_Biobadd_Screen.pdf)

<sup>42</sup> Veijalainen A-M., Juntunen M-L., Vääntinen K. and Heinonen-Tanski H. 1999: Metsätaimitarhojen jätehuolto-ohjeita jätehuoltojärjestelyjen kehittämiseksi [Waste management instructions for tree nurseries to improve waste management arrangements]. Finnish Forest Research Institute Research Papers No 738. 58 pages. <http://jukuri.luke.fi/handle/10024/521369>

<sup>43</sup> Kontiokari V. and Mattsoff L. 2011: Proposal of Environmental Quality Standards for Plant Protection Products. The Finnish Environment 7/2011. [https://helda.helsinki.fi/bitstream/handle/10138/37029/FE\\_7\\_2011.pdf?sequence=3](https://helda.helsinki.fi/bitstream/handle/10138/37029/FE_7_2011.pdf?sequence=3) <sup>44</sup> Government Decree on Substances Dangerous and Harmful to the Aquatic Environment 1022/2006. <http://www.finlex.fi/fi/laki/ajantasa/2006/20061022>

<sup>45</sup> Kemi Kemikalieinspektionen (National Chemical Inspectorate) 2018: Riktvärden för ytvatten (Target values for surface water). <https://www.kemi.se/hitta-direkt/bekämpningsmedel/vaxtskyddsmedel/riktvarden-for-ytvatten>

<sup>46</sup> University of Hertfordshire 2018: The PPDB - Pesticide Properties Database. <http://sitem.herts.ac.uk/aeru/ppdb/>

### 3.2.3. Adequate and continuous environmental monitoring of PPPs *MEASURE: Organisation of sufficient environmental monitoring of PPPs. SYKE*

#### Actions taken

##### *Monitoring of agriculture and forestry loads*

Concentrations of PPPs in surface waters and groundwater have been monitored in the monitoring programme for agriculture and forestry loads and their impacts on water bodies (the MaaMet programme) since 2007.<sup>47</sup> The monitoring results from years 2007-2012 have been published for surface waters. In connection with the report, a database containing the sample-specific results for each analysis performed was also published<sup>48</sup>. The MaaMet monitoring results for groundwater bodies were published in 2017<sup>49</sup>. The monitoring is designed to meet obligations laid down in the Water Framework Directive<sup>34</sup>, the Directive on environmental quality standards in the field of water policy<sup>50</sup> and the Directive on priority substances in the field of water policy<sup>51</sup>. The monitoring results have been utilised, for example, in the classification of water status. The results from the monitoring of surface waters and groundwater are also available from the environmental data management system Hertta, which is part of the OIVA service<sup>52</sup>.

##### *Monitoring of surface waters*

In 2013 and 2014, a total of around 150 samples were taken from surface waters. On average, the samples were taken from smaller bodies of flowing water than in previous years. Due to the location of the sampling sites and advanced analytic methods, nine substances that have not been previously detected from water bodies were observed. The most common substances identified were still phenoxy herbicides (MCPAs), but the most common pesticide observed in 2014 was clothianidin, which is a neonicotinoid. The substance has not been previously analysed. The imputed annual concentrations of two low-dose herbicides, namely triasulfuron and florasulam, achieved or exceeded the EQS proposed for them. Of these, florasulam has not been previously analysed.

The surface water monitoring was not performed in 2015, and in spring 2016, the surface water herbicide concentration monitoring of the MaaMet project was focused in Savijoki, where the monitoring will continue until autumn 2018. The aim is to also utilise the results of the intensive monitoring performed in Savijoki<sup>53</sup> in the use of PPPs in the related catchment area<sup>54</sup>.

<sup>47</sup> Finnish Environment Institute 2018: Maa- ja metsätalouden kuormituksen ja sen vesistövaikutusten seuranta (MaaMet) [Monitoring of agriculture and forestry loads and their impacts on water bodies (MaaMet)]. <http://www.syke.fi/hankkeet/maamet>

<sup>48</sup> Karjalainen A.K., Siimes K., Leppänen M.T. and Mannio J. 2014: Maa- ja metsätalouden kuormittamien pintavesien haitta-aineseuranta Suomessa. Seurannan tulokset 2007–2012 [Monitoring of contaminants in Finnish surface waters affected by agriculture and forestry – Monitoring results from 2007-2012]. Reports of the Finnish Environment Institute 38/2014. <https://helda.helsinki.fi/handle/10138/153152>.

<sup>49</sup> Juvonen J., Hentilä H. and Aroviita J. 2017: Maa- ja metsätalouden kuormittamien pohjavesien MaaMet-seuranta - Torjunta-aineet ja ravinteet 2007–2015 [Monitoring of groundwater bodies affected by agriculture and forestry (MaaMet) – Pesticides and nutrients 2007-2015]. Reports of the Finnish Environment Institute 15/2017. <http://hdl.handle.net/10138/192749>

<sup>50</sup> Directive 2008/105/EC of the European Parliament and of the Council on environmental quality standards in the field of water policy. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0105>

<sup>51</sup> Directive 2013/39/EU of the European Parliament and of the Council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013L0039>

<sup>52</sup> Finnish Environment Institute 2018: Avoimet ympäristötietojärjestelmät [Open environment data systems]. [http://www.syke.fi/fi-FI/Avoin\\_tieto/Ymparistotietojarjestelmat](http://www.syke.fi/fi-FI/Avoin_tieto/Ymparistotietojarjestelmat)

<sup>53</sup> Project SAVE 2017: SAVE – Saving the Archipelago Sea by applying gypsum to agricultural fields. Blog archive. Kasvinsuojeluaineiden pitoisuuksia seurataan Savijoella [PPP concentrations are monitored in Savijoki]. <http://blogs.helsinki.fi/save-kipsihanke/2017/09/04/kasvinsuojeluaineiden-pitoisuuksia-seurataan-savijoella/>

<sup>54</sup> Project SAVE 2017: SAVE – Saving the Archipelago Sea by applying gypsum to agricultural fields. Blog archive. <http://blogs.helsinki.fi/save-kipsihanke/2017/12/07/kasvinsuojeluaineiden-kaytto-savijoen-valuma-alueella/>

In summer 2017, PPP concentrations were also monitored in Loimijoki in addition to Savijoki. Additional samples were also taken from a few river sites that were included in the river mapping activity carried out in the 'Vesien- ja merenhoidon uudet prioriteettaineet' project (UuPri)<sup>55</sup> concerning the new priority substances for the management of water bodies and the sea. The UuPri river mapping activity carried out in 2016-2017 covered 13 Finnish bodies of flowing water, but only some of these are located in predominantly rural areas and the majority of the samples were taken outside the growing season. However, the river mapping still supplemented the data about PPP background concentrations, demonstrated that the sampling should be primarily performed during the growing season, and provided measurement data about concentrations lower than the limit of quantification, which is important, for example, when reporting concentration levels to the EU. Instead of PPPs, the most common substance detected in water bodies was DEET, which is used in insect repellents. The results of the UuPri project will be published in summer 2018 in the Reports of the Finnish Environment Institute publication series.

The development of a catchment area-specific risk indicator for PPP loads was started in 2015. The risk indicator can be used, for example, in the selection of representative surface water sampling sites. There are still some coefficients in the indicator that need further validation, but the first version of the indicator was published in January 2017. The indicator utilises the environmental risk indicator developed at SYKE at the beginning of the 2000s, which was based on PPP sales volumes and the most harmful features of PPPs<sup>56</sup>. This indicator was used when determining the risk values for PPPs sold in Finland from 1985 to 2006<sup>57</sup>. In the catchment area-specific indicator, the sales volume has been replaced with the estimated use of active substances in the catchment area, and the terrestrial toxicity was omitted. Furthermore, the value of the catchment area-specific indicator is divided by the size of the catchment area.

#### *Groundwater monitoring*

Of all groundwater areas investigated in 2007-2015, PPPs were detected in 43% and the EQS was exceeded in 15% of the areas studied. The most commonly found substances were the degradation products of dichlobenil and triazines. The use of these substances and their degradation products was stopped years or even decades ago, and it is possible that the contamination took place several years ago. Therefore, the current land use and area of cultivated land cannot be directly linked to PPP findings in groundwater.

Large concentrations of PPP detected in groundwater could often be linked to a tree nursery or a horticultural farm that is or was located in the groundwater area concerned. The area of agricultural land did not directly explain the detected concentrations. In the future, the groundwater monitoring will be focused more intensely on groundwater areas in which agricultural activities may impact water quality. The objective is to increase monitoring of monoculture areas and analyses concerning the concentrations of glyphosate and its degradation products. New sampling sites may also be included, if the groundwater area already has existing observation pipes or wells. As a rule, the financial resources of the MaaMet project do not allow paying for the installation of new pipes.

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<sup>55</sup> Finnish Environment Institute 2018: Vesien- ja merenhoidon uudet prioriteettaineet -hanke UuPri [The UuPri project concerning new priority substances for the management of water bodies and the sea]. <http://www.syke.fi/hankkeet/uupri>

<sup>56</sup> Londesborough, S. 2003. Proposal for a selection of national priority substances. Fulfilling the requirements set by the dangerous substances directive (76/464/EEC) and the water framework directive (2000/60/EC). The Finnish Environment 622. Permalink: <http://hdl.handle.net/10138/40661> Appendix 5. (pp. 67-69).

<sup>57</sup> Biodiversity.fi 2013: FA4 Pesticide use. <https://www.biodiversity.fi/en/habitats/farmlands/fa4-pesticide-use>

#### *Water monitoring analysis and sampling methods have improved*

The analysis methods used in the monitoring of surface waters and groundwater have improved over the years. New active substances have been included in the analyses and the limits of quantification of previous active substances have decreased. In 2007, a total of 158 active substances were analysed from water samples. In 2017, the respective figure was a total of 243 active substances. Water monitoring analyses will be subjected to competitive bidding in winter 2017/2018.

The use of passive samplers has been tested in the monitoring of PPPs in Savijoki in 2016 and 2017. Passive samplers provide information about the average concentration of a substance in water during the exposure period, which helps to reduce the impact of the sampling time on the results. For some active substances, passive samplers can detect lower concentrations than when using traditional water sampling. The problem with passive samplers has so far been the fact that the laboratories provide the results as concentrations per sampler. Concentrations per sampler could be converted into concentrations in water, if the calibration tests carried out in known laboratory conditions are available. In winter 2016/2017, the samplers were calibrated for more than 50 active substances<sup>58</sup>. In summer 2017, passive samplers were also exposed to active substances in the Uskelanjoki, Aurajoki and Loimijoki rivers in addition to Savijoki.

#### *The financing of water monitoring must be secured for the future*

During the implementation of the NAP, the financing of the monitoring system has not been secured; financing must still be applied for on an annual basis. The financing model for the PPP authorisation scheme, which complies with the Act on Criteria for Charges Payable to the State (150/1992), does not take into account the external expenditure related to the monitoring and management of environmental impacts. Monitoring and management activities are left for payment by the local community, if there is any project funding available to allocate for them. The monitoring objectives of the NAP have not been fully achieved, which is in contradiction with the objectives of the programme. Long-term time-series are still missing, which makes it difficult to draw any conclusions on whether the risk management methods have been successful.

#### *Statistics about the agricultural use of PPPs to help to improve environmental monitoring*

The compilation of statistics about the use of PPPs in agriculture was started in 2013. The usage statistics help to target environmental monitoring activities because they provide more detailed information about which crops require the use of the greatest amounts of PPPs. The first data collection round concerning the agricultural use of PPPs was carried out by the Information Centre of the Ministry of Agriculture and Forestry, Tike<sup>59</sup>. Currently, the Natural Resources Institute Finland Luke is responsible for the compilation of the statistics.

The usage data is collected as part of crop and horticultural production surveys. In 2013, farmers were requested to notify the amounts of PPPs they applied on the crops harvested and the size of the application area. The next data gathering round will take place in autumn 2018, when data is collected about the PPPs applied on crops harvested in 2018. In the future, data about the agricultural use of PPPs will be gathered approximately once every five years.

#### *The greatest amounts of PPPs are applied on sugar beet, potatoes and outdoor vegetable crops*

The greatest total amounts of PPPs relative to the area under cultivation were applied on sugar beet, potatoes, outdoor vegetables, strawberries and apples. For fodder grass, the amounts of PPPs used and the area treated with PPPs were clearly smaller than for other crops. Of all PPP groups, herbicides were used in the greatest quantities (accounting for approximately 80 % of the total amount of PPPs used). The most commonly used active ingredient was glyphosate. The number of products used containing this ingredient was larger than the total amount of all other herbicides.

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<sup>58</sup> Ahkola H., Siimes K. and Aallonen A. 2017: Pesticide monitoring via traditional surface water sampling and Chemcatcher® passive sampling. <http://www.syke.fi/download/noname/%7BBDD0D010E-34A7-4EF0-99FC-.BDB73D1D6309%7D/127410>

<sup>59</sup> Natural Resources Institute of Finland 2014: Use of pesticides in agriculture. <http://stat.luke.fi/en/tilasto/4083>

The reporting of the use of PPPs as amounts of products and active substances used highlights the significance of active substances for which the amount used per hectare is high. However, the possible harmful impacts of PPPs do not directly depend on the amount used, but rather the chemical properties of the substances play a key role.

#### *Background information about the agricultural use statistics*

The statistics cover the most important agricultural and horticultural crops in Finland. The share of crops covered by the data collection effort accounted for 91 % of the area under cultivation and 80 % of the total arable land in Finland in 2013. Farmers were also requested to report their use of glyphosate products on their farms. A total of around 10 000 farms were included in the data collection, and the data collected from those farms were used to estimate the data for all farms in Finland.

#### *Environmental risks of glyphosate use are monitored under various research projects*

Environmental risks of glyphosate use when using different cereal cultivation techniques have been investigated in the GlyFos project<sup>60</sup>. Direct sowing increases the glyphosate loading, and the loading in water bodies is the highest after glyphosate applications following the harvest in autumn. Post-harvest waste may reduce the effect of glyphosate application in direct-sowing fields. The project has yielded two Master's theses<sup>61, 62</sup>. In 2016, Luke launched the Environmental Impacts of Glyphosate and Reducing Them project<sup>63</sup>. The preliminary survey for the project was carried out in 2014-2015. According to the preliminary survey, the use of glyphosate in urban environments has been restricted in Northern European countries through central and local government regulations, which has led to the introduction of non-chemical methods. In Finland, controlling weeds in urban areas has largely relied on the use of glyphosate, but the changes in restrictions on use will also change this situation (see section 3.2.7 regarding alien species and the use of glyphosate in green areas).

#### **3.2.4. PPP application equipment and inspection thereof**

*MEASURE: As agri-environmental support only covers tractor-mounted sprayers and self-propelled sprayers, an investigation of the other sprayer types and test methods should be conducted, and an inspection programme/procedures should be developed for sprayers and for test methods. Tukes, Luke*

#### **Actions taken**

##### *Tukes is responsible for inspection activities*

The Finnish Safety and Chemicals Agency Tukes is responsible for the organisation of application equipment inspection activities. It has also granted an authorisation to a total of 65 inspectors of application equipment. The authorisation is valid for a period of five years at a time. Tukes is also responsible for the drafting and preparation of the required application equipment inspection guidelines.

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<sup>60</sup> Uusi-Kämppeä J., Rämö S., Turtola E., Uusitalo R., Lemola R., and Siimes K. 2015: Glyfosaatin käytön aiheuttamat ympäristöriskit: aineen kulkureitit savimaalla ja päätyminen vesistöön (GlyFos) [Environmental risks of glyphosate use: transport in clay soils and leaching to watercourses (GlyFos)]. Final report, 32 pages. <http://jukuri.luke.fi/bitstream/handle/10024/485832/glyfosaatti.pdf?sequence=1&isAllowed=y>

<sup>61</sup> Petruneva, E. 2015. Comparison of glyphosate transport in clay soil on no-tilled and autumn ploughed plots. Master's thesis. University of Helsinki, Faculty of Agriculture and Forestry, Department of Agricultural Sciences. <https://helda.helsinki.fi/handle/10138/155817>

<sup>62</sup> Senilä K. 2015. Mallin testaus: glyfosaatin kulkeutuminen savimaalta vesistöön [Model testing: Leaching of glyphosate from cultivated clay soil to surface water]. Master's thesis. University of Eastern Finland, Faculty of Science and Forestry, Department of Biology. [http://epublications.uef.fi/pub/urn\\_nbn\\_fi\\_uef-.20150353/](http://epublications.uef.fi/pub/urn_nbn_fi_uef-.20150353/)

<sup>63</sup> Natural Resources Institute of Finland 2016: Environmental impacts of glyphosate and reduction of them. GlyFos II project. <https://www.luke.fi/en/projects/glyfos-ii/>

### *The inspection scheme was updated*

The update of the PPP application equipment inspection scheme was completed in schedule on 26 November 2016. For background data for the update process, Tukes commissioned Luke to carry out a survey on the PPP application equipment in use. The survey was completed in 2014 and is available from Tukes.

The first parts of the new test standards (EN ISO 16122 series) for PPPs used were published in 2015. These new standards were used to update the inspection instructions for boom sprayers, strip sprayers, sprayers for bush and tree crops, and fixed and semi-mobile sprayers. New inspection instructions for other types of sprayers will be prepared as necessary once the related standards are drafted. Where required, the SPISE guidelines<sup>64</sup> may be used for sprayers with no published test standard.

The new inspection instructions were completed during 2016, and they were adopted on 26 November 2016. At that time, training was also arranged for inspectors of application equipment regarding changes to the inspection activities resulting from the new inspection instructions. A transitional period of five years (until 26 November 2021) was given for the acquisition of inspection equipment that meets the new requirements.

### *The inspection scheme from 2016 onwards*

PPP application equipment in professional use was required to be inspected once by 26 November 2016. After this, the inspection is repeated every five years. After 2020, the inspection interval will be reduced to three years<sup>65</sup>. The Ministry of Agriculture and Forestry has specified exceptional inspection timetables for certain application equipment and exempted portable equipment and knapsack sprayers from the inspection obligation<sup>66</sup>. These exceptions and exemptions were based on an assessment carried out by Tukes concerning the risks to human health and the environment, which was completed in autumn 2015. The risk assessment is available from Tukes.

The issue in the organisation of application equipment inspections is that there is no applicable test standard available for all categories of application equipment. For example, application equipment mounted on trains or aircraft were required to be tested by 26 November 2016, without any possibility for exceptions, but there is still no applicable test standard available for such equipment. Certain types of sprayers must be inspected by the set time limit by applying inspection instructions issued for other application equipment types.

### *Feedback concerning inspection activities*

The PPP application equipment inspection scheme has been in use in Finland since 1995. The feedback received on inspection activities has mainly been positive. However, some farmers have also had negative experiences regarding inspection activities, for example, when the inspection equipment used by the inspector has not been suitable for the inspection of larger sprayers. The new inspection scheme has also improved the suitability of the inspection equipment used for the requirements of modern application equipment.

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<sup>64</sup> Standardized Procedure for the Inspection of Sprayers in Europe 2018: SPISE Advice. <http://spise.julius-kuehn.de/index.php?menuid=34>

<sup>65</sup> Decree of the Ministry of Agriculture and Forestry on the requirements set for plant protection product application equipment, inspection of application equipment and risk assessment concerning application equipment (maa- ja metsätalousministeriön asetus kasvinsuojeluaineiden levitysvälineille asetettavista vaatimuksista, levitysvälineiden testauksesta ja levitysvälineitä koskevasta riskien arvioinnista) 4/2016. [www.finlex.fi/data/normit/42535-16004.fi.pdf](http://www.finlex.fi/data/normit/42535-16004.fi.pdf)

<sup>66</sup> Decree of the Ministry of Agriculture and Forestry on the amendment of Annex II to the Decree of the Ministry of Agriculture and Forestry on the requirements set for plant protection product application equipment, inspection of application equipment and risk assessment concerning application equipment (maa- ja metsätalousministeriön asetus kasvinsuojeluaineiden levitysvälineille asetettavista vaatimuksista, levitysvälineiden testauksesta ja levitysvälineitä koskevasta riskien arvioinnista annetun maa- ja metsätalousministeriön asetuksen liitteen II muuttamisesta) 8/2017. [www.finlex.fi/data/normit/43363/17008fi.pdf](http://www.finlex.fi/data/normit/43363/17008fi.pdf)

*Inspections performed in other Member States are also recognised in Finland*

If PPP application equipment has been inspected in another EU Member State, the inspection is also recognised in Finland. However, the inspection performed outside Finland must comply with the content and timetable requirements laid down by Finnish law. The validity of the inspection of a sprayer manufactured in another EU Member State, but imported to Finland complies with the requirements of the country of origin. For example, if an inspection carried out in the country of origin is valid only for one year, the inspection interval will not be extended to comply with the interval applied in Finland.

→ Proposed action: Drafting of self-monitoring guidelines for sprayer users that inspectors could hand out to users during the inspection.

*MEASURE: Control/auditing of inspections by spraying inspectors. The above measure must be added to the Tukes monitoring plan. Tukes*

#### **Actions taken**

Activities of sprayer inspectors, inspection situations or inspection equipment have not been controlled or audited, but this is identified as a future control area in the Tukes control plan. Until the end of the transitional period (26 November 2021), inspection equipment that complies with the old or new inspection instructions may be used. Where required, inspection equipment may be controlled in accordance with the new or old inspection instructions.

In connection with the control of the use of PPPs, it has also been verified that appliance equipment of professional users has been inspected.

→ Proposed action: Risk-based design and implementation of the control of sprayer inspection activities.

#### **3.2.5. Aerial spraying**

*MEASURE: Case-by-case risk assessments to determine the need for aerial spraying. MMM, Evira, Finnish Forest Centre*

#### **Actions taken**

Aerial spraying is forbidden in Finland except under exceptional circumstances. Evira may issue an exemption for aerial spraying with pesticides, provided that the pest in question poses an immediate threat to plant health and it cannot be prevented in a sufficiently effective manner using other techniques<sup>67</sup>. Furthermore, the Ministry of Agriculture and Forestry may issue an authorisation for aerial spraying at the request of the Finnish Forest Centre to prevent extensive damage by insects or fungi to growing tree stock. Forest owners are compensated for the costs of preventing forest damage in accordance with the Forest Damages Prevention Act<sup>68</sup>, or the prevention activities are performed at the cost of the forest owner. Aerial spraying measures have not been carried out in Finland since 2008. Evira and the Finnish Forest Centre assess the need for aerial spraying on a case-by-case basis. The Decree of the Ministry of Agriculture and Forestry<sup>69</sup> contains further provisions, for example, on the aerial spraying decision, area to be treated, obligation to notify, and implementation of the aerial spraying.

#### **3.2.6. Handling and storage of PPPs**

*MEASURE: Regular information campaigns on the storage and disposal of PPPs are to be implemented. (An awareness raising campaign on responsible disposal of PPPs removed from use was launched by Evira in spring 2008. Information on the campaign is available at Evira/Tukes websites and in brochure format.) Preparation of PPP storage guidelines for farms. Tukes, retailers, farmers*

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<sup>67</sup> Act on protecting plant health (laki kasvinterveyden suojelemisesta) 702/2003. <http://www.finlex.fi/fi/laki/ajantasa/2003/20030702>

<sup>68</sup> Forest Damages Prevention Act 1087/2013. <http://www.finlex.fi/fi/laki/ajantasa/2013/20131087>

<sup>69</sup> Decree of the Ministry of Agriculture and Forestry on aerial spraying (maa- ja metsätalousministeriön asetus lentolevityksestä) 8/2012. <http://www.finlex.fi/data/normit/39162-.12008fi.pdf>

### Actions taken

Information on the storage and disposal of PPPs has been disseminated, for example, at plant protection training events, at industry fairs and through newspapers and magazines. The online training materials maintained by Tukes<sup>18</sup>,<sup>19</sup> also include general instructions on the storage of PPPs, as well as instructions on the disposal of empty packages and expired and surplus products. In connection with PPP controls, operators have also been instructed on how to handle PPPs removed from use. PPPs removed from use detected during controls are also reported to the municipal environmental protection authorities.

*MEASURE: Organisation by retailers and Tukes of the collection of PPPs that have expired and have been removed from the PPP Register. Retailers, Tukes*

### Actions taken

The collection of PPPs has not yet been organised, but it could be a feasible practice to implement during agricultural exhibitions, for example. Expired PPPs are considered hazardous waste, and the restrictions applied to the transport of hazardous waste must be taken into account when planning their collection. In connection with control visits, operators are instructed to dispose of their expired PPPs in an appropriate manner.

→ Proposed action: The possibility to organise the collection of hazardous waste together with the Finnish Commerce Federation and Ekokem during agricultural exhibitions is to be investigated. The restrictions concerning the transport of hazardous waste must be taken into account.

*MEASURE: Provisions obliging operators to deliver PPPs that have been removed from use to hazardous waste collection points within a set time period are to be included in legislation concerning waste. Tukes, control bodies*

### Actions taken

#### *Disposing of expired products from storage*

A decision concerning the withdrawal or amendment of a product's marketing authorisation may include a transitional period in accordance with the EU PPP Regulation<sup>23</sup>, which enables continuing sales and distribution for a period of six months, as well as the disposal, storage and use of existing stocks for a period of 12 months after the withdrawal or amendment of the authorisation. The above transitional periods have been included in such decisions in recent years, when applicable. The obligation to dispose of stocks included in withdrawal decisions has not been actively communicated to operators.

If a permitted use is removed for a product included in the PPP Register, Tukes will issue a time limit after which the product may no longer be used for such use. This time limit is indicated in the header of the relevant product label reported to the PPP Register as follows: 'The requirements of this product label must be complied with starting x/x/20xx at the latest'.

The waste legislation has not been amended as proposed. Any PPP wastes detected in connection with the PPP usage controls are notified to the municipal environmental protection authorities. The waste legislation imposes on operators, for example, the obligation to obtain information, the obligation to exercise caution, and the obligation to comply with the best environmental practice available.

### *Obligation to keep records of hazardous waste*

Pursuant to the list of wastes specified in the Waste Decree<sup>70</sup>, expired PPPs or PPPs otherwise removed from use are considered hazardous waste. Producers of hazardous waste are required to keep records<sup>71</sup>. These records must be retained for six years. Such records must include the following information: (1) the quantity of waste; (2) the waste entry in accordance with the list of waste and description of the type of waste and essential information on the properties and composition of the waste; (3) in a case of hazardous waste, the main hazardous properties; and (4) when the waste is delivered to another location for treatment, the name and contact information of the consignee and waste carrier and the method of waste treatment.

### *Storage of expired products*

PPP wastes must be stored in the original packaging, which is suitable for the storage of the product in question. The packaging displays all the essential information that must be provided on hazardous waste. Different types of waste may not be mixed. If the composition of the hazardous waste cannot reasonably be clarified, the waste container must include the labelling 'Vaarallista jätettä, sisältö tuntematon' ('Hazardous waste, composition unknown'). When transporting hazardous waste, it must be ensured that the waste does not pose a risk to human health or the environment. The instructions on how to dispose of expired PPPs or PPPs removed from use are covered in the relevant training, as well as in connection with other communication measures.

Pursuant to the Environmental Protection Act<sup>72</sup>, operators must have sufficient knowledge, for example, of their activities' environmental impacts and risks and of ways to manage those risks. Operators are also obligated to take the appropriate action to prevent pollution or reduce it to a minimum. Although the legislation concerning waste and environmental protection does not directly obligate operators to deliver hazardous waste to a waste collection facility within a set time period, it is of utmost importance for the protection of human health and the environment that hazardous wastes are not kept for long periods of time in storage. The Environmental Protection Act also contains a prohibition on polluting soil or groundwater. Hazardous waste should be delivered to an appropriate waste collection facility without undue delay in accordance with the principles concerning the exercise of due care and caution as well as the applicable best environmental practice.

→ Proposed action: Professional PPP users are to be informed of the obligation to dispose of expired products. The transitional periods concerning use and storage should be controlled where required.

### **3.2.7. Reduced risks of the use of PPPs in green areas**

*MEASURE: Design of information and training, particularly for the needs of landscape workers (see 'Training').*  
Tukes

#### **Actions taken**

Tailored plant protection training and certification are also arranged for landscape workers. Provision of information to landscape workers has also been part of the NAP communications plan. Training and certification providers also actively market their services to landscape workers, and some of the largest undertakings responsible for the management of green areas have their internal training and certification providers. Careful orientation of workers is particularly important since a significant number of landscape workers are young and often seasonal workers.

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<sup>70</sup> Government Decree on Waste 179/2012. <http://www.finlex.fi/fi/laki/ajantasa/2012/20120179>

<sup>71</sup> Waste Act 646/2011. <http://www.finlex.fi/fi/laki/ajantasa/2011/20110646>

<sup>72</sup> Environmental Protection Act 527/2014. <http://www.finlex.fi/fi/laki/ajantasa/2014/20140527>

### *Prevention of invasive alien species*

One of the measures specified in the proposal for management measures of invasive alien species is the eradication of giant hogweed from Finland in 20 years<sup>73</sup>. Glyphosate has been proven to be an effective method to control giant hogweed. So far, no alternative control method that was as effective and inexpensive has been identified, but the development of such methods should be continued. There should be alternative effective methods available for use in green areas and particularly in the vicinity of schools and playgrounds. These are also the areas where it is particularly important to eradicate giant hogweed.

The Finnish National Strategy on Invasive Alien Species was published in 2012<sup>74</sup>. Finland also has in place the Act on Managing the Risk Caused by Alien Species<sup>75</sup>. The Vieraslajit portal<sup>76</sup> contains information about invasive alien species and the related legislation. The European Union's first list of invasive alien species (the EU list) entered into force in August 2016. The original list of 37 species was supplemented with additional 12 species a year later. The list will be supplemented further in the future. The species to be prevented in Finland according to the EU list of invasive alien species concerning include, for example, the wide-spread giant hogweed and Indian balsam. The proposal for the decree on the national list of invasive species will be submitted for comment in the near future.

Miia Korhonen, a student at the Lepaa campus of the Häme University of Applied Sciences prepared her Bachelor's thesis on the prevention of the particularly harmful invasive species giant hogweed in green areas<sup>77</sup>. The Bachelor's thesis was covered in a local newspaper<sup>78</sup>. A presentation concerning the thesis is available on the internet<sup>79</sup>.

*MEASURE: Investigation of non-chemical pest management alternatives. In particular, knowledge of natural enemies of pests is to be improved and suitable conditions for promoting their use are to be created (see 'Integrated pest management'). Luke, KSS, Tukes*

### **Actions taken**

Alternative control methods are discussed in the plant protection training for landscape workers. Plant protection training also provides a better opportunity to assess whether the control methods used are appropriate. In green areas, the control mainly focuses on the prevention of weeds. Alternative weed control methods tested include, for example, flaming, hot steam, manual weeding, string trimming, and using different types of mulch. Previously, chemical control focused on the use of glyphosate, but since the negative publicity attracted by glyphosate, its use has

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<sup>73</sup> Huusela-Veistola E., Erkamo E., Holmala K., Hyvönen T., Juhanoja S., Kauhala K., Koikkalainen K., Lehtiniemi M., Miettinen A., Pouta E., Ryttylä T., Räikkönen N., Teeriaho J., Tulonen J., Tuhkanen E-M. and Urho L. 2017: Ehdotus haitallisten vieraslajien hallintasuunnitelmaksi [Proposal for management measures of invasive alien species]. Publications of the Government's analysis, assessment and research activities 43/2017 154 pages. Helsinki, Finland: Prime Minister's Office. [http://tietokayttoon.fi/documents/10616/3866814/43\\_Ehdotus+haitallisten+vieraslajien+hallintasuunnitelmaksi\\_korjattu.pdf/5813c5b8-fffb-4f72-aff0-a9b07139fbd7?version=1.0](http://tietokayttoon.fi/documents/10616/3866814/43_Ehdotus+haitallisten+vieraslajien+hallintasuunnitelmaksi_korjattu.pdf/5813c5b8-fffb-4f72-aff0-a9b07139fbd7?version=1.0)

<sup>74</sup> Ministry of Agriculture and Forestry 2012: Finland's National Strategy on Invasive Alien Species. [http://vieraslajit.fi/sites/default/files/Finlands\\_national\\_strategy\\_on\\_invasive\\_alien\\_species.pdf#overlay-context=fi/content/national-strategy-invasive-alien-species](http://vieraslajit.fi/sites/default/files/Finlands_national_strategy_on_invasive_alien_species.pdf#overlay-context=fi/content/national-strategy-invasive-alien-species)

<sup>75</sup> Act on Managing the Risk Caused by Alien Species 1709/2015. <http://www.finlex.fi/fi/laki/alkup/2015/20151709>

<sup>76</sup> Vieraslajit.fi 2018: Welcome to Invasive Alien Species Portal! <http://vieraslajit.fi/fi/content/welcome-invasive-alien-species-portal>

<sup>77</sup> Korhonen, M. 2015: Jättiputken torjunta: Eri torjuntamenetelmien vaikutukset jättiputken kasvuun Lahden kaupungin koekentällä [Control of giant hogweed: Impacts of different prevention techniques on the growth of giant hogweed on the test field of the City of Lahti]. Bachelor's thesis, Häme University of Applied Sciences, 48 pages. <http://urn.fi/URN:NBN:fi:amk-2015110515989>.

<sup>78</sup> Etelä-Suomen Sanomat, 24 July 2015: Miehenkokoisia myrkkukasveja Lahdessa: katso panoraamakuva [Man-sized poisonous plants in Lahti: see a panoramic image]. <http://www.ess.fi/uutiset/kotimaa/2015/07/24/miehenkokoisia-myrkkukasveja-lahdessa-katso-panoraamakuva>

<sup>79</sup> Korhonen, M. 2015: Jättiputki - erityisen haitallinen vieraslaji [Giant hogweed – a particularly harmful invasive species]. <https://drive.google.com/file/d/0B9OIjFkLN8DdjZKUDY1S3kOV0U/view?usp=sharing>

significantly reduced. Acetic acid and pelargonic acid have been used as replacement substances, however, the use of acetic acid is no longer approved in Finland.

Hot water treatment has been tested in a few larger cities, but with varying results. The treatment must be repeated several times because it cannot eradicate the roots of perennial weeds. Some parishes have tested pest management in graveyards by using organic products. Furthermore, Luke is currently developing new types of mulch materials that are also suitable for use in green areas.

#### *Use of glyphosate in green areas*

The re-approval of glyphosate generated active public discussion during the programming period. In 2015, the IARC, which is the specialised cancer agency of the WHO, evaluated glyphosate as a potentially carcinogenic substance. The European Food Safety Authority (EFSA) and the European Chemicals Agency (ECHA), on the other hand, have evaluated glyphosate as not involving a risk of cancer. According to the risk assessment performed on glyphosate, there are no reasons to refuse the approval of the active substance. Nevertheless, the debate concerning glyphosate has made Member States cautious about the substance. The excipient POEA, which was used in some glyphosate products, was suspected of increasing the health risks involved in those substances. Consequently, the European Commission banned the use of POEA in glyphosate products. In Finland, a total of 13 products were banned<sup>80</sup>. The public debate regarding glyphosate has been heated, and particularly the use of glyphosate in green areas has caused concerns. Glyphosate has been approved for use for a period of five years until towards the end of 2022.

As part of the assessment of glyphosate products, the following restriction on use in green areas must be appended to the product labelling: 'The product may not be used in children's play areas, on playgrounds or on day care or school yards. When applying the product in public areas, particular attention must be paid to the safety of humans and animals.' In addition, the following sentence was added to the section concerning the prevention of environmental damage: 'The product may not be used in paved areas.' The policy in cities has for long been to not use glyphosate at all in children's play areas and only very rarely using other PPPs in such areas.

*MEASURE: In the selection of plants, species and varieties that are hardy and successful in Finnish conditions are to be favoured. Methods resulting in ground cover with ground-covering plants are to be favoured in the establishment and management of green areas. Luke, KSS, Tukes, users of PPPs*

#### **Actions taken**

Landscape designers play a key role in the selection of plants for green areas. The focus of integrated pest management in green areas is on the design. The plant protection certification is not mandatory for landscape designers. In most cases, landscape workers and landscape designers are not the same individuals, and the design does not take into account the needs of plant protection in terms of plant selection or the non-contamination of the growing medium used. The use of plant species that spread too rapidly or that could be considered invasive alien species should be avoided in green areas.

#### *Controlling the use of PPPs in green areas*

In 2015, controls were carried out on the use of PPPs in green areas. As a rule, the use of PPPs was limited and no significant non-conformities were observed. The exposure of by-standers has been taken into consideration well in green areas. The use of PPPs is particularly limited in children's play areas. Furthermore, spraying is carried out so

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<sup>80</sup> Finnish Safety and Chemicals Agency Tukes 2016: POEA-apuainetta sisältävät glyfosaattivalmisteet kielletään [Glyphosate products containing POEA are banned]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/POEA-apuainetta-sisaltavat-glyfosaattivalmisteet-kielletaan/>

that the number of bypassers is as low as possible. Treatments are also notified using warning signs, and treatments in areas with a lot of traffic is avoided.<sup>81</sup>

Similarly, according to controls performed on golf courses in 2016, several operators were using PPPs appropriately, however, some deficiencies were also found. All sprayers hold a plant protection certification, and the exposure of golf course users is taken into account appropriately when treating areas with PPPs. The use of PPPs is focused on the greens, i.e. the small areas surrounding the holes. A third of the golf courses inspected could not specify the products that may be used on golf courses. The golf industry reacted positively to the deficiencies identified in the controls and arranged an information campaign on PPPs for greenkeepers<sup>82</sup>.

The Finnish Food Safety Authority Evira coordinates the controls which cover the entire food chain and publishes an annual report on the controls performed. The results of PPP controls are also published as part of the annual report<sup>83</sup>.

In 2016, Evira also performed controls on producers of vegetables in pots in greenhouses. Only a few producers had some minor deficiencies in matters concerning plant protection<sup>84</sup>. The positive results are probably partly due to the fact that several vegetable producers have been granted the Sirkkalehti label, which is administered by the Finnish Horticultural Products Society (Kotimaiset Kasvikset ry). The use of the label requires passing an audit and compliance with the Laaturaha (Quality Farm) guidelines<sup>85</sup>. The guidelines cover, for example, the qualification for sprayer testing, integrated pest management, keeping records of PPP use, and monitoring and follow-up.

The use of PPPs in the railway network was controlled in 2017. Representatives of Tukes have informed railway workers about the safe use of PPPs at a training event organised by the Finnish Transport Agency. No deficiencies were observed in the controls performed. All sprayers have completed the plant protection training and all spraying equipment in use has been tested. The exposure of by-standers and environmental protection have been taken into consideration well. According to instructions issued by the Finnish Transport Agency, spraying may not be carried out in groundwater areas or along water bodies. The instructions also limit the number of PPPs that may be used. Mechanical techniques are also used to control weeds, so the quantities of PPPs used remain relatively low.

### 3.2.8. Effectiveness of measures aiming to reduce environmental risks

*How can the measures taken reduce the risks arising from the use of PPPs?* Environmental risks arising from the use of PPPs must remain at an acceptable level. The use of products that may easily migrate in soil is restricted in groundwater areas. The grounds for imposing groundwater restrictions have been investigated in the Northern Zone of the EU.

Water body restrictions for the use of PPPs are now determined on the basis of a risk-based approach. In addition to spray drift, the aim is to also reduce the run-off of PPPs. As a result of these changes, the buffer distance to water bodies has been increased for several products,

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<sup>81</sup> Finnish Safety and Chemicals Agency Tukes 2016: Kasvinsuojeluaineiden käyttö turvallisella tasolla lasten ja nuorten suosimilla alueilla [The use of PPPs in areas used by children and adolescents is at a safe level]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/Kasvinsuojeluaineiden-kaytto-turvallisella-tasolla-lasten-ja-nuorten-suosimilla-alueilla/>

<sup>82</sup> Finnish Safety and Chemicals Agency Tukes 2017: Golfkentille kasvinsuojeluaineiden käytöstä ruusuja ja risuja [Praise and criticism for the use of PPPs on golf courses]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/Golfkentille-kasvinsuojeluaineiden-kaytosta-ruusuja-ja-risuja/>

<sup>83</sup> Finnish Food Safety Authority Evira 2017: VASU-raportit [Control plan reports]. <https://www.evira.fi/tietoa-evirasta/esittely/toiminta/valvonta/arviointi-ja-raportit/vasu-raportit/>

<sup>84</sup> Finnish Safety and Chemicals Agency Tukes 2017: Ruukkuvihannestuotannossa käytetään vain vähän kasvinsuojeluaineita [Only limited use of PPPs in the production of potted vegetables]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/Ruukkuvihannestuotannossa-kaytetaan-vain-vahan-kasvinsuojeluaineita/>

<sup>85</sup> Central Organisation for Finnish Horticulture 2017: Laaturaha – Kvalitetsgård [Quality Farm]. <http://www.puutarhaliitto.fi/index.php?section=116>

even up to 50 metres. For some products, the buffer distance was significantly decreased. The user may decrease the buffer distance on a risk basis and in accordance with the relevant instructions for use when using an application technique which reduces the risk of spray drift. It is also possible to apply risk management measures to drain flow. The impact of the new buffer distances on environmental risks should be investigated.

In the report evaluating the achievement of the goals of the Rural Development Programme for Mainland Finland<sup>86</sup>, one of the areas evaluated was the use of PPPs.<sup>87</sup> The Rural Development Programme measures that help to reduce the area of arable land treated with PPPs (organic production, nature management fields, buffer zones) have promoted the reduction in the use of PPPs. The achievement of the goals was difficult to evaluate on the basis of the rough data available, i.e. the data concerning the PPP sales volumes and the number of measures implemented in the Rural Development Programme and the size of the areas affected. More detailed data about the volumes of PPP use on farms will be collected in 2018. In the future, more specific information about the environmental impacts can be achieved through the catchment area-specific PPP load risk indicator that is currently being developed at SYKE. As part of the advisory services provided for farmers, the cross-compliance requirements, minimum plant protection requirements and the basics of integrated pest management have been specified and notified to farmers, which has also helped to clarify the requirements concerning the use of PPPs.

Environmental monitoring has provided information about the concentrations of PPPs in surface waters and groundwater. The results obtained can be compared against the relevant EQSs to investigate whether the concentrations detected are harmful to the environment. The more advanced sampling and analysis methods now provide more detailed data about the status of the environment. Statistics on the use of PPPs, which contain information about for which plants and in which areas the use of PPPs is the highest, can be used when specifying the sampling sites. The monitoring of the status of the environment also enables the observed risks to be addressed and measures taken to mitigate those risks.

The use of effectively functioning sprayer equipment can also significantly reduce risks to human health and the environment. Regularly tested and serviced sprayers apply the PPP exactly where needed. Expanding the application equipment inspection to cover the most common professionally used sprayers will further enhance the management of health and environmental risks. The surveillance of inspection activities and PPP users helps to ensure that the inspection activities are appropriate and that professional users' sprayers are tested according to the requirements. The impact of the aerial spraying ban on risks has been relatively limited because even previously aerial spraying has only been allowed with special authorisation and it was done only rarely.

Professional users are informed of the requirements concerning the storage of PPPs and disposal of expired products in several ways. The impact of awareness raising methods on PPP practices has not been investigated, and no campaign for the collection of expired PPPs has been organised. It has not been deemed necessary to amend the waste legislation to oblige users of PPPs to dispose of their expired PPPs within a set time period. In decisions concerning the withdrawal of marketing authorisations, a sentence concerning the sale, storage and disposal of PPPs was added. It is difficult to assess whether the actions taken have reduced environmental risks.

The effectiveness of the training and communications measures targeted at landscape workers in terms of the reduction of environmental risks has not been evaluated. The awareness of consumers of PPPs has increased, and particularly the use of glyphosate is opposed. Consequently, a variety of alternative weed control methods have been tested in green areas, which has also reduced the risks arising from plant protection measures. The spreading of invasive alien species outside gardens and yards causes a risk of increasing the use of PPPs. Therefore,

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<sup>86</sup> Rural.fi 2018: Rural development program. <https://www.maaseutu.fi/en/the-rural-network/rural-development-program/>

<sup>87</sup> Huusela-Veistola E. 2017: Arviointikysymysten käsittely: Torjunta-aineiden käyttö [Handling of the evaluation questions: Use of PPPs]. In publication: Maaseutuohjelman ympäristöarviointi: Manner-Suomen maaseudun kehittämissuunnitelma 2014–2020 [Environmental evaluation of the Rural Development Programme for Mainland Finland 2014–2020]. Edited by Yli-Viikari A. and Aakkula J. Natural Resources and Bioeconomy Studies 54/2017: 53-57. <http://jukuri.luke.fi/handle/10024/540249>

it would be necessary to develop alternative control methods to reduce these risks. No significant breaches have been detected in the controls of the use of PPPs in green areas, which indicates that users of PPPs are familiar with the instructions concerning the use of PPPs.

#### *What still needs to be done?*

The most significant deficiency concerning the measures aiming to reduce environmental risks is a lack of appropriate monitoring tools. Environmental monitoring on its own is not enough when assessing the effectiveness, for example, of training, sprayer inspection activities or communications measures. The new NAP should specify monitoring indicators for the planned actions within the constraints of the limited resources available.

The objectives of the NAP referred to the objective specified in the chemicals legislation, according to which the users of PPPs are required to choose the PPP or control method which causes the lowest risk to the environment<sup>33</sup>. No measures to achieve these objectives have been specified. Currently, there is no classification of PPPs which could be used to select the method involving the lowest risk. The use of the Environmental Impact Quotient (EIQ) indicator in the classification of PPPs has been tested in the IPM-APU project. The project investigated the environmental impact of plant protection activities in ordinary production, and in production in accordance with the integrated pest management approach.<sup>88</sup> Categorisation of PPPs on the basis of simple risk indicator would be useful, but it is difficult to develop a sufficiently straightforward classification method. PPPs can involve a variety of risks and, for example, environmental risks caused by PPPs cannot be valued above the health risks involved in PPPs.

### **3.3. Raised awareness regarding the safe use of PPPs**

The objective of the measures aiming to raise awareness is the same as the main objective of the NAP, i.e. reducing the health and environmental risks involved in the use of PPPs. The aim is to:

- distribute correct and relevant information on plant protection, plant protection products and their safe use through training, advice and increased communication;
- distribute information to users and consumers on health and environmental risks involved in PPPs;
- decrease risks arising from the use of PPPs among non-professional users;
- increase awareness so that non-professionals would primarily choose non-chemical plant protection methods.

#### **3.3.1. Communication and awareness raising**

*MEASURE: Preparation of an action plan for the provision of information, guidance, advice and training on PPPs. Tukes, Evira, expert organisations, advisory organisations (KSS, ProAgria, Central Organisation for Finnish Horticulture and its member organisations)*

#### **Actions taken**

##### *Communications*

Tukes has implemented communications measures concerning plant protection according to its annual communications plan. So far, no common communications plan concerning the National Action Plan on the Sustainable Use of Plant Protection Products has been drafted. The need for common communications measures and plan will be considered over the coming years. In terms of communications measures concerning invasive alien

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<sup>88</sup> Vänninen I., Tuovinen T., Lindqvist I., Nieminen K., Rajala P., Hyytiäinen J. 2014: IPM-APU: puutarhaviiljelyn IPM-testipenkki ja integroidun torjunnan kehittäminen direktiivin 2009/128 EY kansallisen toimintasuunnitelman (NAP) mukaisesti (2011-13) [IPM-APU: IPM test bench for horticultural activities and development of integrated pest management in accordance with the National Action Plan (NAP) for 2011-2013 referred to in Directive 2009/128/EC]. Final report. 121 pages.

species, there are a common communications plan and an annual communications schedule, in which the communications measures concerning invasive alien species implemented by various operators are compiled.

#### *Advisory services*

The Agency for Rural Affairs maintains the Neuvo 2020 advisory service system for farmers, which is included in the Rural Development Programme 2014-2020. In connection with advisory services, the cross-compliance requirements, minimum plant protection requirements and the basics of integrated pest management have been specified and notified to farmers, which has also helped to clarify the requirements concerning the use of PPPs. The effectiveness of the plant protection measures included in the Rural Development Programme have been evaluated in the environmental evaluation of the Rural Development Programme carried out by Luke<sup>89</sup>. The planning of the plant protection section of the advisory service system should be integrated as part of the NAP, and therefore, it would also be appropriate that the Agency for Rural Affairs also participated in the implementation of the NAP.

Each party providing advisory services has been responsible for the planning of their own services. For example, ProAgria offers, as part of its Kasvu services, advisory visits to farms during the growing season regarding topics such as plant protection in agriculture and horticulture. In addition, as part of the Neuvo 2020 services, ProAgria offers expert services in the area of plant protection.

#### *Training*

The training system was established during 2013 when the practices for organising plant protection training and certification were specified. In the future, it is important to reform the training, and potentially also the certification system, so that continuing training every five years would provide relevant and new information for professional users.

The continuing training starts in 2018 when the first certification renewal exams will be organised. The training system covers the special needs of different professional user groups, the basic and continuing training, and the training of training and certification providers.

*MEASURE: Information campaign: more effective use of residue control results in communications. Evira, Tukes, expert organisations, advisory organisations (KSS, ProAgria)*

#### **Actions taken**

Reporting on residue controls<sup>5</sup> has been developed to be more effective and up-to-date since the early 2010s. Previously, the report contained numerous pages and its preparation took a lot of time. Now, the information is published quickly after the beginning of the year on Evira's website. The residue control reports since 2008 are also easy to find from the same website (see also section 3.1.1).

*MEASURE: Monitoring and control and provision of information on counterfeit products and other illegal PPPs. Tukes, Evira, expert organisations, advisory organisations (KSS, ProAgria)*

#### **Actions taken**

Identifying counterfeit products and risks related to counterfeit PPPs are covered in the plant protection training and certification. Counterfeit products are controlled as part of the PPP use control and market surveillance organised by Tukes. Each year, samples are taken from the products on the market to control their conformity with the relevant requirements. A representative of Tukes has also participated in the training concerning the identification of counterfeit products organised by the Food and Veterinary Office of the European Commission. Tukes also collaborates with other EU Member States in the development of the control of counterfeit products.

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<sup>89</sup> Yli-Viikari A. and Aakkula J. (eds) 2017: Maaseutuhjelman ympäristöarviointi [Environmental evaluation of the Rural Development Programme]. Natural Resources and Bioeconomy Studies 54/2017. <http://jukuri.luke.fi/handle/10024/540249>

The Finnish Crop Protection Association (KASTE) has trained Customs and Tukes officials to identify counterfeit products and related risks and to prevent the import of counterfeit PPPs. A representative of KASTE has also arranged training on the risks related to illegal and counterfeit products to plant protection training and certification providers. KASTE has also covered the topic at plant protection training events and other seminars targeted at professional users. The materials prepared by KASTE are freely available to training and certification providers, which has promoted the dissemination of information concerning counterfeit products and related risks among professional users. The same materials have also been utilised when preparing the online training materials provided by Tukes<sup>18, 19</sup>.

*MEASURE: Improved monitoring and control and provision of information on origin labelling of PPPs. Tukes, Evira, expert organisations, advisory organisations (KSS, ProAgria)*

#### **Actions taken**

Origin indications of PPPs are controlled as part of market surveillance concerning PPPs. Origin indications play a key role in potential counterfeit cases, where suspected counterfeit samples are compared against the original product. The importance of origin labelling is covered in the plant protection training, one module of which is dedicated to counterfeit products and identification thereof.

*MEASURE: Determination and preparation of guidelines for farmers on procedures for notification to their neighbours, for example to beekeepers, on the use of PPPs. Tukes, Evira, expert organisations, advisory organisations (KSS, ProAgria)*

#### **Actions taken**

##### *Protection of neighbours*

Good plant protection practice requires taking neighbourhood residents and their yards into consideration when performing spraying and avoiding the drifting of PPPs to neighbours' yards. No guidelines on procedures for notification to neighbours or on appropriate buffer distances to neighbours' yards have been prepared. When treating green areas with PPPs, it is recommended to mark the treated area so that the sign indicates the PPP used, the time of the treatment, and the re-entry period for the product in question. Only a few products indicate a risk-based re-entry period on their instructions for use. This period must also be observed when treating green areas with the PPP in question.

##### *Protection of bees*

The need to protect bees is evaluated separately in the product-specific risk assessment. The bee protection measures include, for example, restrictions indicated in the instructions for use concerning the treatment of flowering plants. PPPs harmful to bees may not be applied without beekeeper consent within a distance of 60 metres from beehives.

The online training materials provided by Tukes include instructions on notifying beekeepers. The 'risk to bees' warning text must also be indicated in the instructions for use of products harmful to bees. According to the training materials, farmers are recommended to contact the beekeeper so that the beekeeper can either protect the beehives or temporarily relocate them for the duration of the treatment. Beekeepers, on the other hand, are instructed to notify farmers of the location of their beehives because the beehives may not be clearly visible in the fields on which the treatment is carried out. Beehives should also indicate the contact details of the beekeeper so that the farmer could contact the beekeeper if necessary. The recommendation concerning the indication of contact details is included both in the guidelines of the Finnish Beekeepers' Association and in the training materials of Tukes.<sup>18, 19</sup>

### *Collaboration to investigate the causes of pollinator extinctions*

Tukes has collaborated with the Finnish Beekeepers' Association (SML) in the control of the use of PPPs. Where PPPs are suspected to be the cause of a pollinator extinction, the concentration of PPPs in dead specimens has been analysed. Tukes and SML have also together drafted operating instructions for control authorities regarding measures concerning pollinator extinctions and related sampling and handling of the samples. Tukes also publishes the control results<sup>90, 91, 92</sup> and has actively disseminated information about the operating instructions, controls and control results at events targeted at beekeepers.

→ Proposed action: Updating of the guidelines on procedures concerning the protection of by-standers and notification to neighbours, and investigating the adoption of buffer distance requirements.

### **3.3.2. Training**

*MEASURE: Preparation of a training programme and training material for users, distributors and advisors of PPPs, taking into account the subjects listed in Annex I of the Sustainable Use Directive.*

*Account shall be taken of the following:*

- *Training is required for a wider group than at present and must be differentiated for different production sectors.*
- *Training of sales personnel: Personnel must be available at the time of sale to provide adequate information to customers as regards use, risks and safety instructions to manage those risks. Sufficient information and/or guidance should be provided to all buyers of PPPs. Retailers play a key role. In the sales situation, it should be possible to clarify for home gardeners the risks of using PPPs and to steer consumer choices towards safe products or alternative methods. The above should also apply to online sales.*
- *Development of tailored training for landscape workers.*
- *Adequate trainer competence is to be ensured. Demonstration of competence by means of training/educational background or qualifications, or by means of online training resources followed by a competence-based examination (e.g. online examination).*
- *Inclusion of IPM in the training.*
- *Inclusion of occupational health and safety in training aimed at users, retailers and advisors of PPPs.*
- *Training supervision.*

Tukes in cooperation with other authorities and industrial, retail, expert and advisory organisations in the sector

### **Actions taken**

#### *Training for plant protection training providers*

The planning of the basic training and certification system concerning PPPs was completed during autumn 2013. The qualification of plant protection training and certification providers (hereinafter 'trainers') has been verified

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<sup>90</sup> Finnish Safety and Chemicals Agency Tukes 2017: Mehiläiset säästyivät kasvinsuojeluaineista johtuvilta joukkokuolemilta [Bees saved from extinction caused by PPPs]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/Mehilaiset-saastyivat-kasvinsuojeluaineista-johtuvilta-joukkokuolemilta/>

<sup>91</sup> Finnish Safety and Chemicals Agency Tukes 2016: Kasvinsuojeluaineet eivät aiheuttaneet Euran kimalaiskuolemia [PPP not the cause of the bumblebee extinction in Eura]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/Kasvinsuojeluaineet-eivat-aiheuttaneet-Euran-kimalaiskuolemia/>

<sup>92</sup> Finnish Safety and Chemicals Agency Tukes 2015: Tukes ja Varsinais-Suomen ELY-keskus ovat selvittäneet Loimaan mehiläiskuolemia [Tukes and the Southwest Finland ELY Centre investigated bee extinction in Loimaan]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/Tukes-ja-Varsinais-Suomen-ELY-keskus-ovat-selvittaneet-Loimaan-mehilaiskuolemia/>

on the basis of the application criteria agreed with the operators in the plant protection industry. In 2013-2017, Tukes has trained and approved the applications from a total of more than 200 trainers. Experts from Tukes, Luke, the Finnish Institute of Occupational Health, the Finnish Plant Protection Society, and the Finnish Crop Protection Association KASTE have also participated in the training events organised for trainers. Trainers are also regularly informed of new developments by email, and continuing training is also arranged for trainers, as necessary.

#### *Training for professional PPP users*

The plant protection training targeted at professional PPP users is voluntary. Training providers offer plant protection training tailored to the needs of different sectors, such as arable farming, open-air and glasshouse horticulture, green area management, golf course management, tree nurseries, silviculture, and PPP sales. The training materials targeted at training providers, organised by Tukes, have been distributed to all trainers. The materials are used in the basic training arranged for professional PPP users. Training providers may tailor the training materials according to the needs of their relevant sector.

Professional PPP users may study for the certification exam as they consider appropriate. Tukes has prepared, together with industry operators and with funding from the Ministry of Agriculture and Forestry, online plant protection training materials.<sup>18, 19</sup> The online materials contain videos, audio lectures, animations and text-based information on the sustainable use of PPPs. The materials are intended for both independent study and for support materials for plant protection training.

The materials used in the training arranged for trainers and the online training materials cover all the subjects specified in Annex I to the Sustainable Use Directive<sup>2</sup>. The training programme outlined in the annex has been implemented by a national decree on the training programme<sup>93</sup>. Integrated pest management (IPM) and the protection of workers are also covered in the plant protection training.

#### *Certification requirement*

The certification requirement applies to all individuals who use PPPs in the course of their professional activities. Professional users were required to acquire certification for the first time by 26 November 2015. Thereafter, the certification was to be renewed every five years. By the end of 2017, around 25 000 people had acquired the certification.

#### *Certification requirement concerning PPP retailers*

All PPP retailers are required to acquire certification. A distributor selling PPPs approved for professional use must have at least one staff member in their employ who holds a plant protection certification. The Tukes website contains guidelines on the practices concerning the trade of PPPs<sup>94</sup>, as well as answers to frequently asked questions<sup>95</sup>. The guidelines also cover practices concerning the online sales of PPPs.

Distributors selling only products approved for consumer use are not required to acquire certification. In accordance with the Sustainable Use Directive, PPPs classified as toxic, very toxic, carcinogenic, mutagenic or toxic for reproduction may not be approved for consumer use. Further information about the classification of products for professional or consumer use is available in section 3.1.2.

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<sup>93</sup> Decree of the Ministry of Agriculture and Forestry on a training programme regarding the handling and use of plant protection products (maa- ja metsätalousministeriön asetus kasvinsuojeluaineiden käsittelyä ja käyttöä koskevasta koulutusohjelmasta) 6/2012. <http://www.finlex.fi/data/normit/39160/12006fi.pdf>

<sup>94</sup> Finnish Safety and Chemicals Agency Tukes 2015: Kasvinsuojeluaineiden kaupan käytännöt muuttuvat – tutkintotodistus mukaan ostoksille [Changes to PPP trading practices – buyers must now present a valid plant protection certificate]. <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kasvinsuojeluaineet/Kasvinsuojeluaineiden-kaupan-kaytannot-muuttuvat--tutkintotodistus-mukaan-ostoksille/>

<sup>95</sup> Finnish Safety and Chemicals Agency Tukes 2015: Kasvinsuojeluaineiden kaupan käytännöt muuttuvat [Changes to the PPP trading practices]. <http://verkkolehti.tukes.fi/kasvinsuojeluaineiden-kaupan-kaytannot-muuttuvat-3/>

In connection with the controls of trade carried out in 2017, it was verified that distributors have sufficient staff in their employ holding a certificate. It was also verified that distributors are checking that buyers of products intended for professional use hold a valid certificate. In most cases, the certificate was checked in connection with the first purchase and the validity details were entered into the store's customer register.

#### *Certificates issued in other Member States are now also recognised in Finland*

Certifications acquired in another Member State are now also recognised in Finland, provided that the period of validity and the scope of certification comply with the Finnish certification. A holder of a Finnish certificate must train a holder of a certificate issued in another country in Finnish practices and PPP instructions for use.

#### *Development needs concerning the training and certification system*

The plant protection training should be developed so that the contents of the continuing training that professional users are required to undergo are modified as necessary. Currently, the plant protection training covers the subjects specified in the Sustainable Use Directive and in the Act on plant protection products. The continuing training of professional users starts in 2018, so the planning of the contents of the training must be carried out in due time. Furthermore, the planning and implementation of training and certification controls must be carried out over the coming years.

→ Proposed action: Information should be disseminated to trainers actively and conferences should be arranged for trainers to exchange experiences and disseminate up-to-date information, as required.

### **3.3.3. Effectiveness of measures aiming to raise awareness**

#### *How can the measures taken reduce the risks arising from the use of PPPs?*

The plans concerning communications, advisory services and training referred to in the NAP have not been prepared as such, but communications, advisory and training measures have been carried out as part of the ordinary activities of the parties responsible for the NAP. Planning could have enhanced the effectiveness of such measures. On the other hand, the NAP does not specify any indicators for the monitoring of the success of the measures, which makes it difficult to assess the impact of the measures on health and environmental risks. Publication of the residue control results is now carried out in a more timely manner, and the results are easier to comprehend.

Counterfeit product control methods have been developed in collaboration with other EU Member States. The aim has been to identify suspected counterfeit products as early as possible and more effectively than previously. Professional users have also been informed of counterfeit products. Counterfeit and illegal products cause major risks to human health and the environment, but it is possible to reduce the related risks to plant protection by enhancing the control and communications activities concerning such products.

Information on the safe use of PPPs and related health and environmental risks is disseminated to professional PPP users during plant protection training. Information is also available to professional farmers through the Neuvo 2020 advisory services system. So far, training, communications and advisory measures have been primarily targeted at professional users. Only limited communications efforts have been targeted at non-professionals, and it would be important also to disseminate correct and relevant information on plant protection to these users. Over the coming years, consumer communications should also be emphasised in communications measures.

Many of the measures that aim to protect the neighbourhood or pollinators can be considered communications measures, and the assessment of the effectiveness of them would require monitoring and, for example, conducting interviews among the users. Instructions for use of PPPs harmful to pollinators include restrictions concerning, for example, the use of the product on flowering plants, in the vicinity of beehives or during the bee swarming season.

Risk-based instructions for use specify obligations for the users of PPPs and thus help to reduce the risks arising from the use of PPPs to pollinators.

The plant protection training and certification system increases the awareness of professional PPP users of the safe use of the products and measures to reduce health and environmental risks. Basic training best serves those individuals with limited experience on the use of PPPs. Tailoring training according to the production sector also increases the interest of users on the contents of the training. The number of treatments can likely be decreased through targeted training that provides information about production plant diseases and pests and their appropriate management by sector.

According to some feedback received from individuals who have participated in the training, the training does not provide enough new information or challenge users to change their practices. When planning the continuing training system, it should be considered how it is possible to arrange sufficiently challenging training for professional users and how the certification should be implemented so that the training would have an actual impact on the behaviour of industry operators and on the number of health and environmental risks. The idea of a risk-based plant protection assessment by professional users proposed by one plant protection trainer could be a viable alternative: the users would have to consider themselves how they could reduce the risks in all stages of their work through their own actions. The training event could be, for example, a learning café type of training, where participants would be divided into small groups where they could discuss what measures they have already taken, for example, to reduce the risks or to identify control needs or pests, and how they could further improve their activities and what resources that would require. The participants could also discuss good solutions with plant protection specialists.

### **3.4. Promotion of IPM and organic production**

The objective is to promote integrated and organic plant protection and alternative control methods and techniques. The objective of integrated pest management (IPM) is to control pests only as deemed necessary based on monitoring. The methods used include biological, physical, mechanical and chemical control methods. When using PPPs, the aim is to avoid, to the extent possible, the emergence of PPP-resistant pest stocks by varying the active substances with different modes of action. The effectiveness of the implemented control activities is monitored so that the selection of the control method could be done in the future on the basis of personal experience of the effectiveness of different methods. IPM, organic plant protection and alternative control methods can help to reduce the risks caused to human health and the environment, as well as reducing dependency on the use of PPPs.

#### **3.4.1. Measures required and preconditions for the promotion of integrated and organic pest management**

##### **Actions taken**

All professional PPP users must observe the general principles of integrated pest management (IPM)<sup>96</sup>. Users are provided with information on the general principles of IPM and plant-specific instructions during plant protection training. The knowledge is also verified with the certification exam. Furthermore, prediction models are also developed to support monitoring and decision making concerning pests. IPM guidelines have so far been published for 16 plants or groups of plants.

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<sup>96</sup> Decree of the Ministry of Agriculture and Forestry on the general principles of integrated pest management (maa- ja metsätalousministeriön asetus integroidun torjunnan yleisistä periaatteista) 7/2012. [www.finlex.fi/data/normit/39161-12007fi.pdf](http://www.finlex.fi/data/normit/39161-12007fi.pdf)

The Neuvo 2020 advisory service<sup>97</sup> provides general advisory services for farmers regarding plant protection, IPM and organic production. Farmers are required to keep records of the use of PPPs, and farmers receiving environment payments are also required to indicate the reason for the use of PPPs in their records.

On-site farm events and other advisory and training events are organised to disseminate latest scientific information and exchange experiences and good practices in the organic production and IPM sectors. The Research Programme for Organic Food and Farming in Finland 2014-2018<sup>98</sup> also calls for more research on plant protection issues in organic production. The results are also available for the IPM sector.

Finland has also participated in the work of the Nordic Baltic Resistance Action Group (NORBARAG). The product label requirements concerning resistance have been harmonised in the Nordic countries and the Baltic States. Brochures have also been prepared for farmers on product selection to control resistance.

#### *Sustainable plant protection is promoted in the farmer aid scheme*

IPM and organic production are supported through a variety of measures in the farmer aid scheme included in the Rural Development Programme for Mainland Finland 2014-2020<sup>86</sup>. Environment payments are used to support voluntary plant protection for certain horticultural crops. The eligible techniques include:

- use of macro organism products, use of microbiological plant protection products spread by bees and use of polytunnels;
- use of pest insect nets and use of mechanically spread microbiological plant protection products;
- weed control using sensors, a tractor-driven flame weeder or similar.

The farmer must commit to using a biological or a mechanical control method suitable for the relevant plant or pest species in plant protection. If the selected method is not sufficiently effective, the farmer may use a chemical control method. In such cases, the farmer must indicate the reason for using the chemical control method in its record keeping regarding the use of PPPs. Farmers who have undertaken a commitment to organic production are eligible for support for organic crop and livestock production. Only pesticides approved for organic production may be used in organic production. Alternative plant protection methods and organic commitments are controlled through the farmer aid scheme.

#### *Critique concerning the alternative plant protection measure*

The alternative plant protection measure included in the environment payments has attracted some criticism. The volume of pests can quickly increase to an excessive level before the biological or mechanical control method is initiated. The aid conditions prevent first decreasing the amount of pests by using PPPs so that the rest could be managed using biological control methods. The principles and practices of IPM should be interpreted as they could be successfully applied in different practical situations. Furthermore, additional opportunities and incentives promoting the use of alternative plant protection methods are required for a variety of arable crops. The majority of PPPs used are products intended for the prevention of weeds. Promoting alternative methods to control weeds among arable crops could be an effective way to decrease the dependency on chemical PPPs.

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<sup>97</sup> Agency for Rural Affairs 2018: Maatilojen neuvonta [Advisory services for farmers]. <http://www.mavi.fi/fi/tuet-ja-palvelut/viljelijä/Sivut/tilaneuvonta.aspx>

<sup>98</sup> Nuutila J., Siiskonen P., Kahiluoto H., Mikkola M., Schäfer W., Tikkanen-Kaukanen C. 2014: Research Programme for Organic Food and Farming in Finland 2014-2018. [https://luomuinstituutti.fi/wp-content/uploads/sites/2/2014/03/Research\\_Programme\\_for\\_Organic\\_Food\\_and\\_Farming\\_2014-2018\\_ENG.pdf](https://luomuinstituutti.fi/wp-content/uploads/sites/2/2014/03/Research_Programme_for_Organic_Food_and_Farming_2014-2018_ENG.pdf)

### *Research strategy for integrated pest management*

During the programming period, efforts were made to prepare a national research strategy for IPM. However, the strategy was never completed since during the same period, the European strategic research agenda was prepared under the C-IPM project<sup>99</sup>. The strategic research agenda identified, for example, the following key concerns in IPM research:

- monodisciplinary research focus and lack of interdisciplinary IPM research;
- dominant short-term and project-based funding;
- decreasing trend in budget allocation to IPM research;
- limited transfer of research knowledge into practice;
- lack of design on the bottom-up organisation of applied research through fundamental research;
- insufficient collaboration and communication between funders of IPM research both at country level and between the Member States;
- increasing scarcity of human expertise.

The strategic research agenda also specified the following four core themes for research: (1) preventive measures for sustainable pest management, (2) alternatives to conventional pesticides and innovative control, (3) drivers and impact of IPM, and (4) IPM in minor crops.

### *National programme for organic production*

The objective of the Government development programme for the organic product sector<sup>100</sup> is to increase organic production, diversify the range of organic products available, and improve access to organic produce in retail stores and professional kitchens. Another objective is that by 2010, the share of the area under organic production should be 20 % of the total cultivated area in Finland. The demand for organic products among consumers is increasing<sup>101</sup>. The materials concerning the 'Scientific information on organic production' lecture series published by the Finnish Organic Research Institute (FORI) are freely available for everyone on the internet.<sup>102</sup> Statistics on organic production are also available from the website of ProLuomu<sup>103</sup>.

### *Control of integrated pest management*

In connection with the controls of the use of PPPs, it has also been investigated how IPM is implemented in practice. On tree nurseries, golf courses, green areas and farms with potted vegetable production the principles of IPM are mainly observed well.

→ Proposed action: Promoting the adoption of the low-risk and basic substances and comparative assessment referred to in the PPP Regulation<sup>23</sup> in order to reduce the risks arising from the use of PPPs to human health and the environment.

→ Proposed action: Additional opportunities and incentives promoting the use of alternative plant protection methods for a variety of arable crops should be investigated. Promoting alternative methods to control weeds among arable crops could be an effective way to decrease the dependency on chemical PPPs.

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<sup>99</sup> C-IPM 2016: Strategic research agenda. <http://c-ipm.org/strategic-research-agenda/>

<sup>100</sup> Ministry of Agriculture and Forestry 2014: More organic! Government development programme for the organic product sector and objectives to 2020. [http://mmm.fi/documents/1410837/1890227/Luomualan\\_kehittamisohjelmaEN.pdf/1badaefc-bc12-4952-a58a-37753f8c24ad](http://mmm.fi/documents/1410837/1890227/Luomualan_kehittamisohjelmaEN.pdf/1badaefc-bc12-4952-a58a-37753f8c24ad)

<sup>101</sup> ProLuomu 2017: Luomun kuluttajabarometri 2017: luomu arkipäiväistyy [Consumer survey on organic food 2017: Organic food is becoming part of everyday diet]. <http://proluomu.fi/aineistot/luomun-kuluttajabarometri-2017/>

<sup>102</sup> Finnish Organic Research Institute 2018: Tutkittua tietoa luomusta -luentojen materiaalit [Materials of the 'Scientific information on organic production' lecture series]. <http://luomuinstituutti.fi/koulutus/tutkittua-tietoa-luomusta/materiaalit/>

<sup>103</sup> ProLuomu 2018: Aineistot [Materials]. <http://proluomu.fi/aineistot/>

### 3.4.2. Integrated pest management (IPM)

*MEASURE: Preparation of crop group-specific IPM guidelines by updating the current 'balanced plant protection' guidelines, and awareness raising among farmers regarding the new guidelines. Luke, KSS, Tukes*

#### Actions taken

Guidelines on the application of IPM on cereal farms have been drafted as part of the PesticideLife project implemented in 2010-2013. Electronic versions of the guidelines and training videos on IPM are available from the project website<sup>104</sup>. Luke has published IPM guidelines produced in the VIPM project for potatoes, peas, carrots, swedes, celeriac, parsnip, beetroots and leeks.<sup>105</sup> Furthermore, in the IPM-APU project (2011-2014), IPM guidelines have been drafted for the most important berry plants (strawberry, raspberry and currants) and apples.<sup>88</sup> The guidelines were published in issue 21B of the Puutarha&Kauppa magazine in 2013.

The Finnish Cereal Committee<sup>106</sup> has also published cultivation guidelines and posters, for example, for oil plants, rye and malting barley. In addition to IPM instructions, the guidelines include organic production instructions for oil plants and malting barley.

An IPM training course package was prepared for tree nurseries in 2012-2013.<sup>107</sup> On the basis of this package, IPM guidelines were also prepared and published for transplants on tree nurseries.<sup>108</sup>

In addition, guidelines have also been published on the control of weeds on tree nurseries<sup>109</sup>. The guidelines also include IPM instructions for the control of weeds and liverworts. The guidelines were first introduced at a training event for tree nursery operators and later mailed to all tree nursery operators. Instructional articles have also been published in the Taimi uutiset magazine.<sup>110</sup>

The objective of the KasKas project (Real-time collection and transmission of digital pest data 2016-2018) is to facilitate the identification of pests and support need-based plant protection. Among arable plants, the project covers cereals, oil plants, legumes, cumin and carrots. Descriptions have been prepared on the most important animal pests, diseases and weeds affecting these plants and materials facilitating the identification of these pests and related decision making have been drafted. The aim is also to design an easy-to-use application which utilises observations

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<sup>104</sup> Natural Resources Institute of Finland 2015: Reducing environmental risks in use of plant protection products in Northern Europe. PesticideLife. [https://portal.mtt.fi/portal/page/portal/mtt\\_en/projects/pesticidelife](https://portal.mtt.fi/portal/page/portal/mtt_en/projects/pesticidelife)

<sup>105</sup> Natural Resources Institute of Finland 2016: Uusia oppaita avomaan vihannesten kasvinsuojeluun [New guidelines for the protection of open-air vegetable crops]. <https://www.luke.fi/uutiset/uusia-oppaita-avomaan-vihannesten-kasvinsuojeluun/> and <https://ipm-oppaat.luke.fi/>

<sup>106</sup> The Finnish Cereal Committee 2018: Viljelytietoa – huoneentauluja, tilastoja ja turvallisuusseurantaa [Cultivation information – posters, statistics and safety monitoring]. <http://www.vyr.fi/fin/viljelytietoa/huoneentaulut/>

<sup>107</sup> Natural Resources Institute of Finland 2017: Taimitietopalvelu - IPM (Integrated Pest Management). Paakkutaimien tautien integroitu torjunta metsätaimitarhoilla [Integrated pest management for transplants on tree nurseries]. <http://www.metla.fi/metinfo/taimitieto/ipm.htm>

<sup>108</sup> Poteri, M. and Lilja A. 2013: Paakkutaimien tautien integroitu torjunta metsätaimitarhoilla [Integrated pest management for transplants on tree nurseries]. Finnish Forest Research Institute, 36 pages. <http://urn.fi/urn:isbn:978-951-40-2427-6>.

<sup>109</sup> Poteri M., Himanen K. and Reiniharju J. 2015: Paakkutaimien rikkakasvit ja niiden torjunta metsätaimitarhoilla [Transplant weeds and control thereof on tree nurseries]. <http://urn.fi/urn:isbn:978-952-326-039-9>.

<sup>110</sup> Poteri M. 2015: Uudet kasvinsuojeluaineiden ympäristörajoitukset ja kasvinsuojeluaineiden käyttö metsätaimitarhoilla [New environmental restrictions concerning PPPs and the use of PPPs in tree nurseries]. Taimi uutiset 1/2015: 21-23. <http://jukuri.luke.fi/handle/10024/534242>

made by citizens during the project. The application enables real-time collection, recording and sharing of data about the occurrence of plant diseases, pests and weeds affecting arable crops, horticultural crops or forests.

In the ViherRiski project, a network and operating concept were developed to reduce the risk of pests in imported plants intended for green areas.<sup>111</sup> The operating concept is currently implemented in the ViherRiski II project.<sup>112</sup> The IPM-APU project has generated a roadmap for IPM in landscaping<sup>88</sup>. The roadmap has been utilised, for example, in the reduction of the use of glyphosate in green areas. The ViherRiski project also generated a Facebook group 'Puutarhan parhaaksi' intended for gardening enthusiasts and specialists, which currently has nearly 4 200 members. The philosophy of the group is to utilise ecosystem services to the extent possible in plant protection in home gardens and to raise awareness of the plant protection risks involved in imported green area plants.

*MEASURE: Promotion of research projects targeted at biological pest management (cf. organic farming). MMM, Luke, KSS, Tukes*

### Actions taken

The plant health legislation concerning biological control agents and pollinators was reformed during the programming period. Evira maintains a list of accepted biological control agents and pollinators, i.e. macro-organisms<sup>113</sup>. If a macro-organism is included in the Evira list, it is not necessary to apply for an authorisation to use, market or import the macro-organism. Any new products used for biological control or pollination must be notified two weeks in advance, and the authorisation for the use of such products must be applied for three months prior to the intended import, use or marketing. The control of macro-organism products has been extended to cover the entire country. A representative of Evira participates in the work of the biological control panel of the European and Mediterranean Plant Protection Organization (EPPO).

The monitoring of the control and volume of weeds encountered in organic plant production has been investigated in the LUKEKAS and PRODIVA projects.<sup>114, 115</sup> The objective of field experiments conducted on organic production fields is to investigate the impacts of nine different programmes concerning undersown crops on the volumes of weeds and crops. The results can be utilised in organic crop or livestock production. The tillage techniques used include ploughing and low tillage. The PRODIVA project investigated weeds and weed control methods on organic farms in six Northern European countries in 2015-2016.

Based on the field experiments carried out in Finland, crops undersown at the same time with cereals in spring grow too slowly to prevent the early development of spring annual weeds. However, undersown crops will grow thicker further into the growing season and outcompete weeds after the harvest. It is recommended to use mixtures of clover and grasses (e.g. Italian ryegrass) so that the nitrogen fixed by clovers can enhance the competitiveness of the next cultivation crop against weeds.

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<sup>111</sup> Ministry of Agriculture and Forestry 2015: Enhancing the landscaping sector's ability to manage the risk of quarantine pests. Final report. <http://mmm.fi/documents/1410837/2000497/Loppuraportti+ViherRiski+2014-2015.pdf/2c8e17f1-70e9-420c-bb6c-26c254d3eb96>

<sup>112</sup> The Finnish Association of Landscape Industries 2018: ViherRiski. <https://www.vyl.fi/tietopankki/viherriski/>

<sup>113</sup> Finnish Food Safety Authority Evira 2016: Biological control agents and pollinators. <https://www.evira.fi/en/plants/cultivation-and-production/biological-control-and-pollination/>

<sup>114</sup> CORE Organic 2018: PRODIVA - Crop diversification and weeds. <http://coreorganicplus.org/research-projects/prodiva/>

<sup>115</sup> Natural Resources Institute of Finland 2018: PRODIVA - Crop diversification and weeds. <https://www.luke.fi/projektit/prodiva-crop-diversification-a/>

The field experiments and weed monitoring carried out in the PRODIVA project have established the importance of diverse crop rotation in the control of weeds as part of a multi-annual IPM strategy. The enhancement of the competitiveness of the cultivation crop and mechanical control methods has provided good results. To control persistent perennial weeds, the undersown crops should be left on the field until the next year so that it can be repeatedly mown.

*MEASURE: Development of farming methods and cropping systems that minimise pest occurrence, e.g. use of natural enemies (cf. organic farming). Luke, KSS, Tukes*

*MEASURE: Investigation of the effects of changing cultivation techniques (e.g. direct sowing) on the use and rates of application of PPPs. Luke*

### **Actions taken**

The use of PPPs can be reduced by using healthy seedlings and seeds. Evira controls the quality of plant propagating materials used in conventional and organic production.

Basic information on the impact of different cropping systems has been compiled into a publication prepared in the PesticideLife project<sup>116</sup>. Luke has coordinated the preparation of plant species-specific IPM matrices. The matrices indicate the chemical and alternative control methods that are in use in Finland or elsewhere in the northern cultivation zone. However, the matrices have not yet been developed into an IT-based system because the related data platform project has not progressed.

Luke is currently carrying out a cropping system survey on two long-term experiment fields. The objective is to investigate the impacts of different crop rotation practices and tillage methods on pest populations and their control possibilities. A new method studied in the crop rotation survey uses an organic culture medium.

The use of biodegradable mulches can reduce the use of oil-based plastic covers, improve the growing conditions and facilitate the control of weeds affecting, for example, strawberries. In 2013-2016, Luke has also participated in the development of biodegradable mulches and their application techniques in collaboration with the industry operators.<sup>117</sup> Luke has transferred its patent rights to the Stora Enso Group, which ceased the related product development and marketing activities in 2017. Instead, Walki Group introduced in 2017 a new paper-based biodegradable mulching paper to compete with starch-based biofilm products.

The VILMA project<sup>118</sup> has demonstrated the adjustment of the cropping system to climate change. The techniques used included, for example, mixed cropping, maintenance of good soil structure and water management, the role of perennials in diverse crop rotation, and cultivation of legumes. Many of the methods introduced in the project are also the cornerstones of IPM in agricultural crops. The mixed cropping experiments carried out on pilot farms have been presented at various project events and on the project website. The OSMO project aims to organise information and knowledge about soil health management for use by farmers, as well as to develop new soil health management

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<sup>116</sup> Alanko A-M., Autio S., Huusela-Veistola E., Jalli H., Jalli M., Junnila S., Markkula I., Mäkinen T., Räsänen K. and Tiilikkala K. 2013: Integroitu kasvinsuojelu (IPM) ja riskienhallinta viljanviljelyssä [Defined benefits and weaknesses of different IPM methods]. MTT Raportti 107. <http://jukuri.luke.fi/handle/10024/481108>

<sup>117</sup> Salonen J., Suojala-Ahlfors T., Tiilikkala K., Kempainen R., and Eskola A. 2017: Biohajoavia katteita vihannesten rikkakasvintorjuntaan [Biodegradable mulches for the control of weeds affecting vegetables]. Natural Resources and Bioeconomy Studies 36/2017. Helsinki. 26 pages. <http://jukuri.luke.fi/handle/10024/540082>

<sup>118</sup> VILMA 2018: Tietopaketit [Information packages]. <http://www.ilmase.fi/site/tietopaketit>

methods. These activities promote the enhancement of nutrient recycling and resource-efficiency, as well as water protection in agriculture<sup>119</sup>.

The objective of the POnTE (Pest Organisms Threatening Europe) project (2015-2019) is to identify effective IPM methods to control carrot psyllid. The target pathogen for Finland is *Candidatus Liberibacter solanacearum* and its psyllid vector species that affect carrot and potato. Experiments have already been carried out over two summers in collaboration with Apetit Ruoka Oy.

The benefits of tunnel cultivation have been demonstrated at farmer events of the association for fruit and vegetable farmers in Finland (Hedelmän- ja Marjanviljelijäin liitto ry.). Tunnel cultivation has also been demonstrated in a project aiming to enhance the know-how of horticultural enterprises (Voimaa puutarhayritysten osaamiseen)<sup>120</sup>. The increased production volumes achieved through tunnel cultivation has contributed to the fact that the use of PPPs in the control, for example, of botrytis has reduced. The association Taimistoviljelijät ry. has published a guide for the identification of woody nursery plant pests<sup>121</sup>. The guide includes images of pests and their natural enemies to facilitate identification. Nursery farmers have also been recommended to use micro-propagated, pathogen-free seedlings produced from elite plants. The majority of the elite plant production in Finland was transferred from Luke to Saarioisten Taimistot Oy at the start of 2018.<sup>122</sup>

*MEASURE: Determination of threshold values (action thresholds) for pest control, the viability of forecasting systems, and decision criteria for weed control. Luke, KSS, Tukes*

#### Actions taken

The Ministry of Agriculture and Forestry contributes to the funding of the C-IPM ERA-NET project<sup>123</sup>, which is a joint effort of a total of 32 bodies from 21 countries. The objective of the project is to coordinate and finance joint European IPM research projects. The first application round was arranged in 2015. One of the projects which received funding was a project focusing on turnip rape, in which the University of Helsinki participated.

In connection with another C-IPM application round, funding was granted, for example, to the SpotIT ERA-NET project implemented by the Nordic countries and Lithuania. The objective of the project is to validate effective models for predicting leaf spot diseases in cereals and to develop an IT-based tool to support decision-making by farmers. In terms of the reliability of prediction models, the situation in Finland differs from that of the other countries so that while the other countries need to decide whether repeat the application twice or three times, Finnish farmers often consider whether to spray in the first place.

The PesticideLife project has investigated the effectiveness of threshold values in pest control on a total of 77 parcels. During the project, the threshold values were adjusted to increase their efficiency. Since the completion of the project, the electronic WisuEnnuste forecasting model for leaf spot diseases has been extended to cover more pathogens.

The investigation of pathogen forecasting models has focused on the validation of effective models for predicting leaf spot diseases in cereals in collaboration with ProAgria. In addition, the development of forecasting models is also

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<sup>119</sup> The Ruralia Institute 2018: Osaamista ja työkaluja resurssitehokkaaseen maan kasvukunnon hoitoon yhteistyöllä - hanke [Know-how and tools for resource-efficient soil health management in a collaborative network]. [http://www.helsinki.fi/ruralia/uutiset/2016/Maan\\_kasvukunto\\_OSMO\\_26012016.html](http://www.helsinki.fi/ruralia/uutiset/2016/Maan_kasvukunto_OSMO_26012016.html)

<sup>120</sup> ProAgria 2018: VoPu Voimaa puutarhayritysten osaamiseen [Enhancement of the know-how of horticultural enterprises]. <https://www.proagria.fi/hankeet/vopu-voimaa-puutarhayritysten-osaamiseen-7374>

<sup>121</sup> Valo T. 2015: Puuvartisten taimitarhakasvien tuholaiset [Pests of woody nursery plants]. Taimistoviljelijät ry. 104 pages. <https://kauppa.vyl.fi/tuote/puuvartisten-taimitarhakasvien-tuholaiset/10395/>

<sup>122</sup> Natural Resources Institute of Finland 2017: Luonnonvarakeskuksen valiotaimituotanto siirtyy Saarioisten Taimistot Oy:lle [Elite plant production to be transferred from Luke to Saarioisten Taimistot Oy]. <https://www.luke.fi/uutiset/luonnonvarakeskuksen-valiotaimituotanto-siirtyy-saarioisten-taimistot-oylle/> <sup>123</sup> C-IPM 2018: Coordinated Integrated Pest Management in Europe. <http://c-ipm.org/>

part of two European research projects investigating the automation of plant production work processes. In addition to the development of models, this has also enabled ensuring compatibility with other functions.

Furthermore, the national HALI project (2014-2015) focused on the development of an application for the enhancement of pest monitoring and dissemination of timely information. The project also piloted community-based observation measures; for example, water quality was monitored on the basis of observations made by citizens. The project also included conducting interviews with farmers, researchers and representatives of advisory organisations and aimed to clarify any issues and threshold values related to the observation of pests, as well as the requirements for the application. The development and testing of the application takes place in the growing seasons during 2016-2019 under the KasKas project.

The IPM-APU project has investigated the introduction of strawberry pest monitoring methods on strawberry farms, and the effectiveness of the existing threshold values from the perspective of cultivation practices. The project involved intensive efforts on four pilot farms during two consecutive growing seasons. The approach adopted in the experiments emphasised the principle of individual learning, meaning that the farmers were requested to reflect on their own experiences after each growing season in a thematic interview. This enabled the farmers to develop their activities on the basis of their own thoughts and experiences. The farmers applied very different approaches to how they integrated the new IPM elements as part of their activities. For some, the integration was effortless, while for others, it took a long time to find the best way to implement the new practices. All the farms experienced difficulties in integrating the prescribed monitoring model as such into their operations; the monitoring was considered to take too much time. The farmers also aimed to maximise the security of production and minimise the risk of crop losses, so the threshold values in accordance with the guidelines were not always observed. For example, at times, the farmers took measures to control strawberry mites or bugs even though the threshold values had not been exceeded. In the learning stage, the previous subjective view of the risks involved still strongly affects the farmers and tries to discredit the 'correctness' of the new, formal threshold values<sup>88</sup>.

One of the objectives of the DroneKnowledge project<sup>124</sup> is to identify spectrum ranges that could be utilised in locating pea aphid damage among pea crops through remote sensing performed using unmanned drones.

The aim of the Terve Kasvi project<sup>125</sup>, which was launched in 2017, is to investigate which methods enhance positive links between crop health and efficient use of nutrients in cereals and grass crops. The aim of the project is to increase the availability of data suitable for use on the level of farms, in modelling or in nutrient balance calculations, create more indicators measuring the impacts of crop health on efficient use of nutrients, promote the profitability of production, and reduce the environmental risks caused by nutrient loss.

*MEASURE: Ensuring the continuation of national IPM information services as an integral part of the performance guidance of expert institutions. MMM, Luke, KSS, Tukes*

### Actions taken

The Finnish Plant Protection Society has developed an IPM information service in collaboration with several industry operators. In the first stage, a demo version was developed for the IPM portal of a service for the identification of barley and strawberry pests. Later, the IPM portal was renamed as the IPM data platform, the aim of which is to provide a data platform for a variety of different databases. Currently, the Finnish Plant Protection Society is developing, in collaboration with the Potato Research Institute PETLA, a potato pest identification service<sup>126</sup> to demonstrate the operation of the data platform. The plan is that in the future, all required regulatory

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<sup>124</sup> DroneFinland 2018: DroneKnowledge-hanke vauhdittaa Suomalaista vientitoimintaa Tekesin tuella [The DroneKnowledge project facilitates Finnish export activities with funding from Tekes]. [www.dronefinland.fi/](http://www.dronefinland.fi/)

<sup>125</sup> Natural Resources Institute of Finland 2017: Terve satokasvi – parempi ravinteiden hyödyntäminen [Healthy crops through better utilisation of nutrients]. <https://www.luke.fi/projektit/terve-kasvi/>

<sup>126</sup> The Committee of the Potato Sector Association 2018: Kasvintuhoojakuvasto [Pest gallery]. <https://perunasta.fi/kasvintuhoojakuvasto/>

information, weather data, crop observations, pest population models, etc. required in plant protection would be available to farmers through a single portal. Currently, further funding has not yet been secured for the data platform development project. The early stages of the portal development project have been described and the performance of the portal model evaluated in the final report of the IPM-APU project<sup>88</sup>.

*MEASURE: Inclusion of IPM in PPP training. Tukes, Luke, advisory organisations*

#### **Actions taken**

The general principles of IPM have been incorporated as part of the plant protection training (see section 3.3.2 on training). When designing the continuing training scheme, it is necessary to consider which new elements of IPM should be taught to professional users. The perspective could be widened from single IPM activities into larger themes covering, for example, environmental management or ecological infrastructure of farms.<sup>127</sup> A guide published by the University of Helsinki describes, for example, the most important natural enemies and measures aiming to enhance their living conditions.

*MEASURE: National research and development efforts should support plant breeding and variety development aimed at placing disease- and pest-resistant varieties of the most important and most widely cultivated garden plants and arable crops on the market. Luke, advisory organisations, MMM, Tukes*

#### **Actions taken**

Luke has launched the Hyötygeeni project, which aims to enhance the resistance of the most important agricultural and horticultural crops against the most harmful pathogens. The project is implemented in close collaboration with the Finnish company Boreal Plant Breeding Ltd, as well as with other Nordic plant breeding establishments. Hyötygeeni is an umbrella project which covers research projects aiming, for example, to improve the pathogen resistance of apple and barley, to enhance the resistance of barley against seed-propagated pathogens, to reduce the risk of *Fusarium* and DON toxins by means of plant breeding, as well as to enhance the resilience of arable crops, for example, by means of mixed cropping, improved pathogen resistance and enhanced absorption of nutrients.

In the first application round coordinated by the C-IPM project, financing was granted to the IPM4Meligethes project led by the University of Helsinki<sup>128</sup>. The project focuses on the development of IPM methods against the pollen beetle through preventing the pest from becoming resistant to insecticides. The techniques used include: (a) buffering the cropping system against pest outbreaks via innovative biological control methods; (b) development of forecasting and monitoring methods and revised treatment thresholds; (c) development of targeted precision control methods; and (d) development of novel RNA interference methods.

#### **3.4.3. Organic plant protection**

*MEASURE: Promotion of research projects targeted at biological pest management (cf. IPM). Luke, advisory organisations, Luomuliitto, MMM*

#### **Actions taken**

The task of the Finnish Organic Research Institute (FORI) is to promote organic research in Finland. In 2016, the project funding available to Luke and the University of Helsinki for organic research in the sector of primary production totalled EUR 1.1 million, which accounts for approximately 50 % of the overall funding for organic research in Finland.

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<sup>127</sup> Piirainen A. 2016: Working with nature – environmental management and ecological infrastructure of a farm. University of Helsinki. The Ruralia Institute. Reports 155. 67 pages. <http://www.helsinki.fi/ruralia/julkaisut/pdf/Raportteja155.pdf> <sup>128</sup> C-IPM 2018: Drastic reduction of insecticide use against pollen beetles is possible. <http://c-ipm.org/research/ipm4meligethes/>

Of the supported research projects, several studied issues concerning plant protection in organic production, and the results were also applicable to IPM. The project funding available for plant protection measures totalled EUR 671 000. Below is a brief description of the objectives of these projects, as well as references to related project publications.

The Finnish Association for Organic Farming, or Luomuliitto, represents the interests of organic farmers. Luomuliitto provides services that aim to increase organic production, such as mentoring services to farmers starting organic production or switching their crops, and publishes the versatile magazine Luomulehti, which is targeted at professionals. In addition, Luomuliitto provides expert services for its members. In 2017, Luomuliitto launched in collaboration with industry operators campaigns aiming to promote organic seedling production, which is still limited in Finland.

The REVI and RATKO projects<sup>129, 130</sup> aim to enhance resource-efficiency in Finnish open-air vegetable production and to reduce harmful environmental impacts by enhancing nutrient management, developing crop rotation on farms and reducing storage loss of vegetables. The projects include three work packages: 1. Efficient utilisation of nutrients in vegetable production<sup>131</sup>; 2. Good soil health on vegetable farms; and 3. Management of onion and carrot storage diseases<sup>132</sup>.

The BICOPLL project<sup>133</sup>, which focuses on the biocontrol of pests, investigates the control of grey mould using strawberry as a case study. Biotus Oy has investigated, in collaboration with the Häme University of Applied Sciences, biocontrol of the red spider mite in raspberries. The VIPM project<sup>105</sup> has investigated biocontrol of the cabbage maggot. The EkoKas-project<sup>134</sup>, which focuses on the development of organic and IP production, has investigated the control of *Fusarium* infestations in onion and studied potato varieties that are best suited for organic production. The Luomupuutarha project has studied the impact of biodegradable mulches on the control of weeds in vegetable production<sup>117</sup>. As part of the project coordinated by Taimistoviljelijät ry., a Master's thesis was published on the use of predatory mites in the control of phytophagous mites<sup>135</sup>.

*MEASURE: Development of farming methods and cropping systems that minimise pest occurrence, e.g. use of natural enemies (cf. IPM). Luke, advisory organisations, Luomuliitto*

### Actions taken

The Finnish Organic Research Institute (FORI) organises, in collaboration with other industry operators, debates and seminars on topical issues concerning plant protection. The results of the above-mentioned research projects and other recent scientific studies on organic production are actively disseminated for use by advisory organisations and

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<sup>129</sup> Suojala-Ahlfors T. 2016: Vihannestuotannon resurssit tehokkaaseen käyttöön [Efficient use of vegetable production resources]. Puutarha&Kauppa 10/2016. [https://www.luke.fi/wp-content/uploads/2016/05/REVI\\_esittely\\_Suojala-Ahlfors\\_09062016.pdf](https://www.luke.fi/wp-content/uploads/2016/05/REVI_esittely_Suojala-Ahlfors_09062016.pdf)

<sup>130</sup> Finnish Organic Research Institute 2015: Löytyykö ratkaisuja luomusipulia vaivaavaan sipulimätäongelmaan? [What are the solutions for the onion rot problem affecting organic onions?] <http://luomuinstituutti.fi/loytyyko-ratkaisuja-luomusipulia-vaivaavaan-sipulimataongelmaan/>

<sup>131</sup> Kivijärvi P., Iivonen S., Hannukkala A. and Suojala-Ahlfors T. 2017: Viherlannoitus- ja keräjäkasvit avomaavihannestuotannossa [Green manure and catch crops in open-air vegetable production] <http://jukuri.luke.fi/handle/10024/538580>

<sup>132</sup> Kivijärvi P. Suojala-Ahlfors T., Hannukkala A., Latvala S., Koivisto A., Iivonen S. and Kuivainen E. 2016: Luomusipulin tuotannossa ongelmista ratkaisuihin [From problems to solutions in organic onion production]. <http://jukuri.luke.fi/handle/10024/535279>

<sup>133</sup> CORE organic 2018: BICOPLL. <http://projects.au.dk/co2results/conclusions-and-recommendations/bicopoll/>

<sup>134</sup> Leppänen E., Rahkonen A., Avikainen H., Kivijärvi P., Hintikainen V. and Sulkko T. 2013: Luomu- ja IP-kasvituotannon kehittäminen – EkoKas. Luomuperunan lajikekoe; tulokooste 2012 [Development of organic and IP vegetable production – EkoKas. A variety trial in organic potato production; a summary of the results for 2012]. <https://portal.mtt.fi/portal/page/portal/mtt/hankkeet/ekokas/Julkaisut/Luomuperunan%20lajikekoe%20tuloraportti.%202012%20EKOkas.pdf>

<sup>135</sup> Kangas, N. 2013: Biological control in nursery production – Control of phytophagous mites on apple seedlings with predatory mites. Master's thesis, University of Helsinki. [https://helda.helsinki.fi/bitstream/handle/10138/38585/Niina%20Kangas\\_Gradu.pdf?sequence=1](https://helda.helsinki.fi/bitstream/handle/10138/38585/Niina%20Kangas_Gradu.pdf?sequence=1)

farmers, for example, through publications, information measures and farmer events. Information is also freely available, for example, from the website of FORI<sup>136</sup> and the website targeted at professional organic producers<sup>137</sup>.

*MEASURE: The advancement of national basic and applied research into organic production in order to develop sufficiently reliable organic protection methods to address more challenging plant protection problems and to advance current knowledge of preventive methods in organic production. Research and advisory organisations, Luomuliitto*

#### **Actions taken**

FORI, in collaboration with Luke and the University of Helsinki, is actively searching for new sources of funding for organic research and helps researchers to draft project applications and manage their projects, as necessary. Research projects are also designed and implemented in cooperation with farmers and other industry operators, focusing on the research needs of the organic industry.

*MEASURE: Determination of the potential for better harmonisation within the Baltic Sea region of substances covered by Annex II (Pesticides — PPPs) of the Organic Regulation and of substances included in the Finnish Plant Protection Product Register.*

Research and advisory organisations, Luomuliitto

#### **Actions taken**

Industry operators have participated in the development of EU and Finnish legislation on organic production to enhance the operating conditions for Finnish organic producers, for example, by commenting on legislation and communicating with working groups responsible for legislative drafting.

### **3.4.4. Effectiveness of measures aiming at the promotion of IPM and organic production**

*How can the measures taken reduce the risks arising from the use of PPPs?*

Integrated and organic plant protection measures include several actions that aim to offer information and tools for use by professional PPP users on the introduction of integrated and organic plant protection methods. The general principles of IPM must be observed when using PPPs in the course of professional activities. The topic of IPM is also covered in the plant protection training and certification.

The measures specified in the NAP are based on the strong assumption that provision of information will change the practices of PPP users and consequently reduce the risks involved in PPPs. The actions taken under the NAP primarily contribute to the clarification of the requirements concerning the use of PPPs. The NAP sets only a few objectives for the introduction of alternative control methods and re-design of the cropping system. For example, alternative control methods should be developed for the control of pests of turnip rape and rape to replace the use of neonicotinoids.

It takes time to change existing cropping practices. However, many new environmentally sustainable methods have become surprisingly popular, provided that the related economic benefits are good. For example, acquiring a weed hoe suitable for mechanical control of weeds would mean additional expense if the farmer already uses a sprayer. It is important to demonstrate through cost-efficiency calculations that IPM will provide significantly better financial results. The better than average profitability of organic farming and related information measures have promoted the switching to organic production among farmers. In 2017, organic production accounted for 11.7 % of the total cultivated area in Finland, and the growth has accelerated over the last few years.

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<sup>136</sup> Finnish Organic Research Institute 2018: The Finnish Organic Research Institute. <https://luomuinstituutti.fi/en/fori/who-we-are/>

<sup>137</sup> Luomu.fi 2018: Ammattilaisille [For professionals]. <http://luomu.fi/arkisto/ammattilaisille/>

Plant protection activities could be further enhanced to achieve the objective of reducing health and environmental risks caused by PPPs. Health and environmental risks can, of course, be reduced by diversifying the plant protection methods in use, however, higher CO<sub>2</sub> emissions, increased erosion or health risks to users potentially involved in the use of alternative methods should not be forgotten either.

For all actions taken, it is important to consider in the planning stage how these actions can reduce health and environmental risks. Furthermore, when drafting statutory obligations or designing research projects, it should be ensured that professional PPP users will adopt the latest scientific findings. Nissinen et al. (2015) have discussed this issue as follows: 'We need more research steered by a pre-drafted plan on the practical application of the research results. First, a common problem is identified and a group of stakeholders is appointed to specify the information requirements and to draft the information utilisation plan. Then, the stakeholders determine the outputs required of the research to solve the problem identified. The research questions and required methods are then specified based on these. Finally, the utilisation plan pre-drafted by the stakeholders is implemented. This type of research process is referred to as "design-based research". The starting point in a traditional academic research process is the research design, which then leads to conducting the specified research activities, publication of an academic paper and only finally to the practical utilisation of the results. The traditional process should not be completely abandoned, but more design-based research is needed in order to develop the methods of IPM.'<sup>138</sup>

In the next NAP, the focus must be on ensuring that professional PPP users are also involved in the IPM development work. In the press release concerning her dissertation on the methods for evaluating the NAP, Sari Autio summarises as follows: 'The quality of training, extension services and information for the users, as well as the mutual atmosphere of the actors influence the willingness to adopt the knowledge provided. A joint co-production of knowledge between all stakeholders should be considered also in the future.'<sup>139</sup>

The objective of design-based research in terms of plant production is to create cultivation environments in which ecosystem services account for as much as possible of all plant protection activities. Not all PPPs used are selective, and disturbing the natural balance could lead to a vicious cycle in which the need for chemical plant protection increases as new problems keep emerging. By utilising the know-how of professional users, it is possible to ensure that the goals and solutions of IPM research are realistic. The research should be promoted by establishing a network of demonstration farms, on which different plant protection and plant production solutions can be trialled in practice<sup>138</sup>.

Today, research funding is exceedingly difficult to secure, and therefore plant protection research is often outsourced to actual farms. When utilising the services of demonstration farms, it must be remembered that not all farmers have the required qualifications to act as a research expert, and visiting the farms can be difficult for the researchers due to long distances. Furthermore, conditions on the farms often vary significantly. In research requiring specialist knowledge, it is still necessary to carry out high-quality studies on experimental fields.

The NAP<sup>139</sup> also sets research obligations for IPM measures. These measures are implemented through research projects that require applying for separate project funding. The NAP was directly implemented through the

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<sup>138</sup> Nissinen A., Vänninen I., Räsänen K., Tiilikkala K. 2015: Minne ja miten Suomen IPM-tutkimus suuntautuu tulevaisuudessa? [How will the Finnish IPM research evolve in the future?] *Kasvinsuojelulehti* 48:1, 22-25.

<sup>139</sup> University of Helsinki 2016: Uusia välineitä kasvinsuojeluaineiden kestävä käytön kansallisen toimintaohjelman arvioimiseen [New tools for evaluating the National Action Plan on the Sustainable Use of Plant Protection Products]. <https://www.helsinki.fi/fi/uutiset/kestava-kehitys/uusia-valineita-kasvinsuojeluaineiden-kestavan-kayton-kansallisen-toimintaohjelman-arvioimiseen>

national IPM projects which were completed in 2014 (PesticideLife, VIPM and IPM-APU). In addition to these, many more research projects directly or indirectly concerning IPM have been carried out than originally estimated in the objectives and cost calculations of the NAP. The cost-efficiency of the Rural Development Programme has already been assessed<sup>86</sup>, and the intention is to evaluate the effectiveness of the environmental programme next.

### 3.5. Introduction of comparative assessment

The aim of comparative assessment is to replace products containing harmful active substances with less harmful products or control methods. Health and environmental risks are also taken into account in the assessment, i.e. the ultimate aim is to reduce the health and environmental risks caused by the use of PPPs.

#### 3.5.1. Comparative assessment

*MEASURE: Identification of possible nationally problematic PPPs. Application of comparative assessment to these products as far as possible, with the objective of future replacement of certain environmentally problematic substances. Tukes*

#### Actions taken

The objective of comparative assessment is to evaluate whether it is possible to substitute a product identified as containing a harmful active substance with another product or control method. The risks caused by the use of the substitute product or method to human health and to the environment must be significantly lower compared to the currently used product. In the assessment, attention must be paid, for example, to resistance management, and there should be practical experiences of the use of the replacement product, where necessary.

Member States are required to perform a comparative assessment on all products containing active substances that are candidates for substitution. The European Commission has published a list of candidates for substitution<sup>140</sup>. The obligation applies to all applications for the authorisation of PPPs submitted on 1 August 2015 or thereafter. The EU PPP Regulation<sup>23</sup> specifies the criteria under which an active substance must be classified as a candidate for substitution.

The first applications for the authorisation of PPPs that need to be subjected to comparative assessment were submitted for processing during 2017. The preparatory work for the development of the related practices was initiated earlier.

→ Proposed action: Active substances of particular concern in Finland are to be specified.

#### 3.5.2. Effectiveness of the introduction of comparative assessment

*How can the measures taken reduce the risks arising from the use of PPPs?*

The introduction of comparative assessment will significantly reduce the risks caused by the use of the most harmful products. Alternative control methods should be sought for products classified as the most harmful products, and restrictions on use may be set for the approval of such products. Substituting products identified as the most harmful products with less harmful products will directly reduce the risks arising from the use of PPPs. The measure was initiated in 2017, so it will not be possible to assess its impact until the end of the next programming period.

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<sup>140</sup> Commission Implementing Regulation (EU) 2015/408 on implementing Article 80(7) of Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market and establishing a list of candidates for substitution. [http://eur-lex.europa.eu/legal-content/EN/TXT/ELI/?eli=reg\\_impl:2015:408:oj](http://eur-lex.europa.eu/legal-content/EN/TXT/ELI/?eli=reg_impl:2015:408:oj)

## 4. Conclusions and the new NAP

The Finnish National Action Plan on the Sustainable Use of Plant Protection Products has now been implemented for a period of seven years. During this time, the national PPP legislation has been updated to comply with the requirements of the Sustainable Use Directive<sup>2</sup>. The statutory requirements concerning the training and certification system for professional PPP users, inspection of sprayers, and ban on aerial spraying have been transposed within the time limit set out in the Sustainable Use Directive.

In her dissertation<sup>141</sup>, Sari Autio has developed new qualitative assessment methods for evaluating the NAP. The participatory action research involves actors such as advisory organisations, researchers, farmers, authorities, providers of plant protection training and certification, and other stakeholder groups. The dissertation also included a handbook for practical evaluation needs of governance. It also reflected on the measures and success indicators of the different priority areas of the NAP. The tools developed in the dissertation work can help to specify the risk reduction objectives and success indicators of the NAP. Particularly the implementation of qualitative indicators could be hindered by the scarcity of resources.

The measures and reports related to the NAP have been drafted in collaboration by Finnish researchers, authorities, advisory organisations and other stakeholder groups. Some of the measures were implemented as part of normal duties of authorities, such as activities related to training and compilation of statistics. Some measures have required acquisition of separate project funding, such as the drafting of the IPM guidelines.

The NAP has been implemented in accordance with central government spending limits, state budgets and central government productivity programmes. The total implementation costs of the programme measures were estimated to be in the region of EUR 7.9 million, inclusive of all the costs estimated to accrue to the actors in 2011-2020 (see section 5 of the NAP). The actual costs incurred have not been assessed.

The measures specified for the 2011-2020 programming period have already primarily been completed, or the implementation of them was started during the NAP period. In connection with the interim evaluation of the NAP, it became obvious that there was a need to draft a completely new NAP. The following measures included in the first NAP, which have not yet been completed, will be carried over to the new NAP:

- risk-based design and implementation of the control of sprayer inspection activities;
- organisation of a campaign concerning the collection of expired PPPs;
- preparing a guide on appropriate washing methods for PPP sprayers (e.g. biobed, wash tower);
- collecting data on the use of plant protection products in a common database, and clarification of the principles applied to related access rights.

### *Measures to be included in the 2018-2020 NAP*

The first NAP included measures that were intended to last until 2020. These measures and their implementation are discussed below.

*MEASURE: Development of means for transferring parcel-specific data on the use of PPPs by holdings to a common database, and clarification of right of use principles concerning holding-specific information. Luke*

The measure will be carried over to the new NAP.

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<sup>141</sup> Autio, S. Do we listen to earthworms? Tools for evaluating the Finnish National Action Plan on the sustainable use of plant protection products. Academic dissertation, University of Helsinki, 288 pages. <https://helda.helsinki.fi/bitstream/handle/10138/167494/dowelist.pdf?sequence=1>

*MEASURE: Analysis and preparation for implementation of EU risk indicators. Implementation of Community-level indicators once an agreement is reached on the most viable indicators for use. Until this time, the existing national indicators will be used. Tukes, Luke*

The national environmental risk indicators are specified in section 3.2.1. The risk indicators developed in the EU will be monitored in the new NAP. The new indicators will be adopted once they are finalised.

*MEASURE: Monitoring of PPP residues in domestic foods will be continued. Evira*

The residue monitoring measures are specified in section 3.1.1. Residue monitoring will be included in the new NAP as a continuing measure.

*MEASURE: Investigation of means of gathering information on acute poisoning incidents and, as far as possible, chronic poisoning incidents related to PPPs. Tukes*

The actions taken thus far are specified in section 3.1.2. The new NAP will also cover monitoring measures related to acute and chronic poisoning incidents, updating of the guidelines for occupational health care and development of biomonitoring methods.

*MEASURE: Investigation of the potential for developing current techniques of PPP use (product dilution, sprayer filling and product application). Tukes, Luke*

The measures related to the use of PPP sprayers will be included in the new NAP in the section covering the continuing training for professional PPP users.

*MEASURE: Assessment of viable biological pest management methods for the eradication of invasive species such as giant hogweed. Luke*

The actions taken thus far are described in section 3.2.7. The measure concerning alternative methods for the control of invasive alien species will be included in the new NAP as a continuing measure.

*MEASURE: Identification of effective weed control methods for green areas, e.g. assessment of alternative ground cover materials. Luke*

Methods developed for the control of weeds in green areas are discussed in section 3.2.7. The measure will be included in the new NAP as a continuing measure.

*MEASURE: Organisation of sufficient environmental monitoring of PPPs. SYKE*

The actions concerning environmental monitoring are discussed in section 3.2.3. The measure will be included in the new NAP as a continuing measure.

*MEASURE: Clarification of the criteria used by other EU countries for the determination of groundwater restrictions; PPP use v. groundwater areas. Tukes, SYKE*

The practices concerning the determination of groundwater restrictions have been investigated and are discussed in section 3.2.1.

### *The new NAP*

In connection with the interim evaluation of the NAP, it became obvious that there was a need to draft a completely new NAP. The new NAP will also briefly discuss the measures covered in this report. It will also specify the new objectives, measures, timetables and indicators for the reduction of risks caused by the use of PPPs. The new NAP<sup>142</sup> was completed at the same time as this interim report.

The new NAP continues some of the measures already implemented during the first NAP. In addition, the new NAP will also contain new measures to reduce the health and environmental risks involved in PPPs.

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<sup>142</sup> Finnish Safety and Chemicals Agency Tukes 2018: The Second Finnish National Action Plan on the Sustainable Use of Plant Protection Products for the years 2018–2022. [http://www.tukes.fi/Tiedostot/Kestava\\_kasvinsuojelu/NAP\\_II.pdf](http://www.tukes.fi/Tiedostot/Kestava_kasvinsuojelu/NAP_II.pdf) 26 pages.